ESTONIAN ENTREPRENEUR UNIVERSITY OF APPLIED SCIENCES

Software Development and Entrepreneurship

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DEVELOPMENT OF A WEB-BASED INTERNSHIP MONITORING AND REPORTING SYSTEM FOR ESTONIAN ENTREPRENEURSHIP UNIVERSITY OF APPLIED SCIENCES STUDENTS

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ABSTRACT

The current internship system for Estonian Entrepreneurship university of applied sciences students, has the capability to allow students to submit an internship offer. After which the offer is approved, and students can go for internship. Then, after the internship period, the students can finally submit their internship report. This system has no provision for reporting and monitoring/mentoring of internship activities during the internship period. This paper suggests an improvement in the current internship system, by proposing the development of an eLogbook which serves as a reporting tool for the student and a monitoring/mentoring tool for the university supervisor. A qualitative research strategy was used, where primary data was collected in the form of direct observation of the current system, and secondary data was collected through study of past relevant literatures to create a practical solution. The development adopted the software development life cycle model. ReactJs and firebase were used as development tools. ReactJs was used because of its strong ability to build interactive user interfaces and Firebase was used because of its capacity to take care of the whole backend requirements (authentication server and storage database). Unified modelling language (UML) was used as a graphical language to illustrate system behavior diagrams and the system was finally tested using different test data based on requirements. A minimum viable product was achieved by the end of the development so that proposed users can check and prove that this proposed solution met its requirement.

RESÜMEE

Praegune praktikasüsteem Eesti Ettevõtluskõrgkool Mainor tudengitele võimaldab üliõpilastel esitada praktika pakkumine. Pärast seda, kui pakkumine on kinnitatud ja üliõpilane on praktikal ära käinud, saab ta esitada praktika aruande. Süsteemis ei ole ette nähtud praktika perioodi jooksul praktika tegevuste aruandlust ning jälgimist ja juhendamist. Käesolevas dokumendis soovitatakse praegust praktikasüsteemi täiustada, tehes ettepaneku eLogbook'i väljatöötamiseks, mis oleks üliõpilastele aruandlusvahendiks ning ülikooli juhendaja jaoks järelvave- ja juhendamisvahendiks. Töös kasutati kvalitatiivset uurimisstrateegiat, kus esmased andmed koguti praeguse süsteemi otsesel vaatlusel ning praktiliste lahenduste loomiseks koguti sekundaarseid andmeid, milleks uuriti varasemat asjakohast kirjandust. Arenduses kasutati tarkvaraarenduse elutsükli mudelit. Arendusvahenditena kasutati Reactis'i and firebase'i. Reactis'i kasutati tänu tugevale võimele luua interaktiivseid kasutajaliideseid ja Firebase'i kasutati, kuna see on võimeline hoolitsema kogu taustaprogrammi nõuete eest (autentimisserver ja salvestusandmebaas). Graafilise keelena kasutati UML-i (Unified modelling language), et illustreerida süsteemide käitumisdiagramme. Lõpuks testiti süsteemi kasutades erinevaid nõuetele vastavaid testandmeid. Arenduse lõpuks saavutati minimaalne elujõuline toode, nii et välja pakutud kasutajad saaksid kontrollida ja tõestada, et pakutud lahendus vastab nõuetele.

List of Figures and Tables

Figures

Figure 1 A bit about what happens inside react	23
Figure 2 Use case diagram	27
Figure 3 Data flow in the current internship system	28
Figure 4 Data flow of the internship system now having the proposed eLogbook	30
Figure 5 Data flow for students in the new internship system	31
Figure 6 Data flow for University supervisor in the new internship system	32
Figure 7 Student dashboard	33
Figure 8 Student editor page	33
Figure 9 Students list view	34
Figure 10 Note comment view	34

Tables

Table 1 Student login page test	35
Table 2 Supervisor's login page test	36
Table 3 Student dashboard	36
Table 4 Editor Page	36
Table 5 Supervisor dashboard	37

TABLE OF CONTENTS

IN	ITROD	UCTION	7
1	Prob	lem statement	
	1.1	Objectives of Study	8
	1.2	Organization of the paper	
2	LITI	ERATURE REVIEW	
	2.1 2.1.1 2.1.2 2.1.3	Internship; History, Definition and Types Brief History of Internship Definition of Internship Types of Internship	10 10 10 12
	2.1.4	Challenges of internships	14
	2.2	Web Based Application and system.	14 14
	23	Web servers	
	2.3.1	Description	
	2.3.2	Definition Some Of The Known Webservers	16 16
	2 .5.5	Single nage applications (SPA)	17
	2.4.1	Definition	
	2.4.2	Advantages of SPAs	
	2.5	What's an eLogbook?	18
	2.5.1	Related all ophook systems	10 19
3	Z.0 MF1		21
5	2 1	Desearch stratomy	
	2.2	Data collection technique	
	3.2.1	Development tools used	
	3.3	Proposed development method	24
	3.3.1	Proposed development limitation	24
4	SYS	TEM DEVELOPMENT AND RESULT	
	4.1	Planning	
	4.1.1 4.1.2	Non - functional requirement	26 26
	4.2 4.2.1 4.2.2	System Analysis System architecture Matching development tools and requirements	26 27 29
	4.3	System Design	29
	4.3.1	Components of the eLogbook	
5	SYS	TEM IMPLEMENTATION AND TESTING	
	5.1	Testing all core modules and roles	35
6	CON	NCLUSION	
	6.1 6.1.1 6.1.2	Proposed improvements For the internship system as a whole For the eLogbook	38 38

