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Designing E-learning Application to Enhance Education Effectiveness for PELNI Medical Center

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Abstract: ***PELNI Medical Center is one of the oldest Medical Centers in Indonesia which in 2018 is already 100 years old. In providing good health services to the community, PELNI Medical Center also conducts education and training processes for its employees. The current training is conventional training, where the time and place of training can change because it adjusts to the conditions of existing services and patients. Besides, the costs required are quite a lot to meet the needs of the training that is held. Therefore, PELNI Medical Center wants an e-Learning system as a learning medium to overcome these problems and can facilitate the education and training process. The design of the e-Learning system is built using the method of designing Object-Oriented Analysis and Design with the Unified Process. As for the data collection techniques used, namely interviews and questionnaires. The expected results of the design of this e-Learning system are that it can be used as an educational medium in the education and training process at Pelni Medical Center, increase the ability of knowledge and independent learning in each of its users, and can facilitate the improvement and storage of learning materials applied at the PELNI Medical Center.***

Keywords: ***E-learning, OOAD, Web, Mobile, Unified Process***

I. INTRODUCTION

As the development of technology that is very advanced in this modern era encourages various activities carried out quickly and efficiently. One technological development among others is the internet. This can be proven based on the results of the www.statista.com survey, the number of internet users in 2019 reached 143.26 million people or equivalent to more than 50 percent of the total population of Indonesia and is predicted to increase every year. In addition to the internet, technological developments have greatly influenced our way of life such as in the field of education with the use of e-Learning in learning activities in schools, colleges, and companies that have begun to use concepts like this. E-learning or electronic learning is a learning concept that is carried out through electronic media networks. Along with the development of information technology and the demands of the globalization of education and distance learning, various concepts have been developed to replace traditional learning methods, one of which is the concept of e-Learning. E-learning is a combination of content and learning methods delivered through computers to build knowledge and skills. This helps the acquisition and understanding of knowledge by interactive technology offline and online [1]. There are various technologies used in e-Learning, namely the internet, intranet, video, interactive TV, and CD-ROM. Also, there are several approaches to e-Learning including online learning or web-based instruction, computer-assisted instruction, and virtual classrooms. Well-Designed e-learning is very influential for companies where e-learning can cut transportation costs, train employees, improve efficiency, and help to build a cohesive culture. The main reason for a company to switch to using e-Learning is because e-Learning greatly saves costs such as travel costs, printing costs and other material costs associated with training costs that are still running conventionally (face-to-face) [2]. Learning to use e-Learning is not just using a computer, with the use of smartphones it enables the development of e-Learning features into the mobile version. The use of platforms on smartphones is supported by Android and since Android is open-source, therefore anyone can develop it according to their needs. Currently not only used for education but has penetrated other markets such as health by using e-learning as a leading strategy for education. In companies that involve health such as Medical Centers, training of employees is needed to increase the skills possessed by these employees. So this research will discuss the design of e-Learning as a tool in learning to improve internal performance.

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II. LITERATURE REVIEW

A. E-Learning

One technology that makes it easy and practical to use is not only in schools or universities but has penetrated to companies, as a medium for the learning process using e-Learning. Technological advances can lead to the need for online media-based teaching and learning concepts to be unavoidable especially in terms of education.

The concept which is then called e-Learning has an impact on the process of change or transformation of education in conventional forms into digital form (online), both in content and the system [3].

In a journal, according to e-Learning can change the learning model at this time such as for students, students, employees and for ongoing training and professional development such as doctors, nurses, and teachers about how someone finds something of a nature formal or informal [4]. So that knowledge will be obtained in an updated and by following the times.

The development and implementation of e-Learning have been carried out in various institutions, with the aim of learning and training. For that e-Learning has advantages, including 1. It can be accessed anywhere and is global, which can overcome the problem of time and place so that someone who accesses e-Learning can do learning easily anytime and anywhere using a computer or smartphone connected to the internet network; 2. Different learning experiences so that users can overcome boredom and boredom in learning with the usual method; 3. Encourage user awareness to learn independently.

