E- NOTICE BOARD

By

BIT18-55

DEPARTMENT OF INFORMATION TECHNOLOGY
SCHOOL OF COMPUTING AND INFORMATICS TECHNOLOGY

A Project Report Submitted to the School of Computing and Informatics Technology for the Study Leading to a Project in Partial Fulfilment of the Requirements for the Award of the Degree of Bachelor of Information Technology of Makerere University

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June, 2018
Declaration

We declare that the work in this report is original and no one has ever submitted it in any University or any institution of learning.

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<td>NAMBOOZO</td>
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Date: 10th Aug 2018
Approval

This project report has been submitted for examination with the approval of a University Supervisor.

Signed:  

Date: \[\text{10 Jul 2018}\]

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Dedication

We dedicate this project to our families whose untiring support and assistance have made possible the realisation of our efforts. We also dedicate this work to our lecturers, friends and classmates for their cooperation while conducting the project.

Above all, we dedicate this work to the Almighty God the author of knowledge and wisdom who made this possible.
Acknowledgement

The completion of this undertaking could not have been possible without the participation and assistance of so many people whose names may not all be enumerated. Their contribution is sincerely appreciated and gratefully acknowledged. However, the group would like to express their deep appreciation and indebtedness particularly to its lecturers Mr. Mugejjera Emmanuel and Bitwire George Albert for their endless support, kind and understanding spirit during this project.

We further extend our appreciation to all relatives and friends who in one way or another supported us, either morally, financially and physically, thank you.

Above all, we acknowledge the Great Almighty, the author of knowledge and wisdom, for His countless love.

We thank you.
Abstract

Our project is an online notice board where a group of people can easily communicate with each other by sticking or posting virtual notes, announcements and information. The main objective was to design an e-notice board, which enables students and staff post and receive the notices from the college, anywhere, anytime about events and communications going on at the college.
For the specific objectives, the system requirements elicitation phase, qualitative and quantitative data was collected through focus group discussions and questionnaires. An analytical study and scrutiny of existing traditional cardboard notice boards was undertaken to inform the requirements of a new system. Data flow diagrams and Entity Relationship Diagrams were employed to enable design and modeling of relationships between entities and attributes of the system. The system was implemented using a number of tools and technologies such as MySQL, HTML, CSS, PHP, JavaScript, Bootstrap, jQuery, D3.js and Ajax.
For testing and validating the system, questionnaires were designed and hands on experimentation done and results analyzed.
More work needs to be done in areas like developing a mobile app for the e-notice board to increase user outreach to information. Further a messaging functionality need to incorporated to enable users receive information using GSM functionality.
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<th>Description</th>
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<tbody>
<tr>
<td>Admin</td>
<td>Administrator</td>
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<tr>
<td>BIT</td>
<td>Bachelor of Information Technology</td>
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<td>CHAR</td>
<td>Character</td>
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<tr>
<td>CSS</td>
<td>Cascading Style Sheets</td>
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<td>D3</td>
<td>Data Driven Documents</td>
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<td>DA</td>
<td>Digital Assistant</td>
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<td>DFD</td>
<td>Data Flow Diagrams</td>
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<td>DOC</td>
<td>Document (Microsoft Office Word Document File Extension)</td>
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<td>E-Book</td>
<td>Electronic Book</td>
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<td>E-Mail</td>
<td>Electronic Mail</td>
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<td>Electronic Notice board</td>
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<td>ER</td>
<td>Entity Relationship</td>
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<td>ERD</td>
<td>Entity Relationship Diagram</td>
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<tr>
<td>GIF</td>
<td>Graphical Interchange Format</td>
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<td>GUI</td>
<td>Graphical user interfaces</td>
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<td>html</td>
<td>Hyper Text Mark-up Language</td>
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<tr>
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<td>Hypertext Markup Language</td>
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<tr>
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<td>Information Technology</td>
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<td>Integer</td>
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<td>JPEG</td>
<td>Joint Photographic Experts Group (Image File Extension)</td>
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<td>Local Area Network</td>
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<td>Personal Computer</td>
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<td>Portable Document Format</td>
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<td>Hypertext Preprocessor</td>
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<td>Random Access Memory</td>
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<td>Relational Database Management Systems</td>
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<tr>
<td>SQL</td>
<td>Structured Query Language</td>
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<td>VARCHAR</td>
<td>Variable Character</td>
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CHAPTER 1

GENERAL INTRODUCTION

For a long time, in many institutions and organizations, announcements, memos and communications have been always posted on notice boards made up of cardboards hoping for students to chance on them as they go about the various academic (and sometimes non-academic) undertakings at schools. Unfortunately, all this communication can be missed due to several factors like papers being pulled down for malice, pins falling off, overlap of newer communications and limited space for newer hot communication. Some information is not readily available on these boards, like which lecturer was supposed to be in what class, which lectures are offered for a given day and lecturers communication on failure to come.

The solution to this is an e-Notice board. E-notice board helps to access online notices on the go, either on mobile smart phones, laptops and tablets. It is an online notice board where a group of people can easily communicate with each other by sticking or posting virtual notes, announcements, information to students. These postings can be of text, images or if further upgraded, include online videos. E-notice board brings the traditional notice board to a virtual location where staff, students and student leaders would not only read notices, but also instantly react and respond to them on the go.

1.2 Background to the problem

It is expected that all institutions ensure an effective communication strategy. The ultimate test of any communication is enabling effective action. Users must receive the communication and extract the information they need (Baruch, 2011).

So many times, as students, we have had problems with how communications from the College administration has been relayed, most times via students and sometimes via traditional card board notice boards. Communications have been misinterpreted, and misguided in some instances simply because of the way they are relayed. As students we have missed important events, classes and deadlines simply because the ineffective and inefficient communication.

In today's dynamic and turbulent environment, changes in either the business environment or the business strategy would lead to the need for new or revised measures and metrics (Umit et al, 2014). We believe that the e-notice board project will help both us students and staff access online notices on the go, via mobile smart phones, laptops and tablets. Using an online notice board a group of people can easily communicate with each other by sticking or posting virtual notes, announcements and information to each other.
1.3 Problem statement
Currently the College of Computing and Information Sciences runs a manual system of putting notices on notice board or calling class representatives to disseminate information. In this day and age, this is outdated. Students have to keep on checking on the board to see if there is a new announcement, stand in droves to read new communication, doubting student leaders about important communications etc. Further, there is no proper organization of notices on the traditional notice board, leading to communications/notices being scattered anywhere on the board making it easy for anyone to miss out on important information. Some communications are over ridden/covered, or someone accidentally puts some communication in the wrong place which would lead to loss of data/information. The traditional notice board does not allow users to easily edit data or information directly.

It is therefore, as a goal of our research project for the award of a bachelor’s degree, to design an Electronic notice board (e-notice board) to enable students and staff post and receive the notices from the college, anywhere, anytime.

1.4 Objectives
1.4.1 General Objective
The main objective of our research was to launch an e-notice board, which enables students and staff post and receive the notices from the college, anywhere, anytime about events and communications going on at the college.

1.4.2 Specific Objectives
i. To collect and analyze requirements necessary for the design of a e-notice board
ii. To design the e-notice board
iii. To implement the e-notice board
iv. To test and validate e-notice board

1.5 Research scope
Our research was conducted at the School of Computing and Informatics Technology, the students and specifically under the Department of Information Technology at Makerere University, Kampala.