INTRODUCTION

The internship program is designed to provide students engaged in a field experience, with an opportunity to share their insights to explore the links between students' academic preparation and their field work, and to assist participants in developing and carrying out the major research project which will serve to culminate their internship experience (Frostburg State University, 2020). Internships are the way to explore or expend the related knowledge and skills required in a real-world situation and experience, to enter into a particular career field (Aliza Sarlan, November, 2007). Before now, manual processes need to be done for this system, which means the student or internship candidate need to fill a paper form, and also need to submit it by hand to the internship office (Jason A Miller, April 2011). During the training, candidates need to keep update in a logbook about the daily routine of the training by writing and pasting any attachment in the logbook. Finally, progress of the training in the logbook will be examined by internship instructor every week, and also by the university supervisor at the time of visiting the trainee.

A web-based internship system is a management system that handles the process of the internship monitoring, mentoring and reporting connected to the university's intranet system. A web-based internship system can also be a comprehensive tool for monitoring and reporting internship students' activities, with the goal of facilitating continuous flow of information between the student and the university supervisor (Chanlin, 2015).

Many times, during internships, the interns are bothered about many things like:

- how they present themselves to the company,
- do they fit in the real work environment?
- are they able to integrate themselves well enough in their immediate team etc.

These concerns, many times, makes them forget to take note of the activities and little progresses they make during their internship period. Then at the end of the internship period, it becomes a headache when they embark on writing their report for academic assessment (Sabah, May, 2011).

The proposed web-based internship system will allow students to electronically add/modify information about activities performed daily/weekly at the internship institution (Aliza Sarlan, November, 2007). The university supervisor will be able view these entries as well, assess student's progress and ascertain if these activities are meeting the internship learning objectives.

1 Problem statement

This current internship system allows student to submit an offer, acceptance through the university intranet system. Then the university supervisor/co-ordinator can approve and update internship information, as well as view all the students that are going on internship. The instructor will be notified whenever a student submits an internship offer and has a choice of accepting or rejecting it.

The proposed system would complement the current internship system further, in the sense of filling up the space of what happens between the time of internship approval and the internship report submission. The balanced concept will involve:

- Reporting

The intern can add summaries of their daily/weekly activities, which will be a future advantage to them after their internship period. This will make it easier for students to create a comprehensive report from these daily/weekly summaries (Chanlin, 2015).

- Monitoring

These daily/weekly summaries entered by the intern can be viewed by the university supervisor, and they can give comments and advise, which in turn should boost the integrity and credibility of the internship exercise.

1.1 Objectives of Study

The objective of this study is to develop a web-based internship monitoring and reporting system for Estonian Entrepreneurship University of Applied sciences students, by proposing an e-logbook accessible to all players in the internship programme.

1.2 Organization of the paper

The final paper is structured as follows:

Chapter 1 bears the introduction, problem statement and objective of study, scope of project and organization of paper is discussed.

Chapter 2 shows an overview of:

- The history, definition and types of internship

- Web based application/systems and their advantages
- Web server definition and examples of known ones
- What an eLogbook is and a few of its implementations.
- Single page applications and its advantages.

In chapter 3, the author explains the research strategy, data collection technique, development tools used, proposed development method and limitation was discussed.

Chapter 4 was about the system development and result: Planning, system analysis and system design.

Chapter 5 will have the implementation and testing, where all core modules were tested.

Chapter 6 will be the conclusion and suggestions on further improvements

2 LITERATURE REVIEW

This chapter presents a selected review of other authors' work on relevant topics important to the paper.

2.1 Internship; History, Definition and Types

2.1.1 Brief History of Internship

The modern internship is very similar to apprenticeships that began under the guild system in the 11th century. Agricultural methods and technology had become advanced, needing lesser workers in the fields. Aspiring farm workers took up trades in their early to mid-teens, paying a guild master to teach them the trade. Apprentices often lived with the master for a decade, if not longer, and couldn't marry or earn wages during their apprenticeship. At the end of this period, the apprentice became a member of the guild and a journeyman, which meant he could earn his own wages.

After the Industrial Revolution, the apprenticeship system died out, after which, vocational training replaced it - vocational equipped workers with the skills needed for factory work in the 18th and 19th centuries. "Apprenticeships resurfaced in the late 1800s and early 1900s, but masters were replaced by employers who no longer housed apprentices". The duration of the apprenticeship was reduced because apprentices were taught only parts of the trade, rather than the whole trade. Apprentices who learned as machinists and carpenters did their craft and got payment based on prearranged wage scales and upon completion, would join trade or labor unions.

Internships evolved over the course of the 20th century, as some fields incorporated supervised and practical experience into educational curriculums. 'The term "intern" was first applied to medical students in the 1920s'. Government and businesses eventually adopted the term. After then, internship and co-op programs began to be offered in colleges campuses in the 1960s. But it wasn't until recently that internships became a norm for the average college student (Group, Taylor Research, 2014).

2.1.2 Definition of Internship.

"Internship according to McMahon and Quinn internship is a 'supervised work experience' whereby a student is under special attention, instead of working alone".