E-Learning activities can consist of Synchronous and Asynchronous [5]. Synchronous happens in real-time, users are asked to be present at the same time. Whereas Asynchronous happens with independent time, independent learning is an example of asynchronous e-Learning because online learning can be done at any time.

B. Web-Based

In the current technological era, websites are beginning to be known as pages that provide information via the internet and make them the source that can be accessed in various parts of the world while connected to the internet network. A website is one way to display information about companies that can be visited without space and time limits. With the website, this will be a good marketing strategy in the business field. Previous research is used as a reference and study of current research, an appropriate comparison of research topics can be obtained, namely the website-based application system used as an online marketing medium of a company.

Web-based learning is online learning or e-learning because it includes online course content [6]. Discussion forums via email, video conferencing, and live lectures (video streaming) are all possible via the web. Web-Based can also provide static page views such as course material.

Web-based learning can be in the form of, learning management systems, learning content management systems delivering a life-long education, training applications, and online learning services to anyone, anytime, anywhere in real-time, which resulted in the emergence of e-Learning systems [7]. Digital technology continues to influence the way we search for, create, share, discuss and ideas, and even influences the way we think about knowledge itself.

C. Object-Oriented Analysis and Design

Object-Oriented Analysis and Design are available securely in the system development cycle from requirements, analysis to implementation steps [9]. Non-functional requirements are used in the requirements and analysis phases while in the design phase using UML. Object-Oriented Analysis and Design is the process of identifying and defining each class, method, and each message needed to execute from the use case [10].

D. Unified Modeling Language

In a journal, UML (Unified Modeling Language) is a standard, object-oriented, modeling system that is used to describe the model of a system to be built. UML is also a graphical language in the visualization and depiction of a system by combining object-oriented development technology, technology, and object-oriented UML [11].

Unified Modeling Language is a standard set of information model constructs and has a notation specified by the Object Management Group [10]. The following are parts of UML, including:

- Activity Diagram In the development of information systems, business process modeling is very necessary for describing business processes that are running and which will be developed. One model that is commonly used is the activity diagram. UML activity diagrams resemble horizontal flow charts that show actions and events as they occur [13]. Activity diagrams are used for all types of activity modeling that are described in the context of modeling business processes [14]. This means describing the process or activity carried out and how the movement of objects or data. The activity diagram is a UML diagram that illustrates the activity of the user (or system), the person or component that completes each activity, and the order in which all activities are carried out [10].
- User Interface At the time of designing the information system, all design data have been made starting from the flow of scenarios to business process scenarios that will run, the next step is to create a User Interface or better known as the UI. The user interface or UI is a set of inputs and outputs that interact with users or users to carry out application functions [10]. If the user interface has a bad appearance, the user cannot benefit from the system, otherwise, if the user interface has a good design, such as navigation and informative, it will increase system usage.

III. RESEARCH METOD

The research method used in this study is an interview with representatives from PELNI Medical Center including the Head of Nursing Division, Head of IT Division and also related stakeholders. PELNI Medical Center wants an online learning system or E-Learning that can help the training and learning process for employees. The results of these interviews have been summarized in Table-I.

Table-I: Impairment Analysis of Problems and Solutions

Problem	Solution	Feature
The same training is done repeatedly	With e-learning, all participants can access the material anywhere and anytime	Material & Forum Features to access learning material and information. Tasks feature to increase competency
The schedule of training can be adjusted at any time	With e-learning, Medical Center service activities will not be disrupted	
Availability of training venues not reliable	E-learning requires no place	
The interviewees who was suddenly unable to attend	E-learning does not require interviewees to be present but rather with live chat	The live chat feature can help interviewees to communicate directly with participants
Requires a lot of costs to meet the needs of conducting a training	E-learning will save costs for the training	E-learning that is made as a whole
Lack of participants insights into the material presented by the interviewees	E-learning can help participants explore material without time limit	Training module being adjusted based on each division needs