1.6 Significance
A well designed e-notice board would be easy to update and accessible from everywhere anytime. An e-notice board can easily replace the traditional cardboard notice board but with an added value to dynamically manage content in a way that paper just cannot compete with. E- Notice board is the
way to go today and is designed to do the following:

Eliminate wastage of time and energy: with an e-Notice board, the university administration and students will save a lot on paper and time spent on printing and pinning up paper notices on the notice board. All notices will be electronic.

Reduce on the duplication and overlap of communication: the university and administration and students will have enough room and space on the e-notice board for passing on information without repetition or duplication since the information on the e-notice board will be more organized, easing access to it by users.

Enable tailored searching for particular Notices: all users will be able to easily and efficiently search for a relevant communication or information about an event on the e-notice board, e.g. searching by date, searching by programme. This means that whoever accesses the e-notice board will be able to only read information that is relevant to him/her.

Free delivery service: Student, Lecturers and Administrators will be able to access the e-notice board anywhere without being limited by location or time or crowding around notices as has been with the traditional notice board.
CHAPTER 2

LITERATURE REVIEW

2.1 Notice board

The Longman Dictionary of Contemporary English defines a ‘notice’ as “a written or printed statement that gives information or warning to people”. A definition for ‘e-notice’ might be as follows: “a written or printed statement that gives information or warning to people and which is created, sent, displayed and stored electronically”. However, an e-notice is not just an electronic replica of a traditional paper-based notice. Instead, it has features that indicate that the e-notice is emerging as a separate genre.

E-notice boards place constraints on how, what and to whom communication is meant. These constraints result in e-notices with similar structures, stylistic features, content and intended audiences (Dowling, 2008).

Vinod et al., (2016) proposed that it is possible to remotely send a notice to a digital monitor from any authorized device (PCs) on Raspberry pi card. They suggested using Wi-Fi for data transmission. Posting, removal or editing postings could be done at will, any time. An authorized device or PC was used for sending or posting notices and at the receiving end; Wi-Fi was connected to raspberry pi. Wireless was a popular technology that allows an electronic device to exchange data wirelessly over a computer network, including high speed wireless connections. The data is received from authenticated user.

Arulmurugan et al., (2016) asserts that notice boards are a common feature in many institutions. Currently, these notice boards are managed manually. Their publication proposed a system which facilitates transmission of notices onto a notice board using Wi-Fi. Wi-Fi can pass information for about 100meter distance Wi-Fi data rate has 1 or 2 Mbps. It accesses numerous points and supports network interfaces. It also makes the system compatible with more than one wireless technology.

Ajinkya et al., (2013) argue that Notice Boards are a common occurrence in a variety of institutions which we come across on a daily basis. In the current scenario the notice/ advertisement boards are being managed manually. There is a long process involved in order to put up notices on the notice board. This wastes a lot of resources like paper, printer ink, man power and also brings about loss of time. They proposed a system which was to enable people do wireless transmission of notices on a notice board using Zigbee. This proposed system wasto work in way that only authorized people can access the notice board using a graphical user interface. There was possibility for the system to be compatible with more than one wireless technology. The review further looks at the archiving and display, security, access and linkages/hyperlinks in e-notice boards.
Generally, the existing notice board system as applied in the college works on the basis of manual updating method. Spaces need to be searched in and around the notice board, spread at different floors/levels depending on the notice that is to be displayed. This is a tedious job, especially on the days of exams where we get to see a huge crowd of students crowding a single notice with information like the subject to be sat and the lecture room number. This creates panic and undue anxiety since there are limitations on space availability, as well as time consuming especially when it comes for searching for the relevant notice. Maintaining the archived files also becomes hectic (Anushree et al., 2014). On regular observation, only updates would be available and cannot be accessible outside that physical location.

In addition, for the benefit of having an interactive interface that provides for categorization of notices posted by posters (e.g. administration, student leaders and registry), in our design and proposal, we deem it fit to enable a sizeable storage capacity that will facilitate archiving of old messages by say, date, occasion and time of posting so that intended receivers can view missed postings at will.

Much of the literature on the e-notice boards online (as shown above) is about the technicalities of the transmission, display and related devices, but lacking on the actual interface design. They talk about LCDs and mobile devices screens but not about the actual arrangement and interaction design of the boards.

There are 3 major characteristics to be considered when designing an interface; user involvement, establishing specific usability and user experienced goals at inception and iteration (Preece et al., 2002). There are several aspects about the display that need to be understood.

2.1.1 Subject lines

It was universally agreeable that both paper-based and electronic notices had subject lines, for enabling readers to mentally switch to the correct context before reading the notice. However, the subject line in an e-notice differs from its paper-based counterpart in one significant way: when an e-notice is received, the subject line initially appears detached from the main body of the notice. The receiver clicks on this subject line to see the main body of the e-notice. Dowling, (2008) affirms that the probability of positive responsiveness to the notice lies entirely in the attractiveness and how captivating the subject line is. (Parker, 2001) concurs too that the subject line plays a much more important role in e-notice boards than in paper based.

Our system therefore is cognizant of the benefits of subject lines since they determine (i) the usability of the system i.e. how effective and efficient to use the board, does it offer a good utility?
Do people find it resourceful? (ii) Improved user experience i.e. was the e-board enjoyable, helpful, aesthetically pleasing, and fun?

The subject line must be precise and concise to the point. To effectively communicate, the receiver is enticed to reading the posting. The receiver, especially when rushing somewhere, needs to briefly decide; whether to actually download and read/open a posting and whether the posted article/piece of news was intended for him/her. The context and perspective of the subject line must be short enough not to clutter the interface, but long enough to convey the message—showing a pinch of what is being communicated. The design and determination of subject line length matters a lot here.

2.1.2 Colour and Graphics

There were many aspects we had considered that can make a good e-notice board, e.g. Page-layout, Legibility of the font, Use of white space, Graphics, etc. Of all these, color and graphics are perhaps two of the most important tools since the use of color and graphics increases the reader’s interest, enhance retention, and improve comprehension. One tool designers use to connect with people is color. Color gives an array of emotional and visual cues. Apart from that, it sets the tone and attracts people’s attention towards the design (Patrick, 2013). Different color hues, tones, shades and tint have diverse effect on people’s responsiveness to them. Patrick alludes that for example, yellow stimulates mental processes and activates memory; blue aids intuition; orange encourages socialization; white aids mental clarity; grey creates expectations, to mention but a few.

Our e-notice board system intends to harness this perspective, to design and develop an interesting and attractive user interface. For effective communication: the choice of colors; number of colors mixed on the interface; the colors for the different interfaces and backgrounds as and when and for what type of category of information communicated plays a vital role. For example, subject lines about very important stop-the-press information should be in red to alert every one.

2.1.3 Link to other entertainment, academic and news centres/sites

In the review of the literature, as shown above, is about communication from administrators to recipients. Little or none had been shown about the affordances for hyperlinks to other academic and related sites.

Our system willenable linkage of different Webpages and features carrying out different functionalities of the system with different interfaces. There will be links to say, academics, entertainment and news. It will also facilitate linkage to social media site pages for the college like twitter, Face book and instagram.
This functionality of linkages is not found in literature from the reviewed literature about online notice boards like an online Announcement Display System in Tanzanian Colleges (Senzota et al., 2014). This only provided students with an electronic school bag (e-school bag) which packs electronic books, notebooks and enabling students get more flexible scope of learning at a convenient time. With our proposal, all these are provided to students plus the convenience to access entertainment and news both locally and internationally. In the proposed e-notice board system, the students have linkages to other sites and news sites and also follow the social media page of the college.

