DEVELOPMENT OF I-COMPLAIN@META: A COMPLAINT MANAGEMENT SYSTEM FOR FKMT STUDENTS USING NAÏVE BAYES CLASSIFICATION ALGORITHM

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LAPORAN PROJEK TAHUN AKHIR DIKEMUKAKAN BAGI MEMENUHI SYARAT UNTUK MEMPEROLEH IJAZAH SARJANA MUDA KEJURUTERAAN PERISIAN
(PERISIAN PENDIDIKAN) DENGAN KEPUJIAN

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ABSTRAK

Aduan adalah penting di dalam institusi pendidikan kerana ia melambangkan ketidakpuasan pelajar terhadap kemudahan dan perkhidmatan. Namun, sistem pengurusan aduan semasa di mana pelajar FKMT perlu mengisi borang aduan secara manual dan pihak pentadbiran FKMT perlu menghantar aduan secara manual ke ahli berkenaan adalah tidak cekap. Oleh itu, projek ini bertujuan untuk membangunkan I-Complain@META yang merupakan salah satu sistem web hibrid yang dibangunkan untuk Pelajar FKMT, Ahli FKMT, dan Pentadbir FKMT bagi memudahkan pengurusan aduan mereka. Sistem ini akan digunakan di dalam FKMT, UPSI. Sistem ini mengandungi teknologi Kepintaran Buatan, iaitu Algoritma Klasifikasi *Naïve Bayes* untuk mengklasifikasikan aduan pelajar FKMT dan menghantarnya kepada jabatan yang berkaitan secara automatik. Selain itu, Pemberitahuan Melalui Emel yang dihantar kepada Pelajar FKMT dapat membantu mereka untuk menjejaki kemajuan aduan yang dibuat. Sistem ini adalah sistem web hibrid yang dibangunkan menggunakan *Bootstrap PWA, Laravel*, dan *MySQL* sebagai pangkalan data. Metodologi yang digunakan untuk membangunkan projek ini adalah Model Prototaip Evolusi yang terdiri daripada 6 fasa. Berdasarkan penilaian, sistem ini memberikan pelbagai kelebihan kepada pengguna berpotensi dalam membuat dan mengurus aduan.

Kata Kunci: *Pengurusan Aduan, Fakulti, Kepintaran Buatan, Algoritma Klasifikasi 'Naïve Bayes', emel*

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ABSTRACT

Complaint is important in the university as it represent the dissatisfaction of student to the facilities and services. Yet, the current complaint management system where FKMT Student need to manually fill in the complaint form and FKMT Admin need to manually send the complaint to respective department is inefficient, therefore, this project is to develop I-Complain@META which is one of the hybrid web system is developed for FKMT Student, FKMT Member and FKMT Admin in order to ease their burden on complaint management. This system is going to use within FKMT, UPSI. This system had include the Artificial Intelligence technology, which is Naïve Bayes Classification Algorithm to classify the complaints of FKMT student and send to the respective departments automatically. Other than that, Email Notification sent to FKMT Student can help them in tracking the progress of complaint made. This system is hybrid web system that developed using Bootstrap PWA, Laravel and MySQL as database. The methodology used to develop this project is Evolutionary Prototyping Model that consists of 6 phases. Based on the evaluation, this system bring a lot of advantageous to potential users in order to make and manage the complaints.

Keyword: *complaint management, faculty, Artificial Intelligence (AI), Naïve Bayes Classification Algorithm, email*

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LIST OF ABBREVIATIONS

SDD	*Software Design Document*
SRS	*Software Requirement Specification*
STD	*Software Testing Document*
FKMT	*Faculty of Computing and Meta-Technology*
UPSI	*Universiti Pendidikan Sultan Idris*
AI	*Artificial Intelligence*
SUS	*System Usability Scale*

CHAPTER 1

INTRODUCTION

1.1 Overview

The advancement of technology has transformed people's living culture. Nowadays, people can easily communicate, exchange information and cooperate globally through websites, e-mail, instant messaging systems, social networking sites and other internet-based communication systems. This has a great impact on academic growth and educational development as well, and from various concerns in the academic environment to promote a social and practical educational system (Al-waeli & Hassan, 2022). We can also see that technology has impact our life especially in educational field, mostly students are more preferred to use mobile app or website to done their work.

Technology had bring a big impact in educational field. Current education system emphasis more on using technology in teaching and learning session. For instance, elementary teachers used courseware or media kit to teach students instead of using textbook. During pandemic covid-19, many education's services started using web-based system or mobile app platform for management, such as student's attendance or student's classwork. Even after the pandemic is over, some of the education institution are still using technology to manage these services. This had proved that technology brings benefits to the educational field.