In addition to conducting interviews to assist in the design of e-learning applications, this study also conducted questionnaires to retrieve the required and submitted data provided by companies which they would use e-learning to use. The distribution of this questionnaire was carried out at PELNI Medical Center which was distributed to 93 respondents from various divisions. The number of samples to be taken based on the Slovin formula with participation data of 1300 employees, can be formulated according to sample processing as follows:

n=N
1 + N e2
n = 1300 / 1 + (1300 * 0,12)
n = 1300 / 1 + (1300 * 0,01) n = 1300 / 1 + 13
n = 1300 / 14
n = 92,8 = 93

This study will use interview data with the Head of the Nursing Division, the Head of the IT Division and also the relevant stakeholders. Then data will be added from the questionnaire distributed to 93 respondents who will later use the e-learning application. It is expected that the existence of these two data can produce a useful application and can be utilized by PELNI Medical Center as one of the Medical Center learning processes.

IV. RESULT

A. Demographic Data

Table-II: Results of PELNI Medical Center Questionnaire

Category	Range	Percentage
Gender	Male	24.7%
	Female	75.3%
Employee Division	Doctors	9.7%
	Nurses	47.3%
	Human Resources	10.8%
	IT and Procurement	10.8%
	Finance and Accounting	10.8%
	Service Support	10.8%
Internet User	Yes	98.9%
	No	1.1%
Duration of Internet Usage	< 1 hour/day	7.5%
	1-2 hours/day	15.1%
	> 2 hours /day	77.4%
Owned communication tools	Handphone	63.4%
	Smartphone	50.5%
	Laptop	47.3%
	Tablet	22.6%
Internet usage with telecommunication tools	< 1 hour	9.7%
	1-2 hours	20.4%
	> 2 hours	69.9%

In Table-II it can be concluded that most of the respondents at PELNI Medical Center were women. This can be seen from the collected result namely 70 respondents (75.3%) and 23 respondents (24.7%). Most of the respondents from the division of employees are Nurses. This can be seen from the respondents who have been collected is Nurses about 44 respondents (47.3%), Doctors about respondents (9.7%), HR about 10 respondents (10.8%), IT & Procurement about 10 respondents (10.8%), Finance & Accounting 10 respondents (10.8%), and Supporting about 10 respondents (10.8%).

From the results of the table, it can also be seen that most of the respondents from the division of employees are internet users.

From the results of the table, it can also be seen that most of the respondents from the division of employees are internet users. This can be seen from collected respondents who use the internet as many as 93 respondents (98.9%) and those who are not internet users are 1 respondent (1.1%). With this, e-Learning can be accessed by PELNI Medical Center employees since most employees are internet users.

From the results of the questionnaire, we found out that most respondents use the internet for more than 2 hours per day. This can be seen from collected respondents who used the internet for more than 2 hours per day around 72 respondents (77.4%), respondents who used the internet less than 1 hour per day about 7 respondents (7.5%), and respondents who used the internet 1- 2 hours per day are around 14 respondents (15.1%).

Then the communication tools owned by respondents, most of them have mobile phones. This can be seen from the respondents who have been collected around 59 respondents (63.4%) have a mobile phone, Smartphone around 47 respondents (50.5%), Laptop about 44 respondents (47.3%), and Tablet around 21 respondents (22.6%). With a large number of respondents who have smartphones and laptops therefore the design of e-learning is made based on the web. Finally from the results of the questionnaire, figured that the majority of respondents use the internet for more than 2 hours. This can be seen from the respondents who have been collected there are 65 respondents (69.9%) using the internet for more than 2 hours per day, respondents who use the internet less than 1 hour per day around 9 respondents (9.7%), and respondents who use the internet 1 -2 hours per day about 19 respondents (20.4%). With this, e-Learning is very suitable to be applied at PELNI Medical Center.