In the college, upon successfully utilizing this system there will be no need for students and staff members to walk around to read or search for newspapers since they will have quick access to the notice board electronically.

2.1.4 Security

The main concern in the development and operation of online systems is system security. It is of critical importance to properly specify and implement system security requirements (Husam et al., 2015). Safety and security are two key properties of online systems. Safety is aimed at protecting the systems from accidental failures in order to avoid hazards, while security is focused on protecting the systems from intentional attacks. They share identical goals - protecting the systems from failing. It is common knowledge that threats to information systems evolve with new and possibly sophisticated approaches, always breaching the security of information. Tariqul et al., (2016) addresses key security threats and vulnerabilities as related to information systems that need to be considered.

Figure 2.1: Login interface to authorise access of posting
2.1.4.1 Network Security

Issues related to security include those that are specific to computing methods, but also, issues that exist in traditional computing environment. Tariqul et al., 2016 presents a selected list of security issues associated with network communications and configurations.

XML Signature (Wrapping Attack)

XML signatures are widely used for the purpose of authentication and integrity of SOAP (Simple Object Access Protocol) messages. Protocols that use XML signatures suffer from a well-known attack called XML signature wrapping attack or simply wrapping attack. To ensure message integrity, a predefined part or parts of the SOAP message are signed using XML signature. The message normally contains a security header with a signature element, which references one or more parts of the message that was been signed. An XML signature wrapping attack essentially exploits the fact that the signature element does not convey any information about the referenced part of the message. An attacker can easily modify the message body and inject malicious code without invalidating the signature. Here, the attacker virtually wraps the XML signature around the malicious code and passes it on as if it were an authentic message.

Flooding Attacks

Whenever a company’s demand on computational demand increases, more instances of virtual machines are assigned instantaneously to cope up with the demand. This opens doors for malicious adversaries to exploit this feature. By instantiating a large number of virtual machines, an attacker can generate a huge amount to fake requests and forward them toward a certain server. In order to determine validity, the server must inspect each and every one of these requests and as a result, the entire network gets flooded with requests, and legitimate requests starve which leads to a distributed denial of service (DDoS) attack.

Malware Injection Attack

This type of attack involves injecting a malicious service implementation or installations of virtual machine instances into a system. In SaaS or PaaS environment, the attacker’s goal was to create his/her own service implementation containing malicious code or scripts and to deploy that service so that it looked like a legitimate service. The impact of this attack includes eavesdropping, subtle data modification, unauthorized access to resources, user credentials leakage, functionality changes, and service blocking. In the same way, in the IaaS environment, attackers would instantiate virtual machines and inject Malware into them. Legitimate users’ requests starve until the fake services are completed. This can lead to service deadlock if the number of requests is huge.
**Metadata Spoofing Attack**

When communicating with other Web services, a Web service client needs to retrieve all necessary information regarding a Web Service invocation, e.g. Web service address, message format, network location, security requirements, etc., which are stored in the Meta data documents provided by the Web services server. Two of the most common Metadata documents are Web Service Definition Language (WSDL) file and WSSecurity-Policy. It was possible for attackers to maliciously alter the content of the WSDL file and distribute them across all the Web service clients, which had serious consequences and security implications, say, an adversary may modify a WSDL file in such a way that a call to a deleteUser operation syntactically looked like a setAdminRights operation. When a user was provided with this altered WSDL file, each of his/her deleteUser operation invocations was be replaced by the set Admin Rights operation invocations, making a user to have administrator privileges.

**SQL injection Attack**

SQL injection attacks are the class of attacks in which malicious code was inserted into the data fields of a standard SQL query, enabling attackers to gain unauthorized access to databases. Under this attack, it was even possible to modify the roles/privileges of the users and execute administration operations that can lead to complete destruction of data form the database server.

**2.1.5 Access to online college notice board**

In the previous years, communication technology has rapidly developed. Very many e-notice boards have been developed. The dawn of e-notice boards is high and issues pertained to who and how one accessed the e-notice board is paramount.

E-notice board provides double authentication and authorization to who posts the information on the board. This guarantees security to the information being posted to prevent posting of junk material onto the notice board

**2.1.6 Contents of an electronic notice board.**

Many institutions use the manual notice boards for relaying information to the students and all staff. With the increasing technology, it’s imperative that colleges now resort to electronic notice boards. Electronic notice boards have a variety of contents available for the notice-board users.
1. Name of the college the board is assisting (i.e. College of computing and information technology) | College of computing and information Technology
---|---
2. Name of different Programs (also name of head of departments) | BIT, CSC, BSSE, BIS
---|---
3. Different office locations (Office information) | Level 4, Name of user Level 2 block A, user and information
---|---
4. Name and Information of different admins (Name and contact information) | Lecturer Name and telephone contact Registrar Name and telephone contact Class Representative Name
---|---
5. Students details (all students at the college the notice will be able to capture there information) | Student Name Registration number Student Number
---|---
| Lecture Room Details | Room number, floor, Event taking place.
---|---

**Table 2:** An example of a table containing contents of the notice board

Besides that, the notice board must be able;

1. To display linkage to external sources. Source like news centers i.e. BBC news, new vision news and also facebook, twitter pages of the college.
2. To enable Popping up of timetables to students when needed, as well as menus and Pop-ups for events that are soon coming-up like competitions, elections, Exams, Entertainment show will be viewed to users.
3. Always insisting on student registration number input and capturing before posting any information on the notice board.
4. To enable weekly backing up of information and data posted on the notice board into the database for archival purposes and future references.
5. To avail enough area/space for posting information as well as storage.
CHAPTER 3
METHODOLOGY
This is a detailed description of selected methodology i.e. step-by-step methods of how the objectives of the study/research can be achieved.

3.1 Introduction
This chapter presents the methodology that was used in carrying out the study. It presents the research designs, study area, population of the study, sampling methods and samples size, data collection methods and research instruments (tools), data analysis and presentation, data quality control measures, ethical consideration and limitations. This section further comprised of research/project design which describes the approaches, processes and techniques, major algorithms and data structures employed in the research study, data collection, analysis, synthesis, design, logical flow, implementation, testing and validation.

3.2 Research design
Research design is a plan of a proposed work frame. To design is to plan. Research design is the arrangement of conditions for collection and analysis of data with the least possible contamination/error by intervening variables and in a manner that is relevant with the research purpose (Pandey et al., 2015). The research design used was the qualitative research design.
Qualitative research includes designs, techniques and measures that do not produce discrete data. More often, data is in form of words, rather than numbers. Qualitative data is advantageous because it permits the researcher to go beyond the statistical results. Human behavior is also explained best when using qualitative research.

3.2 Study area
The study was conducted at the School of Computing and Informatics Technology, the students, specifically under the Department of Technology at Makerere University, Kampala. The research was mainly focusing on the need to develop an online e-notice board to ease information dissemination and access.

3.3 Data collection methods
Questionnaires and observations were used as various methods of data collection and these are discussed below:

3.3.1 Questionnaires
Questionnaires are pre-formulated written set of questions to which respondents record their answers.
Questionnaires were chosen due to their ability to solicit guided answers, and don’t require face to
face interactions that might create bias. Also, due to the busy schedules of respondents, they were the best tool for data collection. Questionnaires were administered to the respondents and the views gathered were in line with our research. The researchers used this method and it was in two categories that are structured or closed ended questions and un-structured or open ended question.

