Understanding user feedback on learning management system of SIPEJAR by using text mining techniques

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Abstract. SIPEJAR (Sistem Pengelolaan Pembelajaran) as a learning management system can organize various activities in e-learning such as assignments, exams, learning materials, etc. This study aimed to use text mining techniques to extract information from the answers given by respondents toward questions about SIPEJAR. Text mining is one of the techniques used to extract and analyze useful information from the unstructured data. The data were collected using an online survey, and the total data collected is 10,456 but only 9,315 were used. The results show that course material, assignment, and search for information are the three most important factors that motivate students to access SIPEJAR. In the contrary, the factors that lead students to reluctant using SIPEJAR is bad quality network, difficulty to use, and frequently server down. In addition, the factors that need to be improved from SIPEJAR is a user interface, features, service, notification, and simplicity.

1. Introduction
The popularity of information technology has been increased recently. There is a various application of information technology that has been used, for example in business, education, healthcare, etc. In education, one example of the application of information technology is a learning management system (LMS). LMS is environments that meet a set of features for creating and structuring of courses in the distance and the objective is to centralize and simplify administration and management of teaching and learning through e-learning [1].

University Negeri Malang has applied a learning management system, which is named as SIPEJAR (Sistem Pengelolaan Pembelajaran). SIPEJAR is a website created by University Negeri Malang that used as a forum for students to collect lecture assignments, to do quizzes, as well as to discuss course material. SIPEJAR also functions as a forum for lecturers to upload assignments and lecture material (e-books, PowerPoint, etc) as well as to assess learning achievement on the website. The goal of SIPEJAR is to reduce the homework assignment in physical form and change them into digital, so the teaching and learning process becomes more effective and easier for both students and lecturers.

SIPEJAR website is designed and created in well-planned processes. However, there still remains flaws that have to be improved. So far, many students still have not used SIPEJAR services during learning processes, even though University Negeri Malang has provided these services for free. This is due to lack of training or introduction for students to use SIPEJAR, so when they are introduced to the new system, students are not aware of the process of using SIPEJAR, which eventually students in this case as users SIPEJAR not responding to the existing of the new system. Besides, there is no guidebook on the website regarding the use of SIPEJAR, especially regarding the functionality of each of the features provided therein. For students who have used SIPEJAR, there are some features are quite confusing to use, and not all of the features that have been provided work in accordance with their functions. Only a few features are frequently used for instance giving or collecting tasks. In addition,
the user interface is not interactive, and errors often occur when accessing the website are some other things that must be improved. Therefore, to avoid the risks of decreasing visitors and to increase the quality of the website because of these problems, the research was carried out using questionnaires about SIPEJAR also as a suggestion for college to improve the performance of its services. The questionnaire’s purpose is to find out how satisfied website visitors are to the existing features, also to see if there are certain suggestions from visitors. The questionnaire is not only contained by multiple-choice (ratios) only, but also contained by essay questions. Multiple choice questions are easy to assess because the responses are quantifiable [2]. Meanwhile, the responses to essay questions are text data, and objectively understanding each student’s preference is quite hard. Besides, it is a challenge to avoid subjective data interpretation. Therefore, to avoid these risks as much as possible, the text-mining method might be useful.

Text mining is a technique to extract new or previously unknown information and knowledge from unstructured text or textual data [3]. In this case, there has been researched on the response or user’s behaviour toward the learning management system, but so far, no one has used text mining methods to obtain information on about it. So, it is hoped that by using the text mining method, the information will be obtained more easily. Generally, it’s easy for people to understand an unstructured text, but it’s a challenge for a computer program. The purpose of text mining is to investigate data with simpler methods for experimentation, which have been linked but previously separate in order to form new theories or actuality [3]. Text mining has been used in various fields such as market trends analysis, social media analysis, healthcare, business analysis, fraud detection, risk management, etc. [4] [5]. In education, text mining applied to discover students’ performance, feedback to users, evaluate essays and online assignments, etc. then with a variety of model approaches that have been used such as topic modelling approach, sentiment analysis, and others [5]. However, there is still not much research reviewing the use of text mining in terms of improving the quality of services from the Learning management system (SIPEJAR). One of the text mining software that is available for free is rapid miner. Rapid miner is the most popular free data science platform that supports data mining, text mining, and other data mining techniques that are applied in combination with text mining [5]. Rapid miner has an easy-to-use graphical user interface consisting of processes and many operators that can be used in data mining. Rapid miner text analytics extension using an easily understandable example set and provided operators that can assist in doing text mining [5]. The method used in this text mining process is Word Frequency. Words from the survey’s result are counted to identify the words that appear most often. Words often appear in the respondent’s answer indicating that an analysis of the word needs to be done, so the survey can be turned into actionable insight. This paper presents the use of text mining to analyse the questionnaire’s essay to get the best conclusion to improve the features of SIPEJAR in order to increase the visitor.