Pauze, Johnson and Miller saw internship to be similar to fieldwork/experience, practicum, co-op or experiential learning. It is an experiential learning that gives students opportunities to incorporate and blend thinking and action.

Renganathan, Abdul Karim and Chong defined internship as an opportunity for students to incorporate their practical work experience and knowledge into their university education by being in a supervised and real-world professional work environment (Andrew Lee Hock Cheong*, March, 2014).

Atkinson William states that internship is nothing but a process to work environment for an entry level candidate who is looking for a job. "Internship incorporates the experience of working in the field of one's choice at the period of completing one's education" - this makes it part of the educational process. The student gets an opportunity to step into a planned work field with a feel of professionality and work culture. This in turn gives the student the benefit to develop connections and references and with the people who are actually practicing managers.

Ellen Herkild feels that the internship is an approach of on-the-job trainings for white collar jobs, almost similar to apprenticeship. Generally, interns are college or university students who are studying to get their bachelors or master's degree. Internship is one further step in a student's education and offers the opportunities to get unpremeditated experience in a chosen field. The interns get the confidence they need to face the real world and reduces their vulnerability. "It further gives them a chance to evaluate themselves as to whether they like and can perform in the field they have chosen". It also gives students the opportunity to better their mark sheets, by gaining credits for this training. Internship gives an avenue for low cost labour to companies on entry level jobs. Many times, these companies retain these interns, which leads to gainful employment for the students as well. The students gain but more economically, it helps companies cut their costs on training, development and advertisement.

Timothy Noah sees internship as an agreement between the industry and a candidate for a stipulated period of time. This time period usually extends from 2 to 6 weeks during semester or summer vacation in case of vacation training. During the internship, the company needs to agree to teach and train a student.

Claus Anderson says that the initiative of internship is used in relation to work experience. "This theory propitiates the fact that many times the companies use this legal definition of internship as 'Volunteers' in order to rationalize and justify the fact that interns will be unpaid" (Prajapati, August, 2013).

2.1.3 Types of Internship.

According to the Employers' Internship Toolkit, internship is any carefully monitored work or service experience in which a student has intentional learning goals and reflects actively on what he/she is learning throughout the experience (Jaafar, Rohafauzi, & Enzai, Dec, 2017). Internships can take place during different times of the year: summer, winter or spring. These may be part-time or full-time internships over different durations and could be paid or unpaid (Bukaliya, March, 2012).

2.1.3.1 Paid Internship and Unpaid Internship

Internships are sometimes paid and sometimes unpaid. This is basically the decision of the employer. Some universities may have a policy on paying interns from their institution, but most will facilitate both types of internships for employers (Bukaliya, March, 2012).

There are specific fields of employment that are more likely to have paid internships. Such fields include the medical field, construction site, sciences, engineering, law, business, accounting, finance, technology, mass media and advertising.

Unpaid internships are done voluntarily or to just gain work experience. These types of internships are available at the institute of costs and works accountant of India, the institute of chartered accountants of India, sports club, government owned companies, non-profit organizations etc. (Prajapati, August, 2013)

2.1.3.2 Typical Internship

A typical internship should be between 6 weeks to 12 weeks. The main objective for this internship type is to earn college credit for a particular semester.

2.1.3.3 Independent and College Sponsored Internships

It is possible for students to enroll in internships either through the school, college or university that they attend, or independent of them. Most colleges and universities will allow students to earn academic credits for participating in internship. But it is also possible for students and employers to arrange internships independent of schools. This approach is befitting for situations where internships are paid and learning objectives are secondary to performing a job (Bukaliya, March, 2012).

2.1.3.4 Summer Internships

Many interns go for internship programs during their summer break. Such type of internship is often referred to as summer internship. It normally lasts for one and half or two months.

2.1.3.5 Service Learning

During service-learning students have to fulfill several criteria. It requires a combination of specific learning objectives to complete some type of community service work. It is different from other forms of experiential education because both recipient and provider of service benefit equally from the experience. They are very structured programs that need self-reflection, self-discovery along with gaining the specific values, skills, and knowledge required for success in the field.

2.1.3.6 Cooperative Internships

Some schools use the term Cooperative Education for a certain type of workplace position that is experiential, in the form of an experience-based education. With these positions, coops are fundamentally similar to internships. Students learn while applying knowledge and skills from the academic environment to a work one. The meaning of these two terms (internships and co-ops) are often unique to the persons or organizations using them. Generally, co-ops or cooperative education programmes involve paid positions and are only available to students in certain majors. Also, they are mostly full-time, and students are more likely to be offered a full-time job.

2.1.3.7 Externship

Internship and externship are more or less same. They are popularly known as job shadowing and they are of shorter duration. It provides the participants a bird's eye view of what's in the reality of working in a particular career field (Prajapati, August, 2013).

2.1.4 Challenges of internships

A research on quality of internships carried out within the European Union reveals that after various improvements have been implemented to better the quality of internships over the years, companies/individuals offering internships, still face some key challenges like:

- Insufficient learning content
- Lack of transparency on hiring practices
- Possibility of traineeships longer than 6 months
- Lack of rules on proper recognition of traineeships (European commission, 2016).