3.3.1.1 Structured or close ended questions
This method of closed ended questionnaire is justifiable because; closed-ended questions are easier to analyze since they were in an immediate useable form. They are easier to administer because each item is followed by alternative answers.

3.3.1.2 Structured or open-ended questions:
This refers to questions which give the respondents complete freedom of response. These free response questions permit an individual to respond in his or her words.

3.4 Data Collection and Analysis
The system developers collected qualitative and quantitative data using a number of techniques, including studying documentation, interviews, focus group discussions and questionnaires.

i. Document review results are detailed in chapter two, citing various references and analyzing the features for several existing systems.

ii. Focus groups discussions were held with students.

iii. Finally, the developers used a data collection questionnaire for the system requirements elicitation. The questionnaires had mainly closed-ended questions and a few open ended questions pertaining a number of issues regarding an e-notice board systems.

Of the questionnaires we distributed, 56% were 2nd year students and 44% were 3rd year students (see Figure 3.0). Of these, 78% were students offering bachelor of IT, 11% were students of Software engineering and 2 from Computer science and information sciences departments respectively (see Figure 3.1).
On investigating how often students visit the notice boards (Figure 3.2 and 3.3), 89% of the respondents agreed to visiting the notice boards with 61% visiting on a weekly basis; 11% on a daily basis and a few visiting twice a month. 11% of the respondents were not visiting notice boards, giving reasons like overcrowding and frustrations due to students unpinning notices for selfish reasons.
We also tried to find out if students had ever missed an announcement pinned on the board, we discovered that 28% had never missed an announcement while 67% had ever missed a notice, 5% attributing this to overcrowding; 33% to finding notices pinned off; 5% to being ignorant of when a new notice is put up; and 17% just not checking on the board as seen in figures 3.4, 3.5 and 3.6.

Figure 3.4: Missed notices

Figure 3.5: Reasons why missed notices
On the whether students believed the notices as genuine and therefore believe in what the notices convey, 50% found them genuine while 44% did not, 17% of these reasoning that most of the notices are non-academic in nature, 11% arguing that since the notice board is open to public, anyone posts anything whether relevant or not, personal or otherwise as seen in figures 3.7 and 3.8.

About ease of access to notices, only 44% were in agreement while 56% answered NO, and of these, 39% attributed it to mix-up of information on the notice board; 33% to congestion of information on the notice board.

Further, asking about how convenient the notice boards were to students, only 22% answered in affirmative while 67% were inconvenienced, 61% citing saying notice boards were scattered at
different floors and buildings; 11% citing reasons like having to travel long distances from hostels and halls of residence to access notice boards.

Almost all students (94%) who were interviewed agreed that it is necessary to have an online notice board, citing reasons like improved access and convenience (78%), control on who posts and un-post (5%); ease of searching for relevant information only (11%).

Investigating the students’ expectations and the functionalities on an online notice board, 94% were expecting notification alerts; 83% expecting an option to access past (missed) notices/archives; 61% expect an interactive nice board; 61% expect linkages to other sites.

3.5 System Design

3.5.1 System development method

The system development method used in project was Agile Software Development method. Agile Software Development methodology was used especially for software development that was characterized by the division of tasks into short phases of work and frequent reassessment and adaptation of plans. Each of the four members was tasked with developing a section or part of the entire system individually, and then at set intervals, we met and discussed process and integration. The Agile development method is for a project that needs extreme agility in requirements. The key features of agile methods are its short-term delivery cycles (sprints), agile requirements, dynamic team culture, less restrictive project control and emphasis on real-time communication.

Agile software development is a group of software development methods based on iterative and incremental development, in which requirements and solutions evolve through collaboration between self-organizing, cross-functional teams. It promotes adaptive planning, evolutionary development and delivery, a time-boxed iterative approach, and encourages rapid and flexible response to change. It is a conceptual framework that promoted foreseen tight iterations throughout the development cycle.
Customer collaboration requirements were not fully collected at the beginning of the software development cycle; therefore, continuous customer or stakeholder involvement is very important. Responding to change, agile development focused on quick responses to change and continuous development.

3.6 Design Approach

A design approach is a general philosophy that was or wasn't included to guide for specific methods. A combination of approaches may be used if they don’t conflict, for example, Function Oriented Design Approach focused on partitioning of a design into subsystems and modules, with each one handling one or more functions. The e-notice board project was going to use function oriented design approach. Every module and sub modules is made, based on its functionality. These modules are designed and implemented separately and then they are integrated together to form the desired e-notice board.

3.6.2 System Analysis and Design

An analytical study and scrutiny of the current system – the traditional soft board notice boards, was carried out to help inform the requirements for a new system. Data Flow Diagrams (DFDs) were used for illustrating the flow and control of data or information. Entity Relationship Diagrams (ERDs were used for enabling database design and modeling the relationships between entities and attributes of the system
3.6.3 Process Modelling
This was achieved by use of the Data Flow Diagrams (DFDs) to show system processes and external entities in the system. A DFD is a graphical representation of the data through an information system, modeling its process aspects (Kendall & Kendall, 2011). DFDs were used to identify the major external entities to the system, and the flow of information between the external entities and the system.

3.6.4 Data Modelling
This was achieved by using Entity Relationship (ER) modeling. ER modeling is a top-down approach to database design that begins by identifying the important data called entities and relationships between the data that must be represented in the model, followed by adding more details such as the information about the entities, attributes and any constraints on the entities.

3.7 System Implementation
This was the phase that involved the actual realization of the system. It is at this stage that various tools, languages and environments are used, say, MySQL and PHP languages used for database design and connectivity, XHTML/HTML and JavaScript, MySQL, HTML, CSS, PHP, JavaScript, Bootstrap, jQuery, D3.js and Ajax was used access enabling, Macromedia Dreamweaver and notepad++ as text editors. These technologies are further defined as below, as adapted from Wikipedia, the online free encyclopedia:

i. MySQL is an open source relational database management system (RDBMS) that we used in developing of e-notice board system database. It is Structured Query Language (SQL), the most popular language for adding, accessing, and processing data in a database.

ii. Hypertext Markup Language (HTML) is a predominant markup language we used for designing web pages, forms as well as enabling our system in creation of web pages.

iii. Cascading Style Sheets (CSS) style sheet language we used for describing the presentation of a document written in a markup language. It is used for styling, making the system to look nice and pleasant to the user.

iv. PHP Server-side scripting language was used to enable the server side of system to connect to the client side of the system.

v. Bootstrap, was used for designing an interface for the user, unlike the PHP server-side code which resides on the "back end" server. Bootstrap included HTML and CSS based designs templates for typography, forms, buttons, tables, nav-models, optional JavaScript plug-ins
and many others. Bootstrap enabled us to create responsive designs for both mobile and desktop screen sizes.

vi. **JavaScript.** Was used to do some data processing at the client side and ensuring that the client enters the required data and information into the system.

vii. **jQuery.** Was used to simplify the client-side scripting of HTML as well as enabling navigation throughout the document, create animations, handle events, and develop Ajax applications.

viii. **D3.js** Was used to produce dynamic, interactive data visualizations in web browsers.