2. Method
This study aims to analyse student opinions about SIPEJAR using text mining. The text mining method consists of three steps. The flowchart process is shown in Figure 1.

![Figure 1. Flowchart process.](image)

The first step is to collect student data about SIPEJAR in University Negeri Malang. Data is collected using an online survey. There are four attributes used in the questionnaire, for more details, see Table 1.
Table 1. Question and respondent profile.

| Attribute      | Item                                                                 |
|----------------|----------------------------------------------------------------------|
| Respondent Profile | Name, faculty, department, semester                                 |
| 1              | What motivated you to use SIPEJAR?                                  |
| 2              | What makes you reluctant to use SIPEJAR?                            |
| 3              | What do you think needs to be improved from SIPEJAR services?       |

The total data obtained is 10,456 data, but only 9,315 can be processed because many students send data repeatedly so that some data is duplicated, and the language used respondent in answering questions is Bahasa Indonesia.

Data obtained usually cases are unstructured, informal, usually long documents written quickly and containing anomalous or dirty text: typos, misspellings, Adcock abbreviations, code, core dumps, cryptic tables, ambiguous and missing punctuation, and bad use of grammar [6]. Text preprocessing aims to clean up the data so that the data used can be processed in the next step. Text preprocessing makes the input documents more consistent to facilitate text representation, which is necessary for most text analytics tasks [8].

![Text mining process](image1)

Figure 2. Text mining process.

![Text preprocessing process](image2)

Figure 3. Text preprocessing process.

Text mining process and Text Preprocessing is shown in Figure 2 and Figure 3. These steps using Rapid miner to process the data. In-text mining process, Nominal to Text operator functions to process the survey data so that it can be processed, and the word frequency calculation is performed. While the select attribute aims to select the questions to be processed, the questions are processed one by one so that the meanings and intentions of the respondents are not ambiguous.

Text preprocessing is a sub-operator of the Process Document from Data in Text Mining Process (Figure 1). In-text preprocessing, five algorithms used. First, transform cases algorithm aims to convert text into lowercase letters to make it easier in processing data, because the answers from respondents are different. Second, tokenize aims to break sentences into words called tokens. Then filter stop words aim to eliminate words that are not meant for analysis because it can make look heavier for the text such as in, a, an, and etc. [9]. And stemming aims to change a word into its basic words, to reduce the number of words in the text to save space and memory, and suffixes can be removed [9]. Specifically, for the parameters used in the stop words and stemming filter operators, it is necessary to write a list of words from stop words and stemming itself, because there are no special Indonesian operators on software. After doing the stemming process, we need to use the generate n-gram operator. If we break sentences into words, sometimes a word has a different meaning when it becomes a phrase. Generate n-
gram functions to record words that appear in a row so that there is no difference in meaning when analyzed. The parameter used to generate n-grams is max. length: 2.

Word Count is done using an operator process document from data. The parameters used are prune method: perceptual, prune below percent: 1. After having done the text mining, then an analysis is performed on the data based on the frequency of the data appearing.

3. Result and Discussion
The aim of this research is to find the response of students using SIPEJAR to improve the services using Text Mining. Text Mining used to help discover information from three questions about SIPEJAR. Attributes are grouped based on the similarity of meaning and relevant to support the answers to each question, so that the following results are obtained the result shown in the table and graph below.

Table 2. Total number of appearance (Question 1).

| Attribute | Appearance of Word | Appearance of Document |
|-----------|--------------------|-----------------------|
| Assignments from lecture/collect assignment/deadline assignment | 2111 | 2096 |
| Lecturer | 2055 | 2022 |
| SIPEJAR | 1000 | 897 |
| Easy | 852 | 831 |
| Material assignment | 803 | 782 |
| Course | 759 | 736 |
| Searching_for_information | 596 | 589 |
| Demands/instructed_by_lecturer | 518 | 518 |
| Study | 359 | 351 |
| Access | 215 | 215 |
| Needs | 171 | 171 |

Table 2 and Figure 4 show the total number of document appearance in question 1 (“what motivated you to use SIPEJAR?”). The top five words with the most mentioned in the answer given by the respondent which is related to the question are: First, an assignment from lecture/collect assignment/deadline assignment with total 2111 appearance of word and 2096 appearances of document. Second, lecturer with total 2055 appearances of word and 2022 appearances of document. Third, easy with total appearances of word: 852 and appearances of document: 831. Fourth, material assignment with total 803 appearances of word and 782 appearances of document. And fifth, searching for information with total appearances of word: 596 and appearances of document: 589. And the last two words that appear the least are access with total 215 appearances of word and 215 appearance of document, then needs with total 171 appearances of word and 171 appearances of document.