B. Activity Diagram

This section will discuss the activity diagram carried out by 3 (three) actors, namely employees, resource persons, and admins. To simplify the activity diagram, it can be divided into 2 (two) such as Front-End and Back-End. For employees who want or use e-Learning systems can be illustrated through the activity diagram, namely:

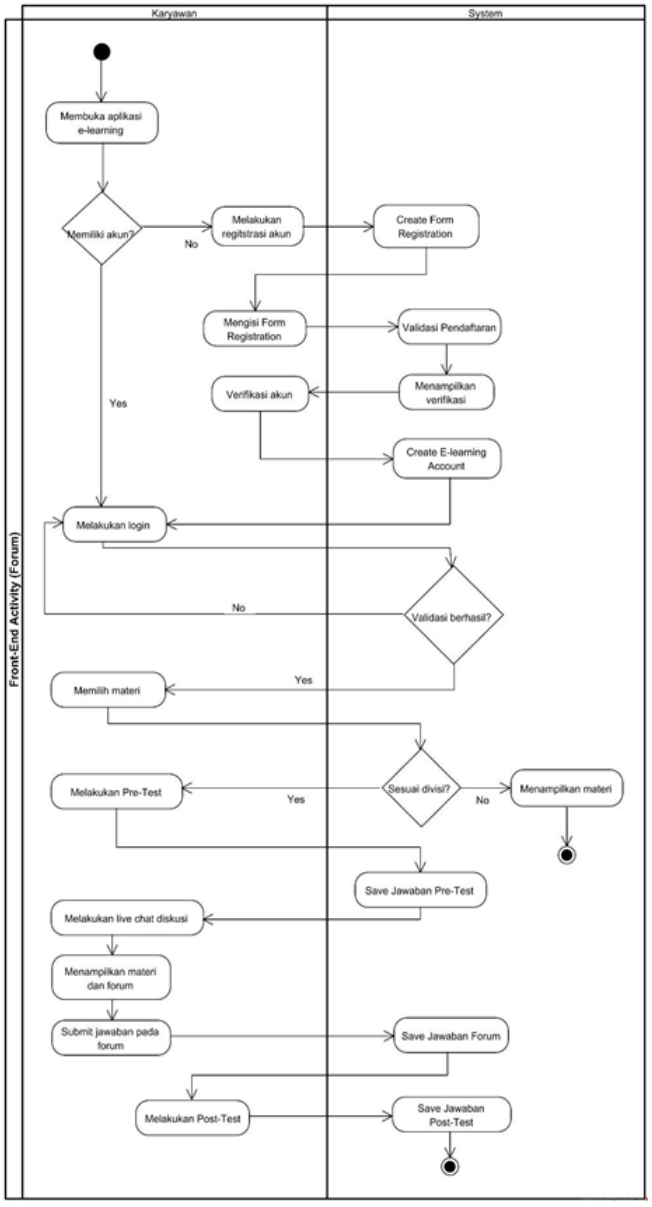

Fig 1 Front-End Activity Diagram (Forum)

The results of Fig 1 shows the stages of the process of using the e-Learning system (forum) that can be done with employees opening the e-Learning application display. When the first e-Learning (login) page is open, employees are required to log in. If the employee opens e-Learning for the first time or does not have an account then the employee is required to register, the system will display the registration form. At the time of registration the employee is required to fill in all the data needed at the time of registration after all data has been filled, the employee is required to submit registration and the system will check the data and send a verification code to the email that was registered by the employee at the time of registration. Then the employee is required to verify the registration where the verification code will be processed by the system to create the submitted account for registration.

After the account is successfully created, employees can login on the login page. Employees must ensure that they filled in the data correctly, if the registered data is not appropriate then the system will reject the login request.

When the registered data is correct the system will direct the employee to the home page. When the employee is on the home page, they will be able to open material pages and forums.

On the material page and forum, the system will check if the material and forum that is accessed by the employee are in accordance with his/her division, the employee also required to answer questions in the pre-test and post-test. Meanwhile, if the accessed material does not match the employee division, the system automatically only shows suitable material without the forum. When the material displayed is in accordance with the employee division, the employee will able to have live chat and discussion with the interviewees and people who are actively accessing the material pages that are being opened by the employees. In addition, employees can answer questions in the forums that have been given by resource persons on the material. Then the system will store the answers that have been submitted by the employee and the system will update the activeness of the employee.

