UMN E-Complaint Application with Automatic Classification Feature

Vannia Ferdina, Seng Hansun, Marcel Bonar Kristanda

Abstract: In university, students' complaints about the services provided are essential things to note because it could lead to higher student transfer if not appropriately handled. In Universitas Multimedia Nusantara (UMN), students can express their complaints through Dewan Keluarga Besar Mahasiswa (DKBM) UMN. By technology development, an online complaint submission system can be applied at UMN. A method that can be used in supporting efficient complaints processing is by using automated classification system since it can save both time and human resources. UMN e-complaints application with automated complaints classification feature was built using the CodeIgniter framework. The evaluation of the e-complaint application was conducted by using the USE Questionnaire. The results show that both DKBM UMN and students agree that the application is useful, easy to use, easy to learn, and satisfying.

Index Terms: e-complaint, university, usability, USE Questionnaire, web application.

I. INTRODUCTION

In the technological era, many applications are developed, and complaints management system is implemented online [1]. A forum-based and web-based E-Complaint opens up many opportunities for companies to monitor and respond the customer complaints [2]. Web-based applications are suitable for marketing and public communication activities and have some advantages such as no installation required, can be used on any device, and can be updated easily [3]. Some researches have reported that the online complaints handling system (e-complaint) can provide solutions to problems that occur in the complaints handling system at Institut Teknologi Telkom and Malaysian police [4, 5].

In Universitas Multimedia Nusantara (UMN), students can express their complaints through an organization known as Dewan Keluarga Besar Mahasiswa (DKBM) UMN [6]. However, based on the feasibility study conducted, a low frequency of complaints is submitted through DKBM. It also shows that the students have low satisfaction in using the existing complaints management system. It could be one factor that affects the low submission level of UMN student complaints. The existing complaints management system has also caused problems for the board of DKBM UMN. The existing complaints submission media was not able to handle, process, and response to the complaints properly [6]. Therefore, an online complaint submission system was suggested to be applied at Universitas Multimedia Nusantara. In e-mail based complaints handling, a method that can be used to support an efficient complaints processing is the use of automated classification system since it can save both time and human resources [7]. Moreover, the user does not have to think about the complaints' subject and where it should be addressed, and the task of categorizing the complaints should be done automatically by using a program [8]. With the development of technology and the increase of information on the internet, text classification has become a hot research topic in modern information processing [9]. Naive Bayes Classifier algorithm is one of the algorithms that can be used to classify text automatically. It often used as a standard of text classification because it is relatively fast and easy to implement [10]. Naive Bayes Classifier algorithm shows outstanding performance and can optimally work despite the small number of training data [10-13]. Some advantages of using the Naive Bayes Classifier algorithm are it is easy to use, requires only one-time scanning of training data, and requires only a small number of training data to estimate the parameters required in the classification [13]. Based on the feasibility study conducted, UMN students were interested in using a complaints submission application. Therefore, the study on the design and development of a web-based e-complaint application with automated complaint classification feature was conducted at Universitas Multimedia Nusantara.

II. RESEARCH METHOD

The research methodology in this study consists of several stages, i.e., feasibility study, literature study, design and development of the application, testing, and evaluation.

The feasibility study was conducted to evaluate the effectiveness of the existing complaints submission system that has been used in Universitas Multimedia Nusantara. The term 'feasibility study' is used extensively and includes any study that can help researches prepare for full-scale research [14]. The purpose of a feasibility study is to test and evaluate the likelihood of success or failure of the effort that will be performed, and it will be carried out as the first stage in the product or service development cycle [14-16]. This feasibility study provides an overview of the problems that occur in the existing system. The feasibility study was conducted using an online questionnaire with a stratified random sampling method. The feasibility study was also conducted with Ika Angela as the Chairman of Dewan Keluarga Besar Mahasiswa UMN 2016/2017.

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The research variable used in the feasibility study is the user satisfaction level and system usability level. The literature study was conducted to study theories related to the design and development of the application, such as feasibility study, Likert scale, stratified random sampling, the measurement of the effectiveness of the information system, the measurement of application usability, and e-complaint system. The application design is done by designing the features, application flow, and user interfaces. Application development is the stage of creating program code based on pre-designed features and user interfaces. Complaints from users will be automatically classified into predefined categories, which are "Akademik (Academic)," "Kegiatan (Activity)," "Fasilitas (Facility)," "BEM (Student Board)," and "Lainnya (Other)," using Naive Bayes Classifier algorithm. Naïve Bayes itself is a probabilistic learning method to classify data, which is popularly used in machine learning and data mining researches [17, 18].