The quality of learning content is important in that, it determines if a major part of the internship learning outcome will be accomplished or not. With the proposed eLogbook system, the university supervisor should be able to monitor the student's internship activities/tasks and give guidance when necessary.

2.2 Web Based Application and system.

A web-based system is an application that is accessed via HTTP. The term web-based is mostly used to describe applications that run in a web browser. It can also be described as an information system that uses internet web technology to deliver information and services, to users or other information systems or applications (Teletrac Navman, 2020).

2.2.1 Advantages of Web-based Application and systems

2.2.1.1 Lower Development Costs

A web-based application runs in a web browser. It means that a single, responsive web application can be used across multiple device types. Although web apps will need to be tested on different browsers, there is no need to test them on different operating systems. This reduces development and testing cost.

2.2.1.2 Easy Installation and Maintenance

Unlike traditional software that is installed and loaded on local devices, web applications run from a host server. Software upgrades are all completed centrally, which reduces the costs of installation and software upgrades.

2.2.1.3 Accessible Anywhere

As long as there is internet connection, a user can always access a web-based system anywhere. This means that users can access the data they need when they are away anywhere.

2.2.1.4 Easy Data Sharing and Collaboration

Web-based systems makes sharing of data and collaborating on projects much easier. This is because data is stored in one central location, so users can share data and work together. It is also easier to integrate web-based systems than isolated desktop applications.

2.2.1.5 Reduced Hardware Costs

Web-based systems can eliminate the need for powerful client PCs since processing is carried out on the host server. The host server can be set to efficiently service simultaneous peak demand. So, the storage, processor, and memory requirements for client PCs can be reduced, hence reducing cost.

2.2.1.6 Increased Efficiency

"In most businesses, the deployment of web-based solutions leads to the streamlining of business processes. Often, paper-based processes can be replaced by workflow-based solutions. The business process improvements can lead to higher employee productivity and lower costs".

Web based custom application development can provide businesses with significant cost savings and productivity improvements. Now that internet access is almost universally available and internet speeds have significantly improved, applications that previously had to be client based can now be deployed on the web.

Although this is the case in developed Western countries, it is not the case worldwide. In some countries, internet access is unreliable. So, major deployment of web-based applications may be impossible. International organizations with oversea offices may not yet be able to take full advantage of web-based solutions.

For domestic organizations, web-based systems have a promising future. From web-based office applications, like content management systems and productivity applications, to

custom web-based software developed specifically for your organization. The foundation of many future software solutions is likely to be web-based (Kambala, 2018).

2.3 Web servers

2.3.1 Description

"The main job of a web server is to display the website content". When a web server is used internally and not available to the public, then it is called Intranet Server. When anyone requests for a website by adding the URL or web address on a web browser, the browser sends a request to the Internet for viewing the corresponding web page of that address. A Domain Name Server (DNS) converts this URL to an IP Address which in turn points to a Web Server.

2.3.2 Definition

A web server can be defined as a computer that runs websites. It's a computer program that distributes web pages as they are requested. A web server's basic objective is to store, process and deliver web pages to the users. This interchange is done using Hypertext Transfer Protocol (HTTP). Web pages produced from web servers are mostly static content that includes HTML documents, images, style sheets etc (The Economic times, 2020). Any computer can be used as web server by installing a server software and connecting the machine to the internet. There are several web server software applications available. Some of the known owns are: Apache, NginX, LightTPD, OpenLightSpeed, NodeJS etc. (James Kiarie, 2020)

2.3.3 Some of the known webservers

2.3.3.1 Apache

Also known as Apache HTTP Server is a free and opensource web server developed by Apache Software Foundation under Apache License version 2. It was released in 1995, after which it grew in leaps and bounds to become one of the most popular and widely used web servers, powering over 37% of all the websites.

2.3.3.2 NginX

Typically pronounced as Engine-X, is an opensource high-performance robust web server which also works as a load balancer, reverse proxy, IMAP/POP3 proxy server, and API

gateway. Initially, it was developed by Igor Sysoev in 2004, "Nginx has grown in popularity to edge out rivals and become one of the most stable and reliable web servers.

2.3.3.3 NodeJS

"NodeJS is primarily an opensource and cross-platform server-side runtime environment used for building web applications in JavaScript. However, it's also bundled with an http module that provides a set of classes and functions that extend its functionality and enables it to play the role of a web server" (The West Michigan Chamber of Commerce, 2009).

2.4 Single page applications (SPA)

One main reason why traditional website is slow, is because they are based on a multi-page interface model, whereby, for every request from the client (browser), the entire interface is refreshed. For example, when we click a link in a traditional website, the screen flashes white and everything reloads over several seconds: the navigation, ads, headlines, text, and footer are all rendered again. Yet the only thing that changes is the slideshow image and perhaps the description text.

An SPA, on the other hand, delivers a desktop application in the browser, with a highly responsive experience that surprises and delights users.

2.4.1 Definition

SPA is an application delivered to the browser that doesn't reload the page during use. Like all applications, it's intended to help the user complete a task, such as "write a document" or "administer a web server" (Michael S. Mikowski, 2014). It is also known as single-page interface and is built on expanding reach via the browser, reducing round tripping, and enhancing user experience (Joseph, January, 2016). Technically, what happens is an SPA loads a single HTML document from the server and then selectively shows different DOM elements to create the effect of multiple page navigation.