Everybody thinks and acts a little differently even when we are in the same environment. Each student will have a different idea of what the university offers. Some students might satisfied with the services and facilities that provided within the faculty, some students may not satisfied yet about that. According to Collins English Dictionary, a complaint is a statement in which you express your dissatisfaction with a particular situation. Many students, especially new students, have many issues, which they are dissatisfied with, but they keep these issues bottled down (Alex et. al., 2021). Therefore, in order to know the deficiencies within the faculty, complaints are very important. However, the common way of receiving complaints are wasting their time and effort as they need to go to the office, take the form and fill in then submit to office again. The existing complaint management system also difficult for students to know the progress. This also leads to students being lazy to make a complaint.

In educational institution, maintaining an effective communication channels between students and administration plays an important role in order to provide a better learning environment. A productive channel for student's complaint is necessary in every educational institutions as a well-structured system for receiving and manage complaints can help to improve the facilities provided within the campus as well as bring convenience to student and administrators.

1.2 Research Background

Complaint management comprises the structured processing of complaints about the quality of a product or service with the aim of improving product quality and the associated production processes by identifying and applying suitable corrective and preventive measures (Hennebold et. al., 2022). In order to know the consumer needs and wants, we need to collect the relevant information on defects and deficiencies and to process and evaluate it. However, complaint handling process had been ignored, thinking that it's not important so there isn't provide a specific platform for complaint management.

The manual process of complaint management such as fill in the paper form and send to the office brings inconvenience to students as they have to go to the office and ask for the paper in order to make a complaint. In addition, the manual analysis of complaint is ineffective and time-consuming, due to notable rise in complaints (Bozyigit et. al., 2022). Therefore, it's time for us to find a better way to manage the complaints, which is develop a system that can manage the complaints and allow the students to make complaint without going to the office of faculty so that all the dissatisfaction from students can be heard and the failures can be solve as soon as possible.

Evolution of technology is going faster where there are some trending technologies that are introduced in the world, such as 5G, cloud computing, Artificial Intelligence (AI), Augmented Reality (AR), Virtual Reality (VR). These technologies integrate with the management system will bring a lot of benefits to us. One of the technologies mentioned above which is AI can enhance the complaint management system.

Artificial Intelligence or sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals. Some of the activities that it is designed to do is speech recognition, learning, planning and problem solving (Saleh et. al., 2019). In machine learning, sentiment analysis is

considered a natural language processing (NLP) method for analysing user's orientations toward services and topics under consideration (Mostafa et. al., 2023). Sentiment Analysis also divided into two based, which is Machine Learning-Based approach and Lexicon-Based approach.

Within Machine Learning-Based approach has two major approaches for handling input data for training. These approaches are supervised and unsupervised. In the supervised approach, the input data must be trained first before applying the testing dataset, as the ML algorithms can perform the prediction based on previous experience (Mostafa et. al., 2023). However, in the unsupervised approach are depends on the unlabelled data where we don't have to know the input and will discover the pattern when performing the specific task that related to machine learning in the system.

By using supervised classification algorithm, we able to set the data such as the category of complaints made by the students, and discover the pattern that this specific category are belongs to the respective departments. This can helps to ease the burden on admin's effort for passing the complaints to different departments. Additionally, this system also include the basic functions that able student and member including the admin to access in order to fully using it for complaint handling process.

The research background gives a good start to identify the problem statement, research objective, scope and significant of the study for this project. Figure 1.1 shows the TPOSS table of I-Complain@META and the details will also be discussed in the sub-sections below.

Title	Topic	Problem	Objectives	Scope	Significance of the study
I-Complain@META : Development of Complaint Management System for FKMT Student by including Naïve Bayes Classification Algorithm	Complaint Management System including machine learning algorithm – Naïve Bayes Classification Algorithm	- The conventional way of complaining process about university facilities has shown several weaknesses and difficulties (Al-waeli & Hassan, 2022), such as students are using the manual form to make a complaint (Illias et al., 2020). - By having a mechanism for complaint management could be more effective as improvement can be done earlier and all the complaints are recorded (Gedye et al., 2019). - Moreover, by using Supervised Classification algorithm to classify the complaints and directly send to the respective departments (Ali-Fauzi, 2018) in order to reduce the processing involves in handling the complaints (Mohammed, 2020).	1. To identify the problem of complaint handling process within FKMT. 2. To develop prototype of a student complaint management system by using naïve bayes classification algorithm. 3. To test the functionalities of student complaint management system prototype.	**Function** – FKMT Student can add, view, edit and delete the complaint, view user guide, search complaint, view complaint status, receive email notification as well as login to the system. FKMT Member and FKMT Admin able to login, view the complaint, add, delete, edit and view feedback and category, update the complaint status, view report as well as receive email notification. The system using Naïve Bayes Classification Algorithm in order to classify the complaints and send directly to the respective departments. **Content** – The system will used English as the main language as we consider that there are some international students and lecturers in FKMT. **Target User** – FKMT Student, FKMT Member and FKMT Admin **Geographical Area** – within FKMT, UPSI	Benefits for the following targeted users: **FKMT Student** – Have a specific channel to make complaint about the facilities in faculty, able to check the status of complaint. **FKMT Member** – Able to solve the complaints immediately **FKMT Admin** - Ease the burden of manually send the complaints to respective departments.

