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Application Prototype for WEB-Based Calibration Registration Process Monitoring (Case Study: PT. CALTESYS Indonesia Semarang Branch)

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ABSTRACT: PT. Caltesys Indonesia Semarang branch is a private laboratory engaged in calibration. Based on interviews that have been carried out with service management, especially in the laboratory section, it seems that there are still several problems, namely the process of processing calibration data registration submissions which have to fill out paper forms to recording results and recapitulating reports that still use Spreadsheets. In this case, considering that calibration registration requires a very complex process, we need a software that can monitor starting from the registration process until the calibration results come out. For this reason, an application prototype was made for monitoring the calibration registration process with the prototype method with the following stages: gathering requirements, quick design, building prototypes and evaluating prototypes. Based on the results, it can be concluded that this Web-based application can overcome existing problems, namely the admin, marketing and customers can be more efficient in monitoring the calibration registration process. In addition, in terms of time, the report printing process, both customer data, calibration data, and registered equipment certificates can be done more quickly.

KEY WORDS: Prototype, calibration, UML, Web based, PHP

I.INTRODUCTION

Measurement activities in general are very important as the main infrastructure for the process of industrialization and trade in the face of global competition. All information related to measurements is very useful for all parties involved in measurement activities, namely calibration laboratories, quality testing laboratories, industry, government agencies and the public.

The availability of good and sufficient information for users is one form of effort in achieving optimal services provided by the calibration laboratory of PT. Caltesys. According to [1] in accordance with the times, the existence of the website not only provides complete information but also communication that is two-way interaction in accordance with the wishes of the user. Therefore, to achieve this optimal service, it is necessary to make a prototype of a web-based calibration registration application that can meet the needs of users (customers and calibration laboratory personnel) and the information provided must be communicative and informative.

PT. Caltesys is a private laboratory company engaged in calibration in the Semarang area which has 127 calibration instruments and 37 kinds of calibration of medical devices. The registration process for calibration measurements is carried out by contacting the marketing department so that several contract letters will be made which must be approved by the customer followed by approval from the leadership of PT. Caltesys. After obtaining approval, the customer can bring the equipment to be tested for calibration and hand it over to the laboratory staff. In addition, based

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Vol. 8, Issue 8 , August 2021

on the contract letter made, the marketing department can contact the customer periodically to remind them about the life limit of the measurement tool so that it is necessary to re-calibrate.
Currently, in carrying out the calibration process in the Caltesys laboratory, there are still shortcomings, namely in the field of data processing which still uses Spreadsheets. This raises problems including: 1) laboratory personnel in recording data related to tools brought by customers are still done manually in Spreadsheets, 2) customers have to ask several times for calibration results to laboratory staff and the last one is 3) for marketing that is not fast enough in providing reminder information to customers to re-calibrate periodically. Starting from these problems, it is necessary to develop a prototype of a calibration registration application based on web development as well as having a monitoring function with the aim of making it better accessible to laboratory staff, marketing and customers.