### 3.8 System Testing and Validation

The system was tested for usability, effectiveness and security in order to identify or find system flaws and errors. Questionnaires were designed and distributed to target users for user testing.
CHAPTER 4
SYSTEM STUDY, ANALYSIS AND DESIGN

4.1 Introduction
This chapter starts by highlighting the key findings during system study of other existing systems before giving the analysis of the system requirements. The system design (section 4.4) describes how the system was logically and physically setup.

4.2 System Study
The data gathered using the selected data collection techniques enabled the system developers to get information which was studied to realize the weaknesses of the existing systems and how the new system would be designed in a better way.

4.2.1 Weaknesses of the Existing Systems
With traditional notice boards, communication missed a lot of guiding features that enable users to access information and also post information.

Some of the main weaknesses are outlined below;

i. The traditional notice boards didn’t have linkages to social Media like Facebook, twitter, Instagram, etc.
ii. The existing traditional notice board systems were open to public, anyone would post uncensored information, no control on content and sometimes not relevant to some users.
iii. The existing notice board systems also lacked resource assurance measures such as, ratings, approvals, agency and recommendations.
iv. Unless one checks the notice board, h/she would be ignorant of any new post, making users to miss out on some vital communications.

4.2.2 The Proposed System
The proposed E-notice board has been specially designed to address all the weaknesses of existing traditional notice board outlined above.

Additionally, the E-notice board system has many powerful features listed below:

i. E-Notice Board has a robust notification system for alerting the users online when certain events occur such as when new notices are posted
ii. User profiles on E-Notice Board are designed to provide basic information and contact details provided by the user on registration, for correspondence purposes.
iii. The system has an Ajax-Powered search engine on the index page, also integrated on the
side panes for all the other pages on the system. The search engine uses a sophisticated SQL algorithm to search for the given keywords in all fields of several underlying tables and return results wherever there is a match in a Google Search-like format.

iv. The system automatically registers the time for several actions such as posting notice, event, uploading files and downloading of information from the notice.

v. The E-notice board system has a strict validation, powered by JavaScript libraries, which filters user input and notifies the user when invalid data is supplied, ensuring that only appropriate data is submitted to the system for a given field type. For example, letters are rejected for fields where only numbers are expected, and some unsupported file sizes and file formats such as executable (.exe) files are rejected by the system. Suitable notifications are sent to the user.

4.3 System Analysis

This section contains specific user, functional and non-functional requirements of the system.

4.3.1 User Requirements

There are three categories of users:

i. **System Administrators**: These manage the system and have higher system privileges than other users. They can post, edit and delete notices and the system functionalities.

ii. **Students**: These can login, upload, post and view on the e-notice board system.

iii. **Lecturers**: These can login, upload, view and download information from the e-notice board system.

4.3.2 Functional Requirements

Functional requirements describe what the system should do, basing on actors’ possible actions.

The functional requirements of the system include;

i. The system enables all users to search and find resources based on the supplied keywords.

ii. The system authenticates users during login, using student registration numbers and passwords for administrators.

iii. It allows the administrator to upload content like timetables, room numbers for lectures and any other vital communications for students.

iv. The system provides links to other external educational websites/resources.

v. The system has administrator tools for moderating content and user activity by deleting inappropriate content and comments.

vi. The system enables the users to categorize the digital resource contents being uploaded.
vii. The system allows all users to upload new events and notices and to download timetables.
viii. The system automatically archives notices older than two weeks and events passed their date of happening.

### 4.3.3 Non Functional Requirements

The non-functional requirements of the system are tabulated in Table 4.1.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Accessibility:**| *Browser Independent.*  
*Viewable on any screen resolution.*  
*No required browser add-on.*  
All scripting at client-side are in JavaScript to ensure cross-browser capability. Use of the Bootstrap Framework features to achieve responsive designs and browser independence. |
| **Content:**     | *Easy to read.*  
Fields are kept short to ensure appropriate “bite-sized” chunks of information.  
All words are left unchanged as the user enters them in the text fields. |
| **Design:**      | *Simple, clean presentation.*  
*Responsive WebPages.*  
*Sans serif font.*  
*Judicial use of color.*  
*Consistent look and feel.*  
*Relative width tables and Images.*  
*Minimal animation.*  
Percent-based tables and widths throughout the site.  
Some resources are provided as downloadable resource files.  
Since the CSS is external to the content, the design elements can be controlled separately from the HTML code. |
| **Navigation:**  | *Simple menu bars used consistently on every page.*  
Dynamic Section-based menu  
Menu is automatically hidden on mobile (small screen) devices by default. |
| **Speed:**       | *Simple, quick loading pages with minimal and Optimized graphics.*  
Popular page loads are cached at browser side.  
Small discreet image navigation icons (glyph icons) all images are optimized GIF and JPEG files. |

Table 4.1: Non Functional Requirements
4.4 System Design
This section defines the physical architectural design and the logical design (showing processes, sub processes and data flows to/from external entities) and database design of the system required to satisfy the specified requirements.

4.4.1 Architectural Design of the System
The E-Notice Board system architecture mainly consists of an Apache web-server, a MySQL database, and a file server. The Internet is used to interconnect the servers and the user computers. The users could be mobile users with small devices such as mobile phones, desktop users or any other users so long as they possess a device with a web browser and a connection to the internet.

When a user sends a request such as a resource download request, the web server queries the MySQL Database to get resource details, locates the requested resource from the File server and returns an appropriate response to be downloaded from the client web browser as shown

![Figure 4.1: Architectural design for the E-notice board system](image)

4.4.2 System map
The system has a home page which is the first view a user receives upon visiting the system. A user may go ahead and simply view the posts, events on the system or can decide to login if s/he is student, lecturer or admin to add or post an event onto the system. The system has an index page, login page, search results page, and many others as shown below.
4.4.3 Process Modelling

In process modelling, a context diagram and a data flow diagram were used to illustrate the activities and the major data flows. A data dictionary was also created to define the processes identified during process modelling. The symbols used during process modelling are illustrated in Figure 4.2.

4.4.3.1 Context Diagram of the E-Notice Board System

A context diagram represents the actors outside the system that interact with that system. It is a simple data-flow diagram that shows an overview of the system, boundaries of the system, external entities interacting with the system and the major information flows between external entities and the system.

![Diagram of the system](image)

Figure 4.2: Map of the system

Figure 4.3: The symbols used in data flow diagram, and their meaning
Figure 4.4: Shows the context diagram for the E-notice board system

4.4.3.2 Level 1 DFD for the E-Notice Board system

Level 1 DFD is more detailed than the context diagram. The entities, inputs and outputs specified in the first diagram remain constant but the diagram is exploded into close-ups showing data stores and new lower-level data flows.
Figure 4.5: Shows the level 1 DFD for the E-notice board system
4.4.3.3 Data Dictionary for the DFD

The Data Dictionary contains descriptions for the processes, data stores, and the external entities identified during process modelling, as summarized in Tables 4.2, 4.3 and 4.5.