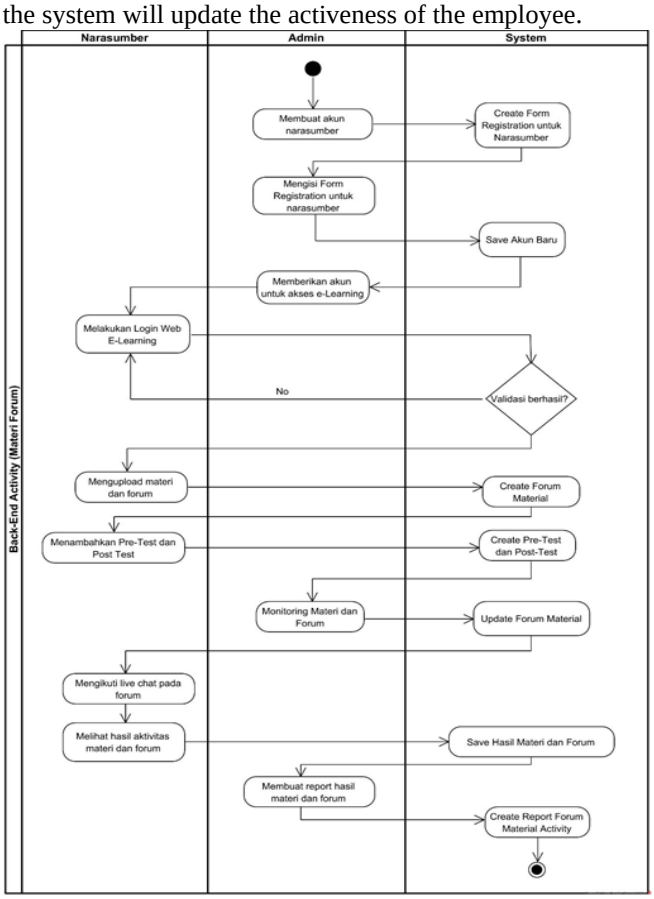

Fig 2 Back-End Activity Diagram (Forum)

From the results of Fig 2, shows the stages of the process of using the e-Learning system in the Back-End (Forum) section. At the beginning of the activity diagram, the admin will create an account for the interviewees who will later provide a resource to access the e-Learning system, then the system will create a registration form for the interviewees. Next, the admin will input the source data for account registration, and the system will save the account that has been created by the admin for the source. After the interviewee's account is successfully created, the interviewee can then log in using the account created by the admin. The interviewee must enter the data to log in and then the data will be checked by the system if the data entered is incorrect then the employee is required to fill in the data again and if the data entered is correct then the system will direct the resource person on the source page.

Interviewees can also upload material and forums and add pre-test and post-test, then the system will create material forms and forums and pre-test and post-test forms. In addition, the admin as the holder of full control can monitor the activities on the forum, and the system will update the activities on the forum. The interviewee can also follow the learning process in the forum by attending live chat and the interviewee can also monitor the activities in the forum then the system will save the forum results. Then the system will generate the results of the forum report in the form of pdf to be printed. Admin will also make a report on the results of the forum as a record of activeness in the forum.