Figure 4. Graph of the total number appearance (Question 1).
Assignment from lecture/collect assignment/deadline assignment, lecturer, easy, material assignment, and searching for information are the words that appear most often. The use of technologies has modified the ways lecturers distribute course materials to students, rarely do university students transcribe notes from blackboards/whiteboards [11]. Learning Management System (LMS) changes the behaviour of lecturers and students, starting from the distribution of assignments, materials, quizzes, communication, and even information for can be done in SIPEJAR. It is also the same as the statement from the previous study [12] which state that the instructor, in this case the lecturer is very influential on the behaviour of students in using learning technology, if the lecturer has an interest and willingness to embrace with information technology, then it also affects the success of the application of information technology. Similarly with study in [13] to find academics’ behavioural intention to use LSM said that ease of use can be one of the factors that influence the attitude toward using LMS and intention or motivation to use LMS. So, the things that must be improved so that motivation to use SIPEJAR increases are: (1) How the assignment or material assignment can be distributed and collect by adding reminder alarms to students regarding assignment deadlines; (2) Interest of lecturer to introduce and explain about SIPEJAR by giving instructions to the lecturer to be obliged to explain how the operation of SIPEJAR itself; and (3) Ease of use it by increase the type of services and user interface.

Table 3. Total number of appearance (Question 2).

| Attribute | Appearance of Word | Appearance of Document |
|-----------|--------------------|------------------------|
| Internet/Connection/network/connection_internet/ | 946 | 939 |
| signal/network_internet/server | 648 | 645 |
| Server/down/loading/error/slow | 591 | 583 |
| Difficult/complicated/complex/ | 460 | 445 |
| Features/display/interesting/interesting display | 177 | 174 |
| Confused/Ease | 145 | 132 |
| Material | 127 | 126 |
| Access | 114 | 113 |
| Task lecturer/task_SIPEJAR | 56 | 53 |
| Utilization | 55 | 54 |
| Socialization | 47 | 46 |

Figure 5. Graph of the total number appearance (Question 2).

Table 3 and Figure 5 show for the total number of appearances in question 2 (“what make you reluctant to use SIPEJAR?”). The table provides the top five words with the most mentioned in the answer given by respondent that are relevant with question 2: First, internet/connection/network/connection network/network internet/ server with total 946 appearances of
word and 939 appearances of document. **Second**, server/down/loading/error/slow with total 648 appearances of word and 645 appearances on documents. **Fourth**, difficult/complicated/complex with the total appearances of word: 591 and appearances of document: 583. **Next**, feature/display/interesting/display interesting with total number appearances of words: 460 and total number appearances of document: 445. **Fifth**, material with total number appearances of words: 145 and total number appearances of document: 132. And the last wo words that appear the least are service with total 47 appearances of word and 46 appearances of document, then utilization and socialization with 56 and 55 total appearances of word and 53 and 54 total appearances of document.

The result indicates that users are reluctant to use SIPEJAR because of the influence of the internet connection, especially if the connection is interrupted, because to use SIPEJAR must be connected to the internet. Inversely proportional to the study [14] which shows that the respondents are quite comfortable when using the internet to access the site. This is possible because the level of connection in that country is better than in here. In addition, the operation of the functions offered by SIPEJAR is difficult and complicated, so users will find it difficult to use it then make them reluctant to use it. This is similar to the study described [15] [16] about the LMS survey. The result said that users does not fully understand and be fully aware of the functions offered from the LMS used. Because the user must know how to access it, utilize, navigate, and convenience when using the system like the results obtained in this research [17] so that it is successfully implemented. In that study [15] also shows the same in terms of website performance, if the website server is often error or loading, it also makes users reluctant to use it, especially when uploading assignments, seeing feedback and quizzes, or download the materials, of course it is frustrating for the users. For display design or feature in SIPEJAR, it also gives an impact on users’ behavior towards SIPEJAR. If SIPEJAR features is not interesting for users such as inconsistent display, or colors and icons used, this will make the users not interested in using it. Thus, in order to improve services of SIPEJAR, some actions that can be considered are: (1) Internet connection must be improved by providing Wi-Fi with wider access area coverage and increased speed, also to avoid errors and loading when accessing SIPEJAR; and (2) The process of using SIPEJAR is quite difficult or complicated, for that service providers must make the process of operation easier and more attractive user interface design. The last is about material provided, SIPEJAR must improve the types of material and also the information provided on the website.