The testing stage is performed using the USE Questionnaire with a seven-level Likert scale to measure the usability variables of the application. Questionnaires are given to UMN students using a stratified random sampling method. The evaluation stage will be performed by analyzing the results of the USE Questionnaire to measure the usability of the application.

A. System Architecture

The system architecture is used to design the system's structure along with its relation, both to the database system and the user and administrator. The design of the system architecture is shown in Figure 1. The application is divided into two parts: one for users and another one for the administrator. Those two parts will be connected to one database system. The web-based application for users is used by UMN students, while the web-based application for administrators will be used by the Student Welfare Division of DKBM UMN. The web-based application for users has filing and tracking complaint status features, while the application for administrator has features for managing student's complaints and information that will be displayed to users. This e-complaint application is named AKU (Aspirasi KBM UMN).
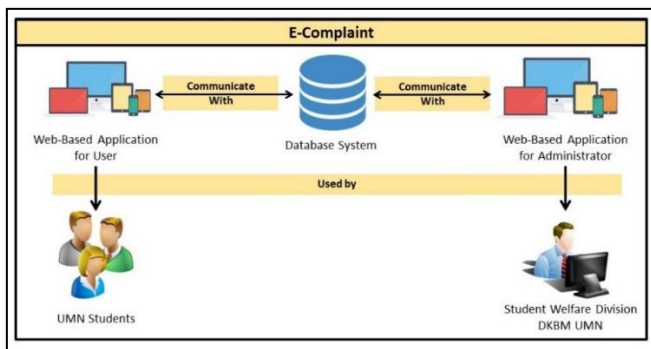

Figure 1. System Architecture [19]

B. Sitemap

Figure 2 shows the sitemap of the application used by UMN students. The application's start page is the homepage. On the homepage, there is a Login menu to enter the application and the Forgot Password menu to reset the user's password. Once the user logged in to the application, there are ten menus that the user can access. The New Complaint menu is used to display the New Complaint page. Through the Complaints History menu, users can navigate to All Complaints, Unread Complaints, Read Complaints, In Process Complaints, and Completed Complaints menu.
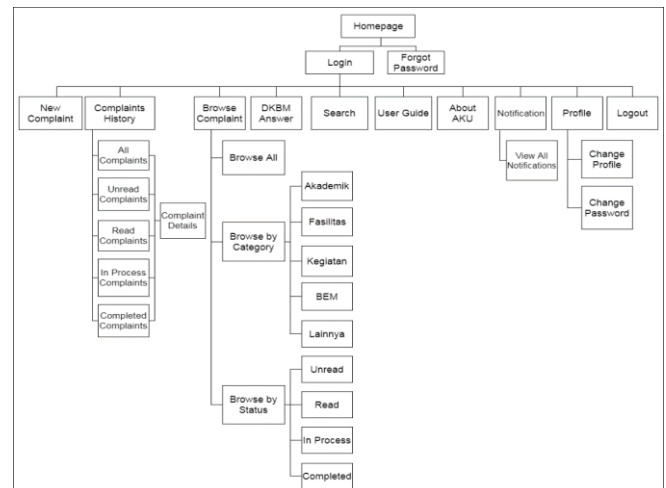

Figure 2. User Application's Sitemap

Those five menus are used to display user's complaints history, either all or filtered based on the complaints' status. From those menus, users can navigate to the Complaint Details menu, which will display the details of the user's complaint.

Browse Complaint menu has three submenus: Browse All, Browse by Category, and Browse by Status. Browse All menu is used to display all complaints. Browse by Category menu has five submenus: Akademik (Academic), Kegiatan (Activity), Fasilitas (Facility), BEM (Student Board), and Lainnya (Other). Each menu is used to display incoming complaints based on its category. Browse by Status menu has four submenus: Unread Complaints, Read Complaints, In Process Complaints, and Completed Complaints. Each menu is used to display incoming complaints based on its processing status. DKBM Answer menu is used to display frequently asked questions along with its answer. The search menu allows the user to find complaints based on search keywords entered by the user. User Guide menu is used to display application usage guidelines for users.

About menu is used to display the application description and credit. The notification menu is used to display unread notifications. From this menu, the user can navigate to View All Notifications menu. This menu is used to view all notifications that have been logged into the user account, whether read or unread. The profile menu is used to display user profile data. This menu has two submenus: Change Profile and Change Password. The logout menu is used for logging out from the application.

III. RESULTS AND DISCUSSION

A. Feasibility Study Results

The feasibility study results for each variable are described as follows.

• User Satisfaction

In the feasibility study, user satisfaction is measured using the question, "Have you been satisfied with the way the students' complaints are delivered so far?".

The percentage of the score is 49.79%, which can be concluded that UMN students have a low satisfaction level toward existing complaints submission media.