In simple words, an SPA is composed of individual page that can be updated independently on each user's action, so that the entire page does not need to be reloaded like traditional web applications. This in turn, helps to increase the levels of interactivity, responsiveness and user satisfaction (Joseph R., January 2015).

The author will be using the concept of a SPA to develop the eLogbook system.

2.4.2 Advantages of SPAs

- Does not need the browser to reload the HTML page
- Is more fluid (the screen does not flash)
- Pages responses are faster
- View data can be:
 - Downloaded once
 - Reused in multiple views

2.5 What's an eLogbook?

eLogbook is short for electronic logbook. Wikipedia defines this as is a computer-based software program for recording (logging) states and events. In this modern time, there is a wide range of different applications of electronic logbooks. Usually, eLogbooks are replication of the old-fashioned paper-based logbooks.

Different fields use it to record events, experiments and important relevant data. "Even if most versions are based on the classical client-server approach. Here the electronic logbook serves a client, which is in most cases a simple web browser" (Wikipedia, 2019).

2.5.1 Some Implementation Of eLogbook

2.5.1.1 Logistics

In the logistic industry, an eLogbook is used to provide accurate records for vehicle operating data and driver activity etc. Teltrac Navmann website explains their implementation of eLogbook as an "electronic logbook" which is a small computer tablet mounted in a truck cab. Some devices have mobile capabilities and can be hand-carried by a driver". Other components may include data collection sensors attached to the motor vehicle to record metrics such as engine temperature, fuel consumption, vehicle motion, speed and other parameters. The recorded vehicle and driver data can be automatically transmitted to an office or stored for other future uses, including timekeeping or review during a vehicle inspection (Teletrac Navman, 2020).

2.5.1.2 Aviation

Aviation implemented eLogbook as a simple way of sharing information between the maintenance organization and the pilot. According to the Bureau of transportation service, 69.7% of all flight delays and cancellations are due to air carrier delays or late-arriving aircrafts. Basically, the fix lies in digitizing the technical logbooks, which should quickly

and easily inform pilots about recent changes or faults on an aircraft. This in turn, improves and optimizes aircraft turnaround times (Kirk Strutt, 2020).

2.5.1.3 In Science Experiment

The eLogbook system is been implemented as an essential bookkeeping tool. This was used to keep a record of the experiment's operational activities. As shifters come and go, a central information repository is needed to store reports of incidents, configuration changes, achievements or planned operations. Furthermore, data-taking conditions and statistics are needed to allow not only the selection of good run candidates for offline processing but also to detect trends, correlations and bottlenecks (V Altini, 2010).

2.5.1.4 For Medical Trainees

From the international journal of surgery, an eLogbook was implemented as a surgical training tool. Accurate recording of operative cases is important during training to demonstrate experience. A.J. Beamish, et al wrote that an "eLogbook is an electronic surgical logbook, permitting accurate and secure recording of operative experience". It is necessary for all UK surgical trainees to record their operative experience using the eLogbook, which can be downloaded and endorsed by trainers. Each trainee's logbook is formally assessed annually by the Annual Review of Competency Progression (ARCP) panel, which is responsible for determining whether a trainee should progress to the next stage of training. Many specialist surgeons use the eLogbook as their operative logbook after completion of training and the database contains more than 46 million procedures at the time of writing.

This same concept, whereby students record their training/internship experiences in an eLogbook, which is be accessible to their instructors, can be implemented in Mainor's current internship system. This is what this paper is about (A.J. Beamish, February, 2020).

2.6 Related eLogbook systems

(Ele sylvester, 2017) computerized the internship activity reporting section of the student industrial work experience scheme. They adopted the Object-Oriented Analysis & Design (OOAD) approach with the Structured System Analysis and Design Methodology (SSADM). Hypertext Preprocessor (PHP) a general-purpose scripting language and Cascading Style Sheets (CSS) were used to create the front-end dynamic web pages while MySQL was used as the database.

In (V Altini, 2010), their custom-made eLogbook application, used to keep record of the events and activities in ALICE (a Large Ion Collider Experiment) was developed using the popular open-source LAMP stack (Linux, Apache, MySQL and PHP). Linux being the operating system on which the Apache webserver works, while MySQL was used as the database and PHP alongside other web languages were used for the frontend.

(Muhammad Anif, Oct, 2017) designed a web-based internship system using the Laravel framework in conjunction with HTML, CSS, and JavaScript. Since it was just a design into a pre-existing database, there was no specific mention of the stacks used for the backend.

(Jaafar, Rohafauzi, & Enzai, Dec, 2017) developed an internship monitoring and supervising web-based system to computerize the whole process of practical training in order to make it accessible online. The waterfall model was used for this development. Adobe Dreamweaver and PHP was used on the front end, XAMP was used to set up the local sever while HeidiSQL is used for database applications.

3 METHODOLOGY

3.1 Research strategy

In this paper, the research strategy adopted is the qualitative method, whereby the current internship system was observed as a whole, from which new patterns and ideas for the proposed system were arrived at.

3.2 Data collection technique

This paper adopted both primary and secondary collection of data, in order to gather data needed for the development of the proposed internship system. Primary data was collected in form direct observation of the current system, while secondary data was collected through study of past relevant literatures to the research topic.