Table 4. Total number of appearance (Question 3).

| Attribute                              | Appearance of Word | Appearance of Document |
|----------------------------------------|--------------------|------------------------|
| Display / Interesting display / Sipejar display | 1154               | 1149                   |
| Feature / feature / It’s feature       | 951                | 861                    |
| Notification / Task notification / Notif| 532                | 509                    |
| service                                | 468                | 454                    |
| Simplicity                             | 349                | 349                    |
| socialization                          | 205                | 204                    |
| forum discussion / forum               | 158                | 146                    |
| deadline task                          | 49                 | 48                     |
Table 4 and Figure 6 show the total number of appearances in question 3 (what do you think needs to be improved from SIPEJAR services?). The top five words with the most mentioned in answer given by respondent which is related to the question are: **First**, display/interesting display/ SIPEJAR display with total 1154 appearances of word and 1149 appearances of document. **Second**, feature/feature feature/ it’s feature with total 951 appearances of word and 861 appearances of document. **Third**, service with total appearances of word: 468 and appearances of document: 454. **Fourth**, notification /task notification/notif with total 532 appearances of word and 509 appearances of document. **Fifth**, simplicity with total appearances of word: 349 and appearances of document: 349. And the last two words that appear the least are forum discussion / forum with total 158 appearances of word and 146 appearances of document, then deadline task with total 49 appearances of word and 48 appearances of document.

From the result shows above, there are several things need to be improved, namely the display is made to be more attractive, features such as those offered can be suitable with the needs of the user such as automatic task notifications/reminders, and also the ease of service offered. This is also supported by research conducted by Carleton University (2018) which provides recommendations on some actions that can be done to improve the usefulness of NGOs that are used based on answers from respondents, for example by paying attention to instructions given on the website, improving the search capabilities of the website, navigation, features tips and tricks as well as instructional videos to be able to support the website, so users can also learn about the use of the website through these media. Besides, the user interface needs to be upgraded, it must be consistent in terms of the use of design, color, etc. SIPEJAR features will facilitate students and make students feel that accessing SIPEJAR became their needs. By knowing the material that will be discussed in class students can access further information to read outside of the course material and conduct research through the use of online journals and databases [11].

The growth in the world of information technology give a large volume of data to be processed to see actually what the respondent needs. There have been several techniques used to improving the learning management system besides text mining. For example in [18] and [13], they are use the technology acceptance model (TAM) to assessing the learning management system with attribute perceived ease of use, perceived usefulness, and attitude toward using it. Also, there is some paper related to this research are [14] that examines learner satisfaction when using learning management system and from the user’s response is known what should be improved in the system, Carleton University report [15] that doing a research about how the feedback from LMS users about their experience when using it, Ohliati and Abbas [19] that measuring student satisfaction from private university when using the learning management system, and Hussein [20] that examine the attitude of a user in Saudi university toward using their LMS. In this paper, data was collected using a questionnaire, then processed using SPSS. The results generated using SPSS describe of how the user responds, but
not as a whole. While, text mining provides results based on the words most often expressed in the response given by the user, and the analyzer must determine which words have an influence on the objectives. SIPEJAR must improve the design to make it more interesting, add new features, make notifications about deadline assignments to be collected or notification that there are new assignments given by lecturers, and simplify the process of its operation.

4. Conclusion
This paper presented SIPEJAR as a learning management system and text mining used to see the respond of the users. Text mining is one of the techniques used to extract meaningful information effectively from a large amount of unstructured data. This paper provided an overview of processing the data using text mining that tries to find information by seeing which words appeared the most from the answers given by respondents. From the result, the most mentioned word for question 1: what motivated you to use SIPEJAR? is because assignment from lecture/collects assignment/deadline assignment, lecturer, ease, material assignment, and searching for information. For question 2: what makes you reluctant to use SIPEJAR? is because of the internet connection, difficulties, and complexity when using it, server error, and interesting display and features. Then, for question 3: What do you think needs to be improved from SIPEJAR services? it is an interesting display, the features provided, services, notification, and simplicity when using it. So, from the results that have been obtained, it is expected that training or workshops will be conducted to improve the understanding and ability of users in operating SIPEJAR, as well as utilizing existing resources to improve services, features, also the user interface of SIPEJAR. Later with the recommendation given in this study, it is hoped that this will help provide useful information to improve the services of SIPEJAR in University Negeri Malang.

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