Cloud-based Computing Adoption in Internship Management System for University Education

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Abstract

During the COVID-19 pandemic, cloud computing became an essential tool in distance education activities. Due to pandemic restrictions, normal face-to-face internship supervision was suspended. Therefore, an online internship management system using cloud-based computing is designed and adopted. Google Suite, a public cloud computing service, was used for this development. Google Suite is a powerful platform with simple administration facilities and multi-platform compatibility and is an excellent collaboration tool widely used at universities. The proposed development approach consisted of Requirements Analysis, User Analysis, Documentation Analysis, System Function Analysis, Tool Analysis, System Implementation and Testing. Standard testing methods of heuristic evaluation and user acceptance tests were performed. The result shows that the cloud-based system for online internship management system using Google Suite has achieved excellent performance levels in terms of cost savings, user interface satisfaction, ease of use, ease of access, ease of control, ease of monitoring, ease of manageability, usefulness and usability. The proposed framework can be used as a prototype to build an educational organization cloud-based management system.

Keywords: Cloud computing, Internship management system, remote education

Introduction

With a new technology trend and especially under the COVID-19 situation, the Education Department had an objective to use technology for distance social learning and educational activities. A cloud computing system is an ideal solution for achieving a rapid development time within budgetary constraints and avoiding complicated system management requirements. A Cloud computing system is pool sharing platform technology. It is software sharing, service sharing, document sharing, data sharing and hardware simulation and emulation. There are no software license and hardware expenses. The benefits of cloud computing include individualized learning, affordability, increased accessibility, reduced distractions, promotion of technology applied to education, creativity, collaborations, time-saving, flexibility and robust backup for data (Edeh, Nwafor, Ugwugbo, Rockson, & Ogbonnaya, 2020). It could enhance efficiency, flexibility, setup and management difficulty and accessibility by more than 50% (Tan & Kim, 2011; Bansode & Pujar 2012; Cieplak & Malec, 2014; Al-Rousan & Ese, 2015; Chopvitayakun 2015; Meenakshi & Meenaakshi, 2015; Upendra & Prashant, 2017). The user can access the system on an AnyTime/AnyWhere/AnyDevice basis and there are no limitations on software or hardware specification compatibility. The cloud system also cut overall IT costs. Also, cloud solutions support cooperative learning during distancing.

To serve the social distancing policy, the cloud computing system was adopted into the internship management system. The developed system is based on the case of the Information Studies Department. The Information Studies Department brings together programmes in Library Studies, Information Studies and Information Technology to create a graduate student to serve not only libraries but also data centres and information

technology organizations. To have professional skills, an internship course is a mandatory credit before graduating. Conventionally, there are a lot of problems in performance practice management. Management of the internship is performed manually by a coordinator or secretary. Using the manual system for this purpose is difficult and, together with poor management, constitutes the main problem. Due to the number of documents that are processed, the management processes are very time-consuming and require a high workload. The computerized system was envisaged to solve these issues.

Many internship management projects (Polat et al., 2010; Chanlin & Hung, 2015; Xue, 2015; El-Haouari, 2016, Afiza et al., 2017; Yannuar, Hasan, Abdullah, Hakim, & Wahyudin, 2018) have been implemented by highly skilled IT professionals and sophisticated specifications. They have been developed using programming languages such as HTML, CSS, SASS, Javascript, Ajax, XAMPP (Apache and MySQL), PHP Git, Astah Professional, and Sublime Text tool, all of which require skilled and experienced developers and skilled administrators to manage the developed system. The technical levels required have subsequently created deployment problems and ongoing user problems and administrators have often not been able to handle and solve problems on their own due to the high technical programming knowledge needed. The administrator who does not have programming experience would no longer be capable of modifying or updating or managing the system which may consequently fall into disuse.

The objective of this research was to develop an easy-to-use internship management system that was easy to maintain, with high up-time and simple administration requirements with administrators being able to modify the systems at any time to accommodate changing requirements or to incorporate new archive regulations. The cloud computing system developed in this research was designed to be simple to modify and administer by anyone with low computer skills. Five of the system's primary users are students, faculty coordinators/administrators, supervisors, internship providers and organizational mentors. The aim was to ensure usability so that the system can be easily used by all users, particularly the faculty coordinators who have the primary obligation to manage the system. Cloud computing technology was used to increase internship management efficiency in both normal and epidemic circumstances. All documents required are easily generated through the system. The system will list out all the organizations that have registered on the system which offered an internship. Importantly, as a cloud-based computing system, development and ongoing administration were easy. There are many cloud services and applications available in the software marketplace. Microsoft Cloud Services, Google Apps, and Amazon Web Services for Education are prominent and offer online data storage solutions. Of these, Google Suite has proven to be a powerful cloud application and is the most frequently used (Herrick, 2009; Arichi, Suneha, Desai, & Jadhav, 2015; Mykytenko, 2017; Mahapatra, Chopra, & Mahapatra, 2017, Najiyabanu, Armstrong, & Solomon, 2019). It is a resource pooling platform. All information and documents are stored on the cloud server. Google suites include Gmail, Calendar, Slides, Docs, Forms, Sheets and Site. A minimal management system was proposed. Users can exchange, share and access data on an AnyTime/ AnyWhere/ AnyDevice basis. It helps increase collaboration, engagement and productivity. Developing a computerized practical training system is essential, and making it accessible online is necessary. The main purpose of this research was to design a new version of the cloud services online internship management system, in which all users can access the same up-to-date information. The system must be user-friendly and self-managed by a user who does not have high technical competence.

In this project, an online internship system was developed to facilitate cooperation between students, supervisors, administrators, internship providers and mentors on the work site. The manual system was transformed into an automated system to meet the challenge of academic activities at a distance, reducing the workload and improving productivity.

Methods and Materials

The traditional work was studied and a new design was proposed. Both System Development Life Cycle (SDLC) and Human-Centred Design (HCD) were used to develop the computerized system. Based on stages of SDLC, this research is carried out in the stages of Problem Identification and Requirements Analysis, System Analysis, System Design, System Development and System Testing. HCD was applied in the design phase to maximize the collection of valid user requirements. To perform usability tests and functional tests, a total of 38 users are identified consisting of 3 coordinators, 5 supervisors, 5 internship providers, 5 mentors, and 20 students. To perform the heuristic tests, 5 evaluators are recruited. The evaluators had no experience with the system. The heuristic ranking is used for determining defect importance with the defects classified and assigned a ranking of minor=1, major=2 or critical=3. The system function testing was measured on a success and failure scale. The proposed system diagram is shown in Figure 1.