<table>
<thead>
<tr>
<th>Entity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>A student is one of the users who can login to the system and interacts with it. A student can perform the following tasks:</td>
</tr>
<tr>
<td></td>
<td>- Post notices and Events</td>
</tr>
<tr>
<td></td>
<td>- View resources and reviews.</td>
</tr>
<tr>
<td></td>
<td>- Search.</td>
</tr>
<tr>
<td></td>
<td>- Download resources.</td>
</tr>
<tr>
<td></td>
<td>- Visit external URLs provided by the system</td>
</tr>
<tr>
<td>Lecturer</td>
<td>A Lecturer is an account holder on the system who can login to do task. The Lecturer user can:</td>
</tr>
<tr>
<td></td>
<td>- Search and view digital content.</td>
</tr>
<tr>
<td></td>
<td>- Login with user name and password.</td>
</tr>
<tr>
<td></td>
<td>- Upload new resources to the system.</td>
</tr>
<tr>
<td></td>
<td>- Post comments.</td>
</tr>
<tr>
<td></td>
<td>- Download any digital content after login.</td>
</tr>
<tr>
<td></td>
<td>- Logout.</td>
</tr>
<tr>
<td>System Administrator</td>
<td>A system administrator manages the system and has higher system privileges than other users. A system administrator performs the following tasks:</td>
</tr>
<tr>
<td></td>
<td>- Moderates content and user activity:-</td>
</tr>
<tr>
<td></td>
<td>- Blocks / removes users violating system policy.</td>
</tr>
<tr>
<td></td>
<td>- Deletes inappropriate content or uploads.</td>
</tr>
<tr>
<td></td>
<td>- Edits / deletes resources or their details.</td>
</tr>
<tr>
<td></td>
<td>- Uploads and updates system web pages.</td>
</tr>
<tr>
<td></td>
<td>- Manages Security and Backups.</td>
</tr>
</tbody>
</table>

*Table 4.2: Shows description of entities*
### Processes

<table>
<thead>
<tr>
<th>Processes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create User Data</td>
<td>Saves data submitted by other systems or users upon registration and saves it into the database.</td>
</tr>
<tr>
<td>Search Resources(Notices, Events, Timetables)</td>
<td>Takes in keywords given by a user and retrieves a corresponding listing of records from the database in form of search results.</td>
</tr>
<tr>
<td>Authenticate Users</td>
<td>Allows authorized users of the system to login and also prevents unauthorized users from using the system.</td>
</tr>
<tr>
<td>Upload Resources(Notices, Events, Timetables)</td>
<td>Transfers files to the file server, renaming them appropriately and saving information about the files in the resource table.</td>
</tr>
</tbody>
</table>

*Table 4.3: Shows process description*

<table>
<thead>
<tr>
<th>Data Store</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1: Users</td>
<td>Contains records containing user information.</td>
</tr>
<tr>
<td>D2: Resources(Notices, Events, Timetables)</td>
<td>Contains details about uploaded resources.(Notices, Events, Timetables entities)</td>
</tr>
</tbody>
</table>

*Table 4.4: Shows data store description*

### 4.4.4 Data Modelling

This was done by classifying the data requirements and identification of entities and their associated attributes. The data to be supplied by the external entities includes files / documents to be uploaded as educational resources, User data during registration and text posted during comments / notices. Section 4.4.3.2 shows a detailed ERD showing the logical database schema.

#### 4.4.4.1 Modelling Relationships between Entities.

The illustrations below describe the various relationships between the entities together with their respective cardinalities.

#### 4.4.4.2 Relationship between User and Event

An Event is uploaded by one user and a user uploads zero or many resources. It is a one-to-many relationship between user and resource as illustrated.
### 4.4.4.3 Relationship between User and Notice

A notice is posted by one user and a user posts zero or many notices. It is a one-to-many relationship between user and notice as illustrated.

### 4.4.4.4 Relationship between Program and Timetable

A program has zero or more timetables. It is a zero-to-many relationship between administrator and timetable as shown in figure below.

### 4.4.4.5 Relationship between Department and Program

A program belongs to one department and a department has zero or more programs. It is a one-to-many relationship between department and program as shown in figure below.

### 4.4.4.6 Relationship between Department and Lecturer

A lecturer belongs to only one department and a department has zero or more lecturers. It is a zero-to-many relationship between lecturer and department as shown in figure below.

### 4.4.4.7 Relationship between Program and Courses

A program has one or more courses. It is a one-to-many relationship between program and courses as shown in figure below.
4.4.4.8 Relationship between Program and Students
A program has zero or more students. It is a zero-to-many relationship between programs and students as shown in figure below.

4.4.4.9 Relationship between Room and Lecturer
A room is occupied zero to many lecturers at time and lecture can be in one and only one room at a time. It is a zero-to-many relationship between room and lecturer as shown in figure below.

4.4.5 The Enhanced Entity Relationship Diagram of the System
An ERD was used to show all the relationships between the entities involved in the system together with their attributes and to indicate the number of occurrences an entity can exist for a single occurrence of the related entity.
Figure 4.6: Shows the enhanced ERD of the system

4.4.6 Database Design

This section contains the various tables with their attributes, data types and constrains.

Table 4.5: Details of Attributes in the Admin Table

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>pk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notice_title</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post_date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posted_by</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programme_id</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hash_pass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>plain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the rest of the tables, similar information is provided in a similar format.
<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>admin_id</td>
<td>INT(11)</td>
<td>PRIMARY_KEY NOT NULL</td>
</tr>
<tr>
<td>full_name</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Email</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Contact</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>hash_pass</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Pass</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
</tbody>
</table>

**Table 4.5: Details of Attributes in the Courses Table**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Date Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course_id</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Course_code</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Course_name</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Programme_id</td>
<td>INT(11)</td>
<td>NULL</td>
</tr>
</tbody>
</table>

**Table 4.6: Details of Attributes in the events upshots table**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Date Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event_id</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Event_title</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Event_subtitle</td>
<td>TEXT</td>
<td>NULL</td>
</tr>
<tr>
<td>Description</td>
<td>TEXT</td>
<td>NULL</td>
</tr>
<tr>
<td>Event_date</td>
<td>TIMESTAMP</td>
<td>NULL</td>
</tr>
<tr>
<td>File_name</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Posted_by</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
</tbody>
</table>

**Table 4.7: Details of Attributes in the time_table Table**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Date Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time_table_id</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Year</td>
<td>INT(11)</td>
<td>NULL</td>
</tr>
<tr>
<td>Semester</td>
<td>INT(11)</td>
<td>NULL</td>
</tr>
<tr>
<td>File_name</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Field name</td>
<td>Date Type</td>
<td>Constraint</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Department_id</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Department_name</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Department_head</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
</tbody>
</table>

**Table 4.9: Details of Attributes in the student Table**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Date Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student_id</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Registration_no</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Student_name</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Student_no</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>programme</td>
<td>INT(11)</td>
<td>NULL</td>
</tr>
</tbody>
</table>

**Table 4.10: Details of Attributes in the Programmes Table**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Date Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme_id</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Programme_name</td>
<td>TEXT</td>
<td>NULL</td>
</tr>
<tr>
<td>Programme_code</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Department_id</td>
<td>INT(11)</td>
<td>NULL</td>
</tr>
</tbody>
</table>

**Table 4.11: Details of Attributes in the Lecturer Table**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Date Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture_id</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Lecturer_email</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Lecturer_contact</td>
<td>VARCHAR(13)</td>
<td>NULL</td>
</tr>
<tr>
<td>First_name</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Last_name</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Lecturer_office</td>
<td>INT(11)</td>
<td>NULL</td>
</tr>
</tbody>
</table>
**Table 4.12: Details of Attributes in the Room Table**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Data Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room_id</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Room_n0</td>
<td>VARCHAR(45)</td>
<td>NULL</td>
</tr>
<tr>
<td>Room_level</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Block_no</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
</tbody>
</table>

**Table 4.13: Details of Attributes in the Notices Table**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Data Type</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice_ID</td>
<td>INT(11)</td>
<td>PRIMARY KEY</td>
</tr>
<tr>
<td>Notice_title</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Post_date</td>
<td>TIMESTAMP</td>
<td>NULL</td>
</tr>
<tr>
<td>Description</td>
<td>TEXT</td>
<td>NULL</td>
</tr>
<tr>
<td>Posted_by</td>
<td>VARCHAR(255)</td>
<td>NULL</td>
</tr>
<tr>
<td>Programme_id</td>
<td>INT(11)</td>
<td>NULL</td>
</tr>
<tr>
<td>Level</td>
<td>VARCHAR(15)</td>
<td>NULL</td>
</tr>
<tr>
<td>category</td>
<td>VARCHAR(45)</td>
<td>NULL</td>
</tr>
</tbody>
</table>
CHAPTER 5
PRESENTATION OF RESULTS

5.1 Introduction
This chapter presents a summarized report about the system implementation, system testing and validation activities, according to the project methodology in chapter 3.