Secondary data was sourced from academic databases like:

- Research gate
- Google scholar
- Mendeley
- IEEE
- Scopus
- Science direct

Using the following search words:

- Internship (Frostburg State University, 2020)
- Types of internship (Andrew Lee Hock Cheong*, March, 2014) (Prajapati, August, 2013)
- History of internship (Group, Taylor Research, 2014)
- Web-based internship system (Aliza Sarlan, November, 2007) (Chanlin, 2015) (Jaafar, Rohafauzi, & Enzai, Dec, 2017)
- Web-based system/application (Jason A Miller, April 2011) (Sabah, May, 2011) (Kambala, 2018)
- Electronic Logbook system (Teletrac Navman, 2020) (Kirk Strutt, 2020) (V Altini, 2010)
- Single page applications (Joseph R., January 2015)
- Challenges of internship (Bukaliya, March, 2012)
- Web server (James Kiarie, 2020) (The Economic times, 2020)

Lots of literatures came up when sourcing for secondary data, but the selection of literature was based on their relevance to this paper.

3.2.1 Development tools used

From the literatures reviewed, a combination of development tools was used to implement their various eLogbook/internship system:

- PHP, CSS and MySQL(Ele sylvester, 2017).
- Another used HTML5, CSS, JavaScript and PhoneGap (Supardi, April 2016).
- Linux, Apache, MySQL and PHP (V Altini, 2010).
- Laravel, PHP, HTML and CSS (Muhammad Anif, Oct, 2017).
- Adobe Dreamweaver, PHP, XAMP and HeidiSQL (Jaafar, Rohafauzi, & Enzai, Dec, 2017).

In all, I discovered that they used development tools that met their specific system requirements. This is why for this paper, the author decided to use tools based on the proposed eLogbook requirements. The tools are as follows

- ReactJs: An open-source frontend JavaScript library. It was adopted mainly because of its ability to build interactive user interfaces in conjunction with HTML, CSS and JavaScript.
- Firebase: A Backend-as-a-Service platform that provides both authentication server and storage database with ready-made configuration that can be adjusted to one's requirements.

3.2.1.1 HTML

The worldwide web consortium (W3C) defines HTML as the language for describing the structure of Web pages.

3.2.1.2 CSS

CSS is defined as a declarative language that controls how web pages look in the web browser - including colours, layout, and fonts. It enables one to tailor the presentation to different types of devices, such as large screens, small screens, or printers. CSS is independent of HTML and can be used with any XML-based mark-up language (World wide web consortium, 2016).

3.2.1.3 JavaScript

The Mozilla developer network defines JavaScript as a scripting or programming language that allows you to implement complex features on web pages. Every time a web page does more than just sit there and display static information for you to look at, then you can be sure that JavaScript is probably involved. It is the third layer of the layer cake of standard web technologies, two of which are HTML and CSS (Mozilla developer network, 2020).

3.2.1.4 ReactJs

React (also known as ReactJs) is an open source, frontend, JavaScript library, used in web development to build interactive user interfaces or components. It was created to enable developers build large applications with data that changes. React can be used as the core in the development of single-page or mobile applications (Jordan Walke, 2020).



Figure 1 A bit about what happens inside react

3.2.1.5 Advantages of using react

- Code reusability through components
- Creation of scalable web apps through stable code.
- Creates fast loading webpages.
- Ease of migration
- Ease of debugging.
- It is backed by a strong support community (Hamza Mahmoud, 2018).

3.2.1.6 Firebase

Firebase is a platform developed by Google for creating mobile and web applications. It is what is called Backend-as-a-Service (Baas) and was originally an independent company founded in 2011, but later acquired by google in 2014 (Crunchbase, 2020).

3.2.1.7 What's a backend as a service?

Backend as a service (BaaS) is a cloud computing service model for providing mobile and web app developers with ways to connect their applications to backend cloud storage via application programming interfaces (API) and software developers' kits (SDK).

It also includes services like user management, file management, push notification and location services (Backend as a Service , 2017).

Firebase frees developers so they can move quickly to focus on building fantastic user experiences. No need to manage servers or write APIs, firebase gives all these functionalities plus a datastore, all written so generically in a way that can be modified to suit needs (Esplin Chris, 2016).

3.3 Proposed development method

The method of development adopted for the eLogbook system is that of the software development life cycle:

- Planning: This part helped to understand the requirements of the proposed eLogbook system.
- Analysis: Based on the requirements gathered, the author analyzed the feasibility of the requirements, to see if it was possible to have such features. This was done by analyzing the current system activity flow and the proposed system requirements. After that, the eLogbook system architecture was drawn out to help with the next phase.
- Design: The design was now made based on the requirements gathered in the planning phase. This included the activity diagrams of the eLogbook system and the entire proposed system.
- Development: development of the eLogbook system.
- Testing: This phase involves testing the eLogbook system based on system requirements.

3.3.1 Proposed development limitation

- The choice of development tools used was because the proposed eLogbook was meant to be an MVP, hence using technologies for large scale development would be an overkill.
- The eLogbook system was tested and checked by a few selected students. However, this has not been checked in an institutionalized way. This can be done in the future for improvements and further progress.

- This development is limited to the key players of the internship programme:
 - EUAS Students and
 - University supervisor.