II. LITERATURE SURVEY

Measurement plays an important role in almost all human activities and has long been used by humans in everyday life. The problem that arises is that there are often errors in measurements such as the inaccuracy of measurement results. According to research [2], the error is caused by several factors, including the non-operation of the measuring instrument or the measuring instrument providing incorrect measurement data. By using the method of participation and observation, lectures, dialogues and discussions were carried out with the community at the location of the activity. The conclusion of this study is that the inaccuracy in the measurement of a measuring instrument can be overcome by recalibrating the instrument.
According to [3] calibration is a process in which various parameters of the simulation model are adjusted until the model accurately represents field conditions. Meanwhile, according to research [4] regarding the introduction of various calibrations of laboratory equipment, it is stated that in testing, instrument uncertainty is often found, causing the test results to be less accurate. By using the uncertanty budgeting report method, laboratory tests were carried out on various tools using a voltmeter, ammeter, clamp meter, ohm meter and LCR meter. The results obtained are that if the uncertainty value is small, the tool is suitable to be used as a measuring tool, and vice versa if the uncertainty value is large, the tool is not suitable to be used as a measuring instrument.
Meanwhile, in research [5] it was stated that the obstacles faced in conducting calibration in the laboratory were the length of the process of submitting and offering calibration. This is because the calibration submission process is still using a mail delivery system so that it has an impact on the slow calibration service. Therefore, a website-based information system was developed to solve these problems using the SDLC waterfall method. The test results through validation testing obtained 100% valid results, time testing of 99.9% and user acceptance rate of 87.5% using user acceptance testing.
In addition, related to the constraints of manual input, there are examples of research [6] on monitoring the maintenance of air conditioning facilities that still perform manual input using Microsoft Excel. The weakness that occurs is that data can not be inputted due to negligence in recording and only the officer who inputs the data knows it so that the data is offline. In this study, the method used is to use Google Spreadsheet to collect data and process data and then apply it to the AC reporting dashboard on the iFacility Official site. Therefore, the application of the dashboard on the iFacility system can make it easier for operations division officers to monitor air conditioning maintenance online.
While research [7] discusses the problems that occur in the administrative process of testing services caused by the delay in the validation process of test results if the person in charge is not in place and typographical errors in issuing certificates of 10.15% in 2017. The research method uses Logical Model Design, namely Context Diagram and DFD which are then implemented in the PHP programming language and MySQL database. This research resulted in an integrated website between sample recipients, treasurers, laboratories and certificate typing so that errors in typing certificates no longer exist and the administrative process becomes faster.
According to research [8] the role of information systems is very important in providing information for management in the decision-making process. This study proposes a model tested by descriptive analysis and t-test of survey data collected from 56 of 84 Deans, Vice Deans, General Managers and Managers. The results of the study indicate that there is a strong relationship and impact of the use of information technology on the decision-making process. Therefore, the use of information technology is a must in the current era. According to [9] based on several previous studies stated that the lack of application of technology in the activities of an organization can lead to low performance and productivity. By applying technology, there is a positive influence in the form of efficiency and effectiveness that can be enjoyed by the organization. Finally, related to quality issues regarding information systems, research [10] measures the quality of the medical device calibration management information system (SIMKAM). The research

ISSN: 2350-0328
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Vol. 8, Issue 8 , August 2021

method used is by using a questionnaire as a research instrument consisting of 19 questions grouped into 5 variables, namely ease, accuracy, completeness, suitability, timeliness. The results obtained are that there is a difference in value of 0.49 higher, which means there is a difference between before and after using the information system. The summary of the literature review above is to avoid the uncertainty of measuring instruments, it is necessary to recalibrate in a laboratory that has an online web-based information system. The purpose of using a web-based information system is to make registration easier and minimize errors in data input, while being online with the aim of making it easier to access by interested parties.

III. METHODOLOGY

The data for this research were obtained by (1) conducting interviews with the laboratory staff and the marketing department, (2) other supporting data for this research were obtained by conducting a literature study on matters relating to system development and calibration issues. The system development method uses the Prototype model [11] whose process is shown in Figure 1:

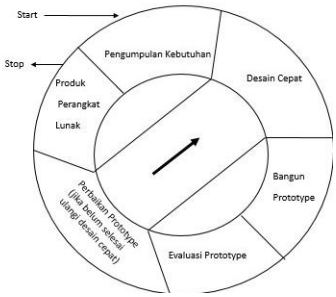

Fig 1. Research method with prototype model

Information:
1. Needs collection is done to find an alternative solution to the problem according to the user's needs by conducting interviews with laboratory and marketing officers.
2. Based on the identification of needs obtained, a design or design is carried out quickly to design a new system with the UML model, namely use cases and class diagrams.
3. Furthermore, based on the design, a new application is built by creating various views using PHP, HTML and MySQL databases.
4. If an error is found, it will return to the quick design for repair.
5. After no errors are found, the application can run properly.

IV. EXPERIMENTAL RESULTS

The following are the various stages carried out on the Prototype model with the results and discussion:

A) Necessity Gathering

Data was collected by interviewing the marketing department and laboratory staff. The results of interviews with the marketing department produce data on the customer's name, address, telephone number and the name of the marketing officer who received the registration tool from the customer. Meanwhile, interviews with laboratory officers produced data on the equipment to be calibrated in the form of PO number, name of the device, brand, serial number, type and date of entry of the device. The results of this interview were checked again by observing the registration document in the form of a contract letter signed by the customer in the marketing department.

Furthermore, based on the data collection, a detailed identification of what can be done by the new system application to be made is carried out. The identification results obtained are 1) laboratory officers who act as admins can manage calibration data, 2) marketing can report customer data and equipment data that must be calibrated regularly and 3) customers can monitor the calibration status process of the equipment being registered. As for the software requirements used, namely for the Windows 7 OS with PHP and HTML programming languages, while relating to the data base using MySql and XAMPP ControlPanel v3.2.2.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 8 , August 2021

B) Quick Design

After completing the process of identifying what needs are needed for the application of the new system to be made, the next step is to design or design quickly. For this reason, UML modeling is used using use case diagrams and class diagrams. In designing the use case diagram, 3 actors are generated, namely admin (laboratory officer), marketing and customer. In this case, the admin who runs the system can manage customer data and data on the equipment to be calibrated which includes input, edit, delete and print reports as well as upload certificates according to the equipment proposed. The marketing department can view customer data so that they can contact the customer if someone forgets to periodically re-calibrate. Meanwhile, the customer can monitor the extent to which the calibration process stages have been carried out and print a certificate from the proposed tool by downloading the certificate. For more details, see Figure 2 below.