5.3 System Implementation Results
This section describes the general design and user interface of the system. Screenshots of different sections of the system are presented to show how the system was implemented.

5.3.2 Sample System screen shots
This section shows screen shots of the key features of the system and descriptions of their functionalities.

5.3.2.1 Index Page
Figure 5.9 shows the Home page/ landing view which a user sees first when he/she visits the system. The user is able to view the notices and events posted on the notice board, can post a notice or an event, download time if he/she is a registered user.

Figure 5.9: Home page of the system

5.3.2.2 Adding notice interface
Figure 5.10 shows the user view interface where the users of the system can post notices onto the notice board. It has a simple form where the user fills the relevant information about the notice he/she wants to post onto the notice board.

User can also level the notice agency to the viewer.
Figure 5.10: Screenshot interface for adding notices

5.3.2.3 Administrator side interface for attaching Time tables

Figure 5.11 shows the view interface where the time tables are uploaded from by the administrator. This also has fill in form which assists the admin in attaching the timetable. This enables the admin to categorize the timetable according to the programme, semester and academic year where it should be intended.

Figure 5.11: Screenshot interface for adding timetables at the admin side

5.3.2.4 Administrator side interface for adding/editing Course Unit

Figure 5.12 Show the admins interface for adding and editing course units that are to be added to the notice board system. This has a simple form that enables the admin to add course unit and he/she can edit the course units from the same interface.
5.3.2.5 Administrator side interface for adding/editing Course Unit

Figure 5.12: Screenshot interface where courses are added into the system

5.3.2.5 Administrator side interface for adding/editing Programme and Department

Figure 5.13: Screenshot interface for adding event

Figure 5.14: Show the view interface for adding and editing programme and department. This interface has independent forms to fill the relevant information or data about the programme and department.
5.3.2.6 Administrator side interface for giving administrative rights

Figure 5.15 shows the view interface where the different user can be given administrative rights. User like lecturers, student's leaders and class representative can be offered some administrative rights to the notice since they have higher influence in the information provision around the college.

5.3.2.7 Administrator side interface for adding lecturers

Figure 5.16 shows the interface for adding and editing the different lecturers that lecture at the college. This has the form for add the different information of the lecturers.
Figure 5.16: Screenshot interface where lecturers are added into the system

5.3.2.8 Administrator side interface for adding Rooms and levels
Figure 5.17 shows the view interface that the admin uses to add and edit the rooms and levels. This contains a fill in form for adding the room information and the level on which the room is located and also allows the admin to delete and remove the room information for the system.

Figure 5.17: interface screenshot for adding a room

5.3.2.9 Administrator side interface for adding Rooms and levels
Figure 5.18 Show the view interface for lecturers in the system on client side. Here the user is able to view the level information like contacts in case he/she wants to contact the lecture or to view the department in which the client belongs.

5.4 System Testing Results

This was done through web deployment and execution of the system, with an intention of discovering its weaknesses and strengths, thereby concluding about its compliance with its intended specifications and functionality.

The following testing strategies were deployed:

5.4.1 User testing

A group of target users where selected to examine the systems functionality and make any feasible recommendations. User included lectures, students, administrator to stamp the compliance of the system.

<table>
<thead>
<tr>
<th>Users</th>
<th>Performance</th>
<th>Security</th>
<th>Interface</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>Good</td>
<td>Better</td>
<td>Better</td>
<td>Very Good</td>
</tr>
<tr>
<td>Administrators</td>
<td>Better</td>
<td>Good</td>
<td>Very Good</td>
<td>Good</td>
</tr>
<tr>
<td>Lecturers</td>
<td>Very Good</td>
<td>Good</td>
<td>Better</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

Table 5.1: Table showing user results

5.4.2 Module / Unit testing
System testing was done after the system was duly coded. Individual modules of the system were checked to ensure they are fully functional units before the integrating them. This was done by examining each unit; each script was checked to ensure that it functions as required and that it performed exactly as intended.

5.4.3 Integration Testing
The success of each individual unit gave us the go ahead to carry out integration testing. Different system modules were put together to make a complete system and integration testing ensured modules were compatible to be integrated to form a complete working system.

5.4 System Validation Results
The system was validated to see whether the system is capturing valid data, this was done by putting wrong data and then the system responded by alert messages displaying the type of error. Testing and validation was done successfully. The figure below shows notifications displayed by the system when invalid file types and file sizes are rejected by the system.

![Figure 5.19: Error message for invalid credentials](image1)

![Figure 5.20: Error for incorrect event information](image2)
CHAPTER 6
SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction
This chapter presents a conclusion to the project report, highlighting the summary of the results, recommendations from the project and the way forward.

6.2 Summary
Our project was to develop an e-Notice Board to solve the problems that the college and students face regarding getting information after all weaknesses of the traditional notice boards were examined and it was realized that many core functionalities were not offered by existing systems. We designed and used questionnaires to collect the requirements. We further analyzed them to inform our design. We designed our project using well documented methods and tools. We also implemented and further tested and validated our system using questionnaires. This system is a web based system that enables various people to access and uses the system from wherever they are and share information via the internet. This system was welcomed by many users who confirmed that it would solve most of the problems and improve conditions regarding information circulation around college of Computing and Information Technology and Makerere University in general.

6.3 Recommendations
This system is highly recommended to the College of Computing and Information Sciences because it can help in dissemination of information at the college as well as improving information sharing at the College. The Information office at the college, together with the college heads and Makerere University at large, should help in adopting and promoting the system so that it can be extended to the whole university.

6.4 Future work
The project does not end here. This project will surely continue. Communication, just like any other computerized major system is, will continue to improve and change according to the needs of the users. Some of the areas that need to be worked on in the near future include the following:

- A mobile app for e-notice board needs to be developed to increase user outreach to information. Through the app, users could receive information on the smart mobile phones and any other mobile device and get notified whenever they are by the system.
- A messaging functionality needs to be incorporated into the system to enable the user receive information on the system, as well as using GSM functionality to send text messages of information to users without smart phones.
- Integrating the E-Notice with the results system to enable users view there results and integrating the system with the digital library material to enable the user access the library on the E-Notice Board.

There are very many great ideas that were suggested by users through the questionnaires. This project considered the basic ones first that could be implemented within the project time constraints. All these ideas in the way forward and a lot more are to be undertaken in future projects for improving the operation of the E-Notice board system.