4 SYSTEM DEVELOPMENT AND RESULT

4.1 Planning

The requirements for the proposed system was gathered from observation of the current system and study on relevant literatures about the proposed system. Two types of requirements were gathered: functional and non-functional requirements.

4.1.1 Functional requirement

How will the eLogbook be used?

- Inserting/editing text and picture data: Students should be able to enter daily activities accomplished into the eLogbook through text and picture data.
- Updating and changing data: Students should be able to update already existing data on the eLogbook when needed.
- Retrieving data
- Deleting data: Students can also choose to delete data from the eLogbook.

4.1.2 Non - functional requirement

- Security/Authentication: Student should have login credentials peculiar to them, which means, they own a password in order to access the eLogbook.
- Scalability: The eLogbook system should be expandable in case the number of users (students) increase.
- Manageability: Should be easy to manage.
- Stability: It should be a stable system in case lots of students are logged in at the same time.

4.2 System Analysis

In this section, the author will analyze the data flow of the current system and the basic architecture (characteristics) of the eLogbook.

4.2.1 System architecture

This describes in general, the typical behaviour of the eLogbook system.



Figure 2 Use case diagram



Figure 3 Data flow in the current internship system

4.2.2 Matching development tools and requirements

Based on the requirements, inserting, editing and deleting of data, means the user needs an interface for interaction (frontend), also, some storage (database) where data entered can be stored and retrieved. And lastly, access restriction ability will be needed (Authentication).

For the frontend, a combination of ReactJS, JavaScript, HTML and CSS was used. While for the database and authentication, firebase was used.

4.3 System Design

In this section, a top-down approach was used to take into account all related variables for the system. After that, the activity diagrams were designed illustrating:

- Data flow of the internship system now having the proposed eLogbook
- Data flow for students in the new internship system.
- Data flow for University supervisor in the new internship system



Figure 4 Data flow of the internship system now having the proposed eLogbook



Figure 5 Data flow for students in the new internship system



Figure 6 Data flow for University supervisor in the new internship system.

4.3.1 Components of the eLogbook

Student dashboard

The student dashboard shows the student's list of notes, from where they can choose to create a new note, modify the previous ones or delete.

eLo	ogbook	
	Diamond Preez	Biden finally won the election 2 days ago GEORGIA - 16 electoral votes Where things stand: Biden has 2,461,
=	Note	Comments
€	Logout	

Figure 7 Student dashboard

Student editor page

This page can be seen when the user creates a new note or edits an existing one.

×	Cre	eate a	new	Note												
Note Title *																
Set	Up a H	lome S	erver													
т	в	I	U	÷	¥	ŝ	7	Ð		≔		77	<>	X		8
Se	et U	ра	Но	me	Se	erve	er									
Settin (I use	ng up a a hon	pa home ne serv	Ho server ver to p	me runnir ower n	Se ng an o ny wor	open-s	er ource o rel webs	operatii site, lux	ng syst xagraf.	tem is net), c	a popu ollect a	lar and	l usefu nd e-ma	activi ail mes	ity. ssa	Useful in what ways, you may ask. You could use it to run a website ges, store your OpenID credentials or serve.
Settin (I use Wh	ng up a e a hom	pa home ne serv ou'll	Ho server ver to p nee	me runnir ower n d:	Se ng an o ny wor	open-s	eource o rel webs	operatii site, lux	ng syst xagraf.	tem is net), c	a popu ollect a	lar and ind ser	l usefu nd e-ma	activi ail mes	ity. ssa	Useful in what ways, you may ask. You could use it to run a website ges, store your OpenID credentials or serve.
Settin (I use Wh	ng up a e a hom at yo A com	pa home ne serv ou'll nputer	Ho server ver to p nee	me r runnir lower n d:	Se ng an o ny wor	open-s	eource o el webs	operatii site, lux	ng sysl xagraf.	tem is net), c	a popu ollect a	lar and	l usefu nd e-ma	activi ail mes	ity. ssa	Useful in what ways, you may ask. You could use it to run a website ges, store your OpenID credentials or serve.
Settin (I use Wh	et U ng up a e a hom at yo A com Archite	pa home ne serv ou'll nputer ecture	Ho server ver to p nee	me runnir ower n d:	Se ng an o ny wor	open-s	ource o	operatii site, lux	ng syst xagraf.	tem is net), c	a popu ollect a	lar and	l usefu nd e-ma	activi ail mes	ity. ssa	Useful in what ways, you may ask. You could use it to run a website ges, store your OpenID credentials or serve.
Settin (I use Wh	et U ng up a e a hon at yo A com Archite Memo	pa home ne serv ou'll puter ecture ry	Ho server ver to p	me runnir lower n d:	Se ng an o ny wor	open-s	ource o el webs	operatii site, lux	ng syst xagraf.	tem is net), c	a popu ollect a	lar and	l usefu nd e-ma	activi ail mes	ity. ssa	Useful in what ways, you may ask. You could use it to run a website ges, store your OpenID credentials or serve.
Settin (I use Wh	et U ng up a e a hom at yo A com Archite Memo Storag Coolin	pa home ne serv ou'll aputer ecture ry ge	Ho server ver to p	me r runnir ower n d:	Se ng an o ny wor	open-s	ource o	operatii site, lux	ng sysl xagraf.	tem is net), c	a popu ollect a	lar and	l usefu nd e-ma	activi ail mes	ity. ssa	Useful in what ways, you may ask. You could use it to run a website ges, store your OpenID credentials or serve.