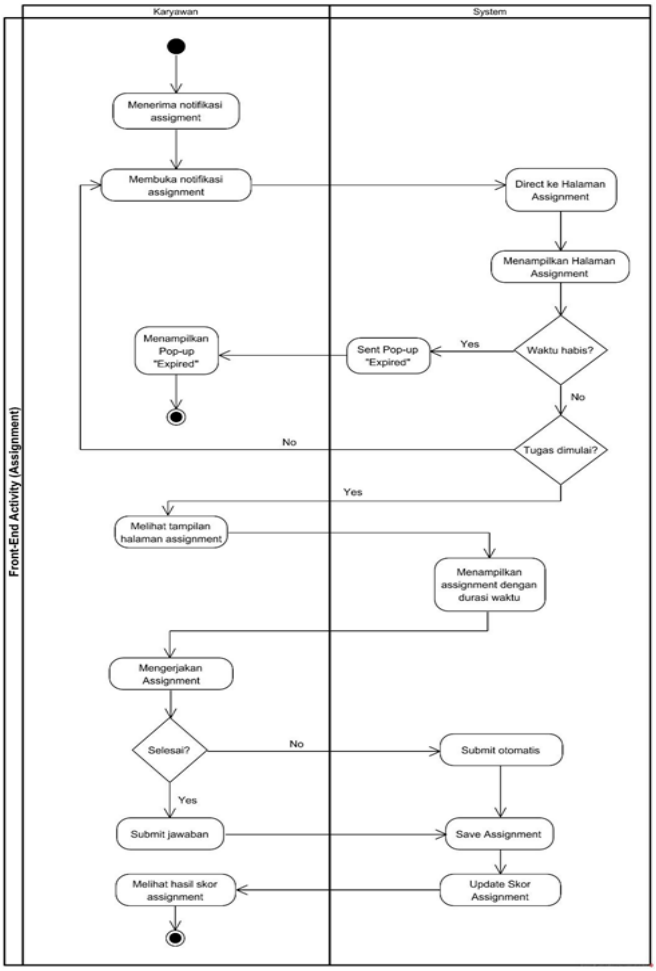

Fig 3 Front-End Activity Diagram (Assignment)

From the results of Fig 3, you can explain the stages of the process of using the e-Learning system in the Front-End (Assignment) section. In the initial Assignment or Assignment process, the employee will receive a notification that the employee is required to work on the Assignment or Task. Then the employee will open the Assignment or Task notification then the system will direct the employee to the Assignment or Task page and display the Assignment or Task page. When the Assignment or Task page appears the system will check whether the available time is still available or has expired and can no longer do the Assignment or Task and the system will send a pop-up that the Assignment or Task time is run out or "Expired" to the employee.

If the Assignment time or Task is still available then the employee will check whether the questions or questions have arisen and can be done or cannot be done, if it cannot be done then the employee will see an Assignment or Task that displays the countdown when the work can be done. When the employee starts to do the assignment, the system will display Assignment or Task with a predetermined time and the employee does the Assignment or Task. When the employee is working on an Assignment or Task and has finished, the answer must be submitted and the system will store the employee's answer. If the time is up when the employee is working on an Assignment or Task then the employee's answer will automatically be saved by the system. The system will automatically update the answers and scores obtained by employees when they have finished working on Assignments or Tasks and employees will immediately be able to see the results of the scores received.

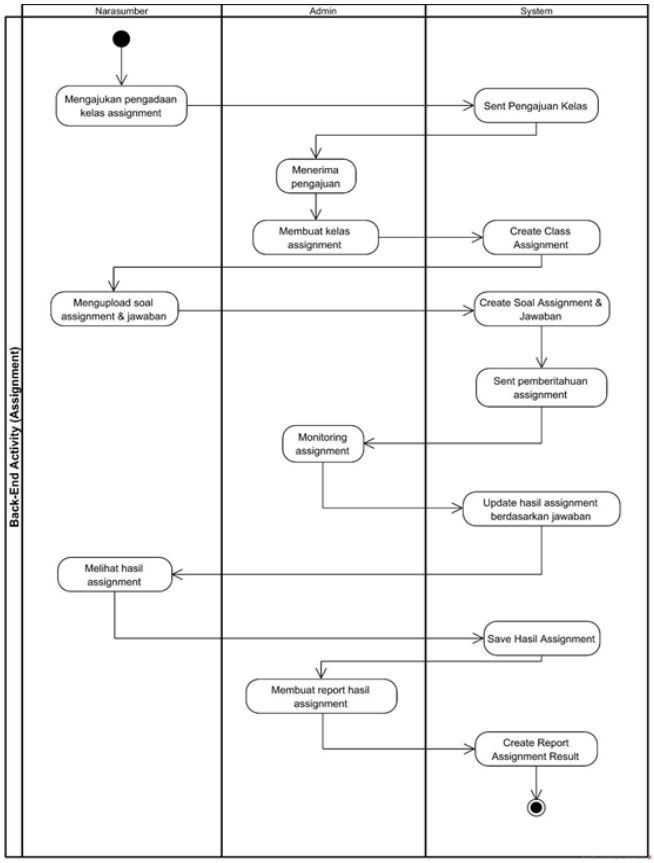

Fig 4 Back-End Activity Diagram (Assignment)