6.5 Conclusion

In line with our specific objectives, questionnaires were used to solicit for system requirements, they were analyzed, integrated into a system design for implementation. The system was tested and validated through questionnaires and practical trials for validation.

E-Notice Board System provides powerful tools that can help in improving communication around different individuals isolated like students, lecturers, administrators. It is designed to improve information circulation among registered users, overcoming many of the challenges encountered at the traditional cardboard notice board. By promoting the culture of sharing and receiving information, the vision of this project will be realized.
REFERENCES


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Parker, R. C. (2001). Effective e-mail, part 1. Guerilla Marketing and Design, 3(2)


Satoshi, O., Yamaguchi, K., Tetsuaki, N., Hiroki, U., Ph.D. 2016


APPENDICES.

Appendix A: GUI view of the Database
These are the graphical view of the database and console access to the database of the system section 4.4.4

Appendix B: View of the database tables
This gives the GUI view of the database tables which are described in the section 4.4.4

Appendix C: System look and the interfaces
Some of the system view and interfaces that the online system is composed of. Show the interface of students at the client side section
Appendix D: Data Analysis Results for Other Questionnaire Questions

In this appendix, we present visual charts that were generated after analyzing the rest of the questions in the questionnaire. These results facilitated the system developers to make certain decisions during the system development.

![Pie chart showing analysis results]

Appendix E: MYSQL database view of the tables

Show the console view of the database tables of the E-notice board system section 4.4.4

```
<table>
<thead>
<tr>
<th>Tables in noticeboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>admin</td>
</tr>
<tr>
<td>courses</td>
</tr>
<tr>
<td>departments</td>
</tr>
<tr>
<td>lecturers</td>
</tr>
<tr>
<td>notices</td>
</tr>
<tr>
<td>programmes</td>
</tr>
<tr>
<td>rooms</td>
</tr>
<tr>
<td>students</td>
</tr>
<tr>
<td>time_tables</td>
</tr>
</tbody>
</table>
```

Appendix F: Interface view of the system

![Image of the interface view of the system]
Appendix G: GUI view of the database
Appendix H: Questionnaires for student
DATA COLLECTION TOOL ABOUT AN ONLINE NOTICE BOARD
(Students)

We are students of Makerere University Kampala, offering a bachelor’s degree in Information Technology. We are in the process of designing an online e-notice board and therefore we are conducting a survey to solicit and consolidate the content of our project. All this is in partial fulfilment of the requirements for the award of a Bachelor’s degree in Information Technology.

Your participation in this survey and every aspect of this study is completely voluntary. You may skip any question that you prefer not to answer, but we would appreciate your cooperation. You may also ask us to clarify any questions if you don’t understand them or decide to stop the interview any time.

This survey is proudly sponsored and censured by Makerere University under the School of Computing and Informatics Technology. We appreciate your help. To ensure confidentiality, do not write your name on the questionnaire paper.

Thank you for your time

**Demographics**

1. Please select your of study (if you are a student)
   - [ ] 1st Year
   - [ ] 2nd Year
   - [ ] 3rd Year
   - [ ] 4th Year
   - [ ] Masters
   - [ ] PHD
   - [ ] Others, please specify: …………………………………………………

2. Tick your respective College or Department
   - [ ] Administration
   - [ ] IT
   - [ ] IS
   - [ ] SE
   - [ ] CS
   - [ ] LIS
   - [ ] Other; please specify: …………………………………………………

3. (a) Do you often visit the notice board to read information posted?
   - [ ]
   - [ ]
Yes  No

(b) If yes, how often do you visit the noticeboard?

☐ Daily
☐ Weekly
☐ Twice a month
☐ Once a month
☐ Others, please explain ………………………………………………………………………

(c) If no, what may discourage you from visiting the notice board often?

4. (a) Have you ever missed an announcement pinned on the notice board?

☐ Yes  ☐ No

(b) If yes, why?

5. (a) Do you believe that all the information posted on the notice board is genuine?

☐ Yes  ☐ No

(b) If no, what is your reason?

6. (a) Do you always find it easy to access information relevant to you from the notice board?

☐ Yes  ☐ No

(b) If no, which of the following factors may be the reason(s)? (Tick all that apply)

☐ Congestion of the information on the notice board.
☐ Mix up of information on the notice board.
☐ Other(s). Please specify……………………………………………………………………

7. (a) Is the notice board convenient for you to access?

Yes☐  No☐

(b) If no, which of the following factors may be the reason(s)? (Tick all that apply)

☐ Scattered notice boards with different information
☐ Inaccessible notice board due to location
☐ Travel long distances to access information
☐
8. Do you think it would be necessary for the notice board to be online?
   
   Yes  No

Give reason for your answer above

9. If the notice board were to be online, what functions would you like the notice board to perform? (tick all that apply)
   
   Interactive
   Sending reminders
   Notification alerts
   Linkages to other relevant sites
   Ability to access past information (archives)
   Others, please explain.
Appendix I: Questionnaires for admin

DATA COLLECTION TOOL ABOUT AN ONLINE NOTICE BOARD
(Administrators)

We are students of Makerere University Kampala, offering a bachelor’s degree in Information Technology. We are in the process of designing an online e-notice board and therefore we are conducting a survey to solicit and consolidate the content of our project. All this is in partial fulfilment of the requirements for the award of a Bachelor’s degree in Information Technology.

Your participation in this survey and every aspect of this study is completely voluntary. You may skip any question that you prefer not to answer, but we would appreciate your cooperation. You may also ask us to clarify any questions if you don’t understand them or decide to stop the interview any time.

This survey is proudly sponsored and censured by Makerere University under the School of Computing and Informatics Technology. We appreciate your help. To ensure confidentiality, do not write your name on the questionnaire paper.

Thank you for your time

**Demographics**

1. Tick your respective Department
   - ☐ Administration / Registrar
   - ☐ IT
   - ☐ IS
   - ☐ SE
   - ☐ CS
   - ☐ LIS
   - ☐ Other; please specify: .................................................................

2. (a) Do you often visit the notice board to post information?
   - ☐ Yes
   - ☐ No

   (b) If yes, how often do you visit the noticeboard?
   - ☐ Daily
   - ☐ Weekly
   - ☐ Twice a month
   - ☐ Twice a month
Once a month
☐ Others, please explain .................................................................

(c) If no, what may discourage you from visiting the notice board often?

...........................................................................................................

3. (a) Do you believe that all the information posted on the notice board is genuine?

 ☐ Yes  ☐ No

(b) If no, what is your reason?

...........................................................................................................

4. (a) Do you always find it easy to post information on the notice board?

Yes ☐ No

(b) Give reason for your answer above

...........................................................................................................

5. Do you think it would be necessary for the notice board to be online?

☐ Yes  ☐ No

Give reason for your answer above

...........................................................................................................

6. If the notice board were to be online, what functions would you like the notice board to perform? (tick all that apply)

☐ Interactive
☐ Sending reminders
☐ Notification alerts
☐ Linkages to other relevant sites
☐ Ability to access past information (archives)

☐ Others, please explain. .................................................................
Appendix J: Data Analysis Results for Other Questionnaire Questions

**Missed Announcements**

- Crowding
- Pinned off
- Ignorance of notice
- Did not check onNB

**Reasons for genuine**

- Reasons for No
- Personal interests
- Duplication
- Non academic
- Open to public