Figure 1.1 TPOSS Table

1.3 Problem Statement

The first problem is the student need to manually fill in the complaint form. The conventional way of complaining process about university facilities has shown several weaknesses and difficulties (Al-waeli & Hassan, 2022), such as students are using the manual form to make a complaint (Illias et al., 2020). It is difficult for students to know the progress of the complaints. Some of the students who would like to stay anonymous will choose not to make the complaint even though the facilities are not satisfied for them.

Secondly, the manual way of making complaint also make students difficult to track the progress as they don't know where to get the information and progress of the complaint that've made.

Third problem statement is the admin have to pass the complaints manually to the respective departments. Based on the interview done with FKMT Admin mentioned that the complaints are received by the admin in faculty, then based on the categories, admin need to pass the complaints manually to the respective departments that have the authority to solve it.

By using this manual way of making complaint, the admin that manage the complaint also need to collect the form weekly or monthly that might need a lot of effort. After settled the complaint, it's hard to inform the students, either call to the phone number of student or inform them through face-to-face.

Therefore, by having a mechanism for complaint management could be more effective as improvement can be done earlier and all the complaints are recorded (Gedye et al., 2019). Technology is everywhere in our life, and we should also use it to manage the complaints as well. An internet-based such as website or application to make complaint and receive as well as manage the complaints can bring advantageous to the potential users.

By including trending technology such as Artificial Intelligence (AI) in our system, the benefits outweigh the risks. Thus, by using Supervised Classification algorithm which is Naïve Bayes Classification Algorithm can help to classify the complaints and directly send to the respective departments (Ali-Fauzi, 2018) in order to reduce the processing involves in handling the complaints (Mohammed, 2020).

1.4 Research Objective

The objective of the study is:

1. To identify the problem of complaint handling process within FKMT.
2. To develop prototype of a student complaint management system to solve problem mentioned in objective 1.
3. To test the usability of prototype student complaint management system.

1.5 Research Question

This research questions are created based on the research objective. The followings are the research questions of this study:

1. What is the problem of complaint handling process within FKMT?

2. How to develop a prototype of a student complaint management system to solve the problem stated in question 1?
3. Does the application serve the user needs after development?

1.6 Research Scope

The purpose of this project is to develop a prototype hybrid web system for a complaint management for FKMT Students using Naïve Bayes Classification Algorithm that can classify and send to the respective FKMT Member or FKMT Admin automatically. The prototype will also include the basic functions of FKMT Student which are add, view, edit and delete the complaint, view user guide, search complaint, view complaint status, receive email notification as well as login to and logout from the system.

FKMT Member and FKMT Admin able to login, logout, view the complaint, add, delete, edit and view feedback, update the complaint status, view user guide as well as receive email alert. FKMT Admin have another 2 functions which are view report and manage, such as add, view, edit and delete the category. The content in the system are English as the main language as we consider that there are some international students and lecturers in FKMT. The target users are FKMT Students, FKMT Members and FKMT Admin and this prototype system will be used within FKMT, UPSI only.

1.7 Significant of the Study

The system brings benefits to FKMT Student where they have a specific channel to make complaint. There's no more filling the manual form in order to make complaint and unable to track the progress of complaint. FKMT Student able to search the past complaints they've made and view the complaint status with simple step on the system. FKMT Member able to solve the complaints immediately without waiting the FKMT Admin to pass the complaints to them which takes a lot of effort and time.

At the same time, which means this prototype system can ease the burden of FKMT Admin where they don't have to manually pass the complaints as the technology used in this system which is Naïve Bayes Classification Algorithm which is one of the algorithm under Supervised Classification Algorithm able to help FKMT admin that manage the complaints to classify the complaints based on the category and send to the specific FKMT Member automatically. The effort of FKMT Admin that need to manually record the complaints and produce reports about complaints 3 months once will be reduce when using I-Complain@META.

1.8 Conclusion

In summary, technologically based system can strength the services provided in the campus. FKMT Admin can save their effort and time on passing the complaints by using Naïve Bayes Classification Algorithm and FKMT Member can solve the complaints as early as possible. In addition, this system able to provide a better channel for FKMT Student to make complaints in order to allow the faculty to improve the facilities provided to the students so that they can learn in a better environment.