In the initial Assignment (Back-End) process of Fig 4, the interviewee when he/she wants to create an Assignment class or the assignment interviewee is required to submit a class creation through the system, the system will send the class submission to the admin. Admin will accept submission for class creation and admin will create a class for Assignment or Assignment based on submission given by the interviewee. When the admin has submitted the data according to the submission received, the system will automatically create the class desired by the resource person. Then the resource person can upload the questions and answers through the page in the upload questions and answers Assignment or Task. Then the system will create an Assignment or Task-based on questions and answers that have been made by the resource person and the system will send notifications to all employees in the Assignment or Task class.

In addition, the admin can also monitor all activities in the Assignment or Task. Then the system will update the questions and answers that have an Assignment or Task page that is running or active. The interviewee can see the results of Assignments or Tasks in Assignments or Tasks that are currently running. Then the system will automatically save the Assignment or Task results. The system will generate Assignment results or Tasks in the form of .xlsx or excel to make it easier to see the results of Assignments or Tasks that have been completed. Then the admin will make a report of the Assignment or Tasks that have been completed. To be evaluated and as a report on the results of the Assignment or Task.

C. User Interface

Fig 5 User Interface of Homepage for User (Website)

In Fig 5 is the appearance of the Homepage on the website. On the Homepage, users can see timelines such as posters containing events and any general material activities that have just been uploaded by the interviewee. Notification on the Home, useful for notification of material and forums or tasks that have been uploaded by the interviewee and must be done according to their division.

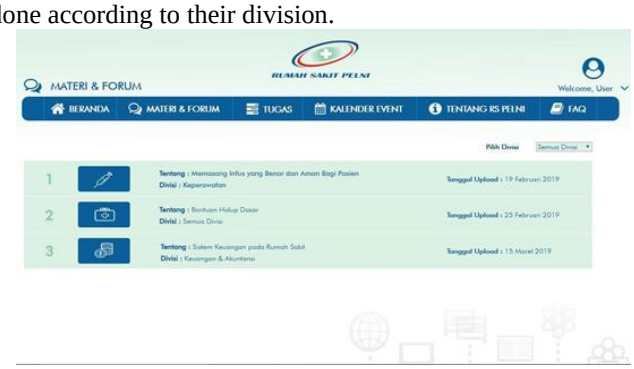

Fig 6 User Interface for Material dan Forum Pages (Website)

In Fig 6 is the Material and Forum display on the website. On the Material and Forum page, users can view and access several material lists from all divisions uploaded by the interviewee, both material that is specific to one division or another division. Therefore, users will be able to learn the material easily and efficiently according to the desired material.

Fig 7 User Interface for Assignment Page (Website)

Fig 7 is the Assignment page (Website) view. On the Assignment or Task page, if the user gets an email notification in the form of a link to do the assignment, the link will go to the e-Learning website and go directly to the Assignment or Task page. A list of questions will appear if the time for the assignment has begun and is allowed to be done. Conversely, if questions have not yet arisen, the time for the assignment to begin will not start. During the task, the user will be given 30 minutes to answer those questions and when the user has answered all questions, the user will be able to see the final score of the task.

V.CONCLUSION

Based on the analysis and design of e-learning applications that have been made it can be concluded that the application of e-learning is very suitable for PELNI Medical Centers. The e-learning was designed based on the results of interviews with the Head of the Nursing Division, the Head of the IT Division and also the relevant Stakeholders. To help the process of making e-learning design, this study uses questionnaires that were distributed to 93 PELNI Medical Center employees. This method is used to get feedback from the Medical Center employee to make the e-learning application that will be created will be based on employee's expectations and can be used properly by users or employees at PELNI Medical Center. The design of E-learning at PELNI Medical Center is also expected to help the learning process in the education and training process at PELNI Medical Center, increase the ability of knowledge and learning independently for each user, and can facilitate the improvement and storage of learning materials applied at PELNI Medical Center.

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