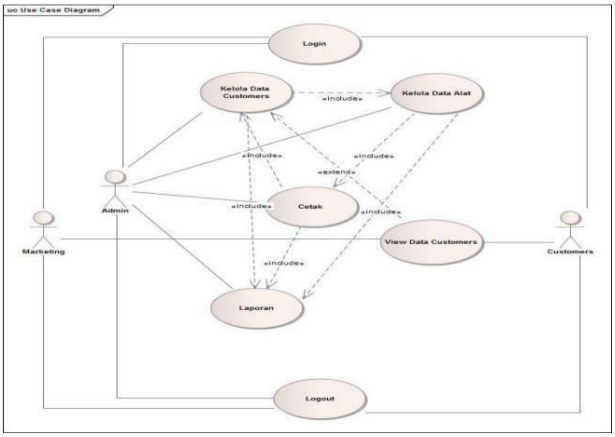

Fig 2. Use case diagram of the calibration registration process at PT. Caltesys

The next design is to create a class diagram model in Figure 3. This class diagram will be described in tabular form in the form of fields, types and sizes in the database design process for the system to be built.

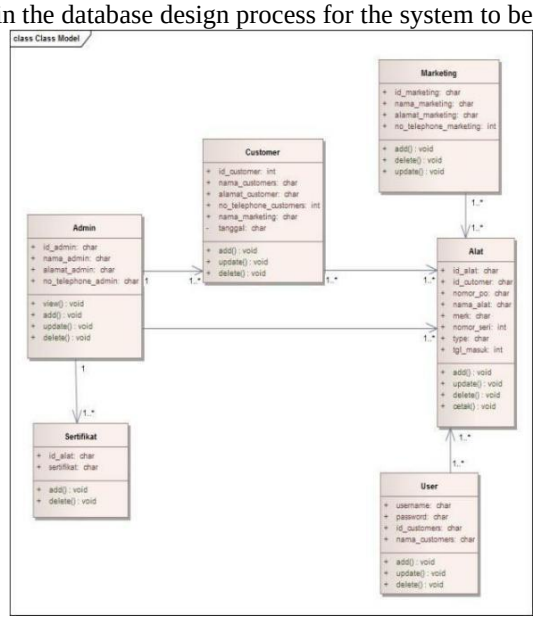

Fig 3. Class diagram of the calibration registration process at PT. Caltesys

C) Build Prototype

After stage 2 is complete, the next step is to build a prototype using the PHP and HTML programming languages with the following results:

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 8 , August 2021

Login page. This is the page that is used to enter the system by entering the username and password as shown in Figure 4. In this case there are 3 access rights according to the system user, namely admin, marketing and customer.

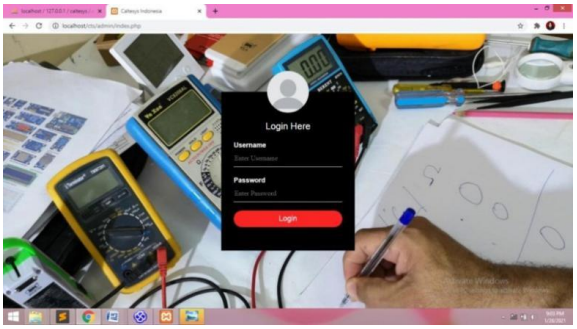

Fig 4. Display of the login page for the calibration registration process at PT. Caltesys

Admin dashboard page. This page is the first screen when logged into the system with access rights as Admin. The display shows 4 push button options, namely customers, tools, print, reports, and settings as shown in Figure 5.