Figure 8 Student editor page

University supervisor dashboard

On this dashboard, the supervisor can see the list of students undergoing internship and can click on any, to view their notes. Also, the supervisor can make comments as a way of monitoring or mentoring the student.

eLo	gbook
	Ifeanyi Emmanuel
	Godstime
	Gift
	King
	Ifeanyi
•	Diamond
€	Logout

Figure 9 Students list view

eLo	ogbook	
	Ifeanyi Emmanuel	Biden finally won the election 2 days ago GEORGIA - 16 electoral votes Where things stand: Biden has 2,461, VIEW
	Godstime	Comments
	Gift	Any hope for trump?
	King	Add Comments
	lfeanyi	Write a Comment SUBMIT
	Diamond	
€	Logout	

Figure 10 Note comment view

5 SYSTEM IMPLEMENTATION AND TESTING

ReactJs comes with lots of components that can be imported from its library which made this development less tedious.

Lots of react components was used, but here are the major ones:

- 1. MaterialUi components which took care of the CSS.
- 2. React rich text editor components which helped with the editor page.
- 3. Axios for management of HTTP requests.

One of the major challenges encountered was adding the rich text editor. One of the eLogbook features was to 'view notes', but sadly, a view option was not readily available with the rich text editor. So, some few tweaks were made to achieve this on both the supervisor and student side.

5.1 Testing all core modules and roles.

The developed MVP was hosted on firebase blaze plan (: <u>https://elogbook-94186.web.app/</u>), in order to enable selected students to use it as in a real-life situation. Below, is the result for each module broken into pages and dashboards.

Test Components	Test Data	Expected Result	Remarks
Username input field	Enter characters into username field	Should accept text characters	Success
Password field accepts input	Enter password into password field	Should accept password	Success
Password field input is masked	Enter password into password field	Input should be masked	Success
Clickable sign in button	Mouse click	Should appear clicked	Success
Sign in Button	Enter valid username, password and click	Should submit inputted data and route to student dashboard	Success

Table 1 Student login page test

Test Components	Test Data	Expected Result	Actual result
Username input field	Enter characters into username field	Should accept text characters	Success
Password field accepts input	Enter password into password field	Should accept password	Success
Password field input is masked	Enter password into password field	Input should be masked	Success
Clickable sign in button	Mouse click	Should appear clicked	Success
Sign in Button	Enter valid username, password and click	Should submit inputted data and route to Supervisor dashboard	Success

Table 2 Supervisor's login page test

Table 3 Student dashboard

Test	Test Data	Expected result	Actual result
Components			
Logout tab	Click tab	Should route page back to sign in page	Success
View button	Click button	Should route page to note view	Success
Edit button	Click button	Should route page to editor page	Success
Delete button	Click button	Should remove saved note from list.	Success
Add button	Click button	Create a new note	Success

Table 4 Editor Page

Test	Test Data	Expected result	Actual result
Components			
Note title	Enter text input	Should accept text input	Success
Note details	Enter text input	Should accept text input	Success
Save button	Click button	Should save the note to the list	Success
Close button	Click button	Should route page back to student's dashboard	Success

Test	Test Data	Expected result	Actual result
Components			
View button	Click button	Should route page to note view	Success
Comments field	Enter text input	Should accept text input	Success
Submit button	Click button	Should submit comments field input to comment section	Success
Students tabs	Click tab	Should reveal specific student notes	Success
Logout tab	Click tab	Should route page back to sign in page	Success

 Table 5 Supervisor dashboard

Feedback gathered from the testers

- After clicking login, it displays a blank page for some first-time users. This was solved by simply clearing the browser cache or using the incognito mode.
- First time users who fail to read through the documentation were unable to save notes. This is not a problem if the right procedure was taken: click on the save icon on the editor tools, then click submit on top right corner.
- UI is not at its best. The developed eLogbook is a MVP version, hence more changes and improvement can be added if adopted into the school's internship system.

6 CONCLUSION

The main aim of this paper was to develop a practical solution for improving the reporting and monitoring capability of EUAS current internship system. An eLogbook system was seen to be a good fit for this, after which a testable MVP was developed.

If the eLogbook system is adopted to the school's internship system, then:

- Students should have more ease of reporting their internship activities which should help them focus more on their internship progress. Also, it should help them escape the headache of compiling their internship report at the end of the internship period.
- The void in the flow of information from the time of internship approval and the internship report submission would be filled.

In view of the above benefits, the eLogbook holds promises to be a good knowledge base of internship activities for interns during their professional internship.

6.1 **Proposed improvements**

6.1.1 For the internship system as a whole

Even with the addition of the eLogbook to the school's internship system, there's still a series of semi-manual activities within the school's internship system that can be potentially automated. These activities include:

- Process of student notifying internship co-ordinator about internship offer.
- Process of Internship co-ordinator providing the internship contract to the student.

6.1.2 For the eLogbook

The below functionalities can be added as improvements in the future:

- A section of the eLogbook can be made to gather data about internship placement companies for future use.
- Two-way communication between student and supervisor.
- Export data functionality.

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Git hub repo link: https://github.com/emmy-diamond/eLogbook

Hosted web- app link: <u>https://elogbook-94186.web.app/</u>