- System Usability

In the feasibility study, system usability is measured using the question, "Do you think the complaints submission media from DKBM makes it easy for you to solve your problem?". The percentage of the score is 58.8%, which can be concluded that the usability level of the existing complaints submission media is only at a sufficient level.

B. Device Specification

The software specifications used in the design and development phase in this study are as follows.

- NetBeans IDE version 8.2
- Web Browser (Chrome version 58.0.3029.96)
- XAMPP version 5.6.8, includes Apache 2.4.4, MySQL 5.5.32, and PHP 5.6.8
- CodeIgniter version 3.1.3 as the framework of application development
- AdminLTE version 2.3.11 as the user interface template
- PHPMailer version 5.2.23 as a PHP library for e-mail delivery
- ChartJS version 1.1.1 as a library for displaying diagrams

C. Implementation Results

The results of application design and development are displayed using screenshots of the application's user interfaces. On the main page, the login form is displayed. After login, the user will be directed to the application's home page. The first page displayed after the user logged in is shown in Figure 3.
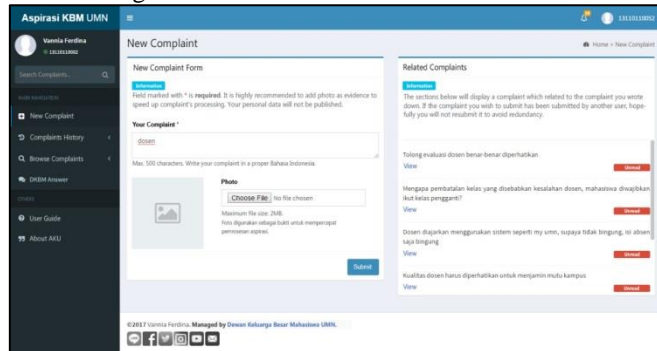

Figure 3. Screenshot of Home Page

On the home page, a form is displayed to submit a new complaint, and when the user typed in his complaint, other complaints (that had been submitted by other users), which are related to the complaint typed by the user are displayed. When the user submits his complaint, the Naive Bayes Classifier algorithm will be run to classify user-entered complaints based on prior probabilities calculated during the algorithm training phase. Users can access their complaints history and its detail, including complaints' processing status, complaints' category, and complaints' responses. The complaints detail page is shown in Figure 4. The complaints' category is obtained from the Naive Bayes Classifier algorithm, which was run when the user submits their complaints.
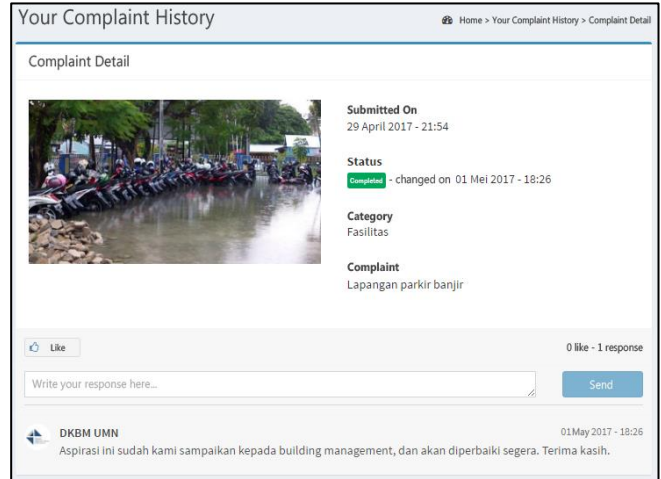

Figure 4. Screenshot of Complaints Detail Page

D. Evaluation Results

The evaluation phase is divided into two parts: the evaluation results by DKBM UMN as administrator and the evaluation results by UMN students as general users.

a) Application Evaluation Results by Administrator

The application evaluation phase was conducted using a questionnaire based on the USE Questionnaire to five respondents consisting of a Chairman of DKBM UMN and four members of the Student Welfare Division. The questionnaire consists of 16 questions on usefulness, satisfaction, and ease of use factors. The ease of use factor was divided into two subfactors, ease of learning and ease of use [20]. The results of the questionnaire were then processed to obtain the percentage score for each aspect [21]. The percentage results are then being used to calculate the average value for each evaluation factor. The results were interpreted using the interpretation table outlined in Table 1. Table 2 outlines the results of the average percentage scores for each evaluation factor.

Table 1. Percentage Interpretation of Questionnaire Result

Percentage Interval	Interpretation
Score $\geq$ 85.714%	Strongly Agree
85.714% > Score $\geq$ 71.429%	Agree
71.429% > Score $\geq$ 57.143%	Somewhat Agree
57.143% > Score $\geq$ 42.857%	Neutral
42.857% > Score $\geq$ 28.571%	Somewhat Disagree
28.571% > Score $\geq$ 14.286%	Disagree
14.286% > Score	Strongly Disagree

Table 2. Average Percentage Score for Each Factor by Administrator

Factor	Score (%)	Interpretation
Usefulness	96%	Strongly Agree
Ease of use	92%	Strongly Agree
Ease of learning	94.29%	Strongly Agree
Satisfaction	97.14%	Strongly Agree

From the interpretation result of the average percentage of all factors, it can be concluded that DKBM UMN strongly agrees if the application is useful to facilitate the complaints management from UMN students, easy to use, and easy to learn, and the overall e-complaint application is satisfying.

b)   Application Evaluation Results by Users

The application evaluation phase for users was conducted using a questionnaire based on the USE Questionnaire to 132 respondents from four faculties in UMN beginning on May 4, 2017, to May 18, 2017. The questionnaire consists of 15 questions on the same factors as evaluation to the administrator (DKBM UMN). The questionnaire results were then processed and interpreted using the interpretation table outlined in Table 1. Table 3 outlines the results of the average percentage scores for each evaluation factor.

Table 3. Average Percentage Score for Each Factor by User

Factor	Score (%)	Interpretation
Usefulness	83.09%	Agree
Ease of Use	83.83%	Agree
Ease of Learning	84.16%	Agree
Satisfaction	84.38%	Agree

From Table 3, it can be inferred that UMN students agree if the application is useful to facilitate submission of complaints from UMN students, easy to use, and easy to learn, and the overall e-complaint application is satisfying. It can also be concluded that new e-complaint system increases the user satisfaction percentage than the existing complaints' submission media from 49.79% to 84.38%.

IV.   CONCLUSION

Based on the research that has been done, conclusions obtained are described as follows.

1. The e-complaint application with automatic complaints classification feature has been successfully designed and developed.
2. AKU (Aspirasi KBM UMN), as an e-complaint application, successfully managed to facilitate UMN student complaints. There are some factors being evaluated, i.e., usefulness, satisfaction, ease of use, and ease of learning. The questionnaire given to DKBM UMN resulted in 96% on the usefulness factor. This result proves that DKBM UMN strongly agrees that AKU can help DKBM UMN in managing UMN student complaints. For the satisfaction factor, the percentage obtained is 97.14%, which means DKBM UMN strongly

agrees that the application is satisfying. Ease of use factor obtained 92% score which means DKBM UMN strongly agrees that AKU is easy to use. Ease of learning factor obtained 94.29% score which means DKBM UMN strongly agrees that AKU is easy to learn. Besides, the questionnaire addressed to UMN students as the application users resulted in 83.09% for usefulness factor, 84.38% for satisfaction factor, 83.83% for ease of use factor, and 84.16% for ease of learning. These indicate UMN students agree that AKU application as an e-complaint application is useful as a complaint submission system, easy to use, easy to learn, and satisfying.

Based on the research that has been done, some suggestions are described as follows.

1. The e-complaint application that had been developed did not use a single-sign-on system so that the process of adding user account data was done manually. If the single-sign-on system is applicable, it is necessary to extend the e-complaint application so that the addition of user account data does not need to be done manually and can be directly connected to student account data owned by IT Division.
2. The e-complaint application that had been developed did not support the feature to embed a priority label for the incoming complaints that can help DKBM UMN manage the priority of complaints processed. Therefore, future development can be created by adding a feature to embed the complaint processing priority label.
3. In the e-complaint application developed, the complaint search feature has not applied semantic search yet because it has not taken the meaning of the word into account. The related complaint search feature that had been developed was only done based on the occurrences of the words. Therefore, future development can be created to implement a semantic search on the complaints search feature.

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AUTHORS PROFILE

Vannia Ferdina had graduated from Universitas Multimedia Nusantara in 2017 and received her Bachelor's degree in Computer Science. She is one of the best graduates from CS Department and has actively participated in many events during her study at UMN.

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Marcel Bonar Kristanda lives in Jakarta, Indonesia. He received in Bachelor's Degree in Computer Science from Universitas Multimedia Nusantara, Tangerang, Banten, in 2011 and Master of Science in Information Management from Chinese Culture University, Taipei, Taiwan, in 2015. From 2011, he began his career in university as Assistant Lecturer until he came back from his master's study and became Lecturer in the Computer Science Department, Universitas Multimedia Nusantara. Then, he was entrusted to lead the Learning Center Department in 2016 and focused on developing E-Learning Platform and Development. His researches are based on his interests in mobile technology, mobile application development, web development, and software engineering. His extensive researches can be seen in several published papers in both national and international journals and conferences.