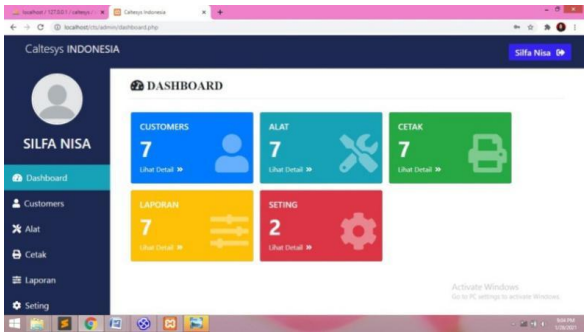

Fig 5. Display dashboard page admin PT. Caltesys

The next button is the Customers button which is used to add and display data including name, address, telephone number, date of entry accompanied by options to edit, delete and update data. The following is the display for entering (input) customer data as shown in Figure 6 below.

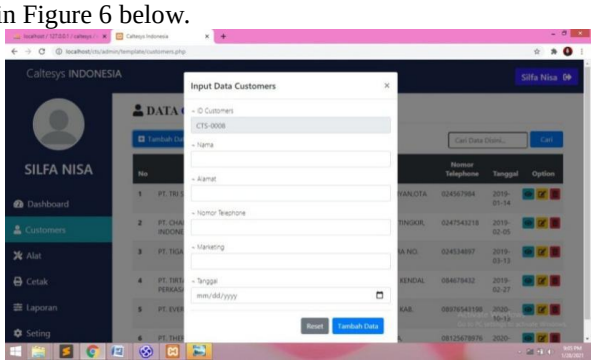

Fig 6. Display customer data input

Furthermore, the Tools button is used to add and display data for the tool to be calibrated which includes id_tool, id_customers, PO_number, tool_name, brand, serial_number, type, entry_date accompanied by options to edit, delete and update data. The following is the display for entering (input) tool data as shown in Figure 7.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 8 , August 2021

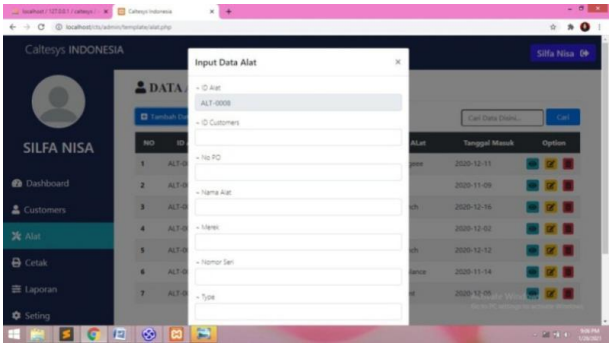

Fig 7. Display of the data input page of the tool you want to calibrate

The next button, namely Print, is used to display and print customer data which includes id_customers data, customer_name, id_alat, tool_name, PO_number, entry_date accompanied by the option to print data and certificate information that has been taken. While the Report button only contains information on customer id_, name, address and cellphone number with the aim that the marketing department can contact the customer if the certificate is ready or someone forgets to re-calibrate regularly. For more details can be seen in Figure 8 below.

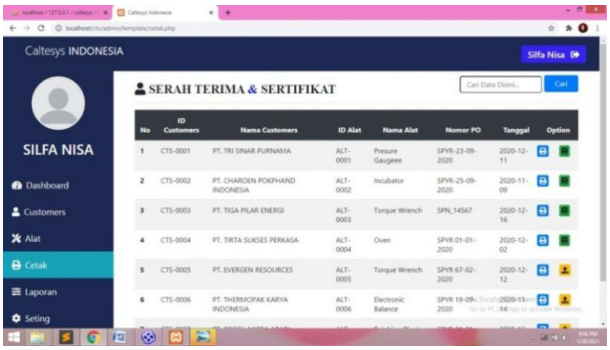

Fig 8. Display of customer handover and certificate print pages

After discussing from the admin side, the next discussion from the customers side, in this case as an example, is PT. Tri Sinar Purnama. The display that appears is almost the same as before, except that there are no options to add, input, edit or delete data. For more details on the customers dashboard page which is the first display after logging in, only 3 push button options appear, namely customer data, tools, and settings as shown in Figure 9 below.

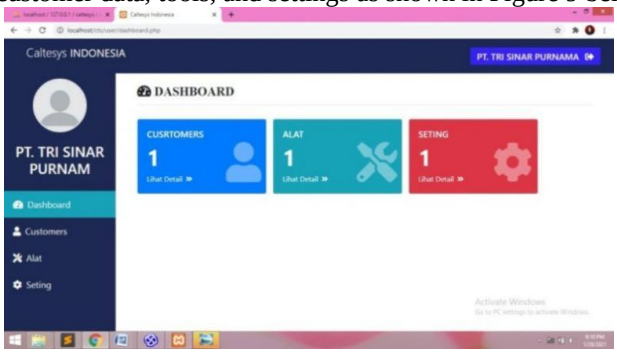

Fig 9. Customer dashboard page display at PT. Caltesys

Furthermore, when the Customers button is clicked, the customer data will appear which includes customer id_data, customer_name, telephone_number, company_address, marketing and tool registration date. The purpose of this data appearance is that if there is a data discrepancy, customers can contact the marketing name listed on the page to make changes to the data.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 8 , August 2021

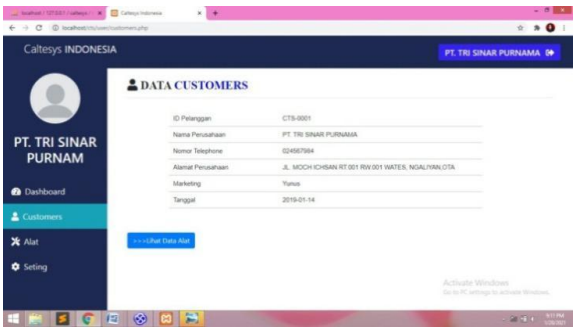

Fig 10. Display of customer data page at PT. Caltesys

The next step is to press the Tool button to see if the registered device has been calibrated. In this case, customers can see in detail the specifications of the equipment registered to be calibrated so that they can perform data matching according to the equipment they have.

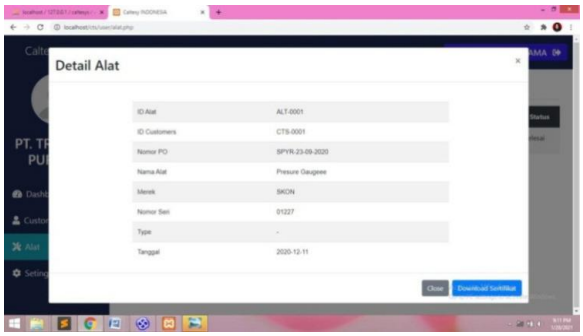

Fig 11. Display of the detailed specification page of the registered tool

After the customer has finished viewing the details of the tool, then proceed with printing the certificate by pressing the download button at the bottom right to get the certificate. The result is a certificate file of type *.pdf as shown in figure 12.

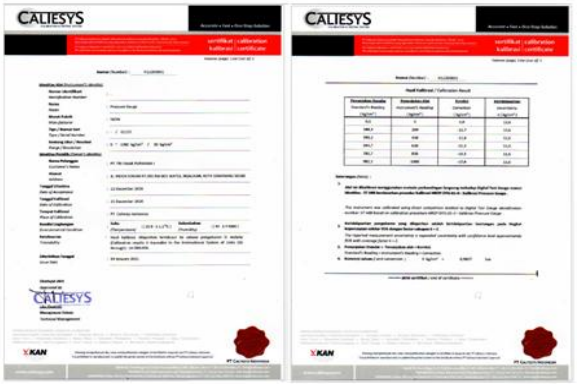

Fig 12. Display of certificates for tools that have been calibrated

D) Prototype Evaluation

The evaluation aims to test the system's functionality using the black box method to find errors that occurred before it was implemented. The following is an example of a login functionality test using the blackbox method which is summarized in table 1.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 8 , August 2021

Table1. Testing User login blackbox

No	Testing Scenario	Trial	Expected Results	Conclusion
1	User fills in username and leaves blank password	*Username*:(xxxx) *Password*:(blank)	The system will deny login access and a message ("*Please fill out this field*") appears	Valid
2	Fill in one correct and one incorrect then click	"Login" *Username*:(xxxx) *Password*:(xxxx)	The system will deny login access and a message will appear ("*Attention! UserID or Password is Wrong*")	Valid
3	Fill in the login data correctly then click	"Login" *Username*:(admin) *Password*:(admin)	The system will successfully login and can make transactions	Valid

V. CONCLUSION AND FUTURE WORK

The conclusion that can be obtained is that the application prototype for monitoring the web-based calibration registration process can solve the problems that exist at PT. Caltesys Indonesia Semarang branch. For laboratory officers (admins), this application makes it easy to manage customer data and calibrated equipment data so that customers can see the suitability of personal data and registered device data. In addition, customers can monitor calibration results and print certificates independently because there is no need to go back and forth to meet laboratory staff. Meanwhile, marketing can be faster in providing information to customers to perform periodic recalibration.
The suggestion for further research is that this application prototype is not limited to monitoring the calibration registration process but can include Customer Relations Management (CRM). In addition, the development of this application is not only web-based but can be developed into an Android or IOS mobile based so that it can be used on all mobile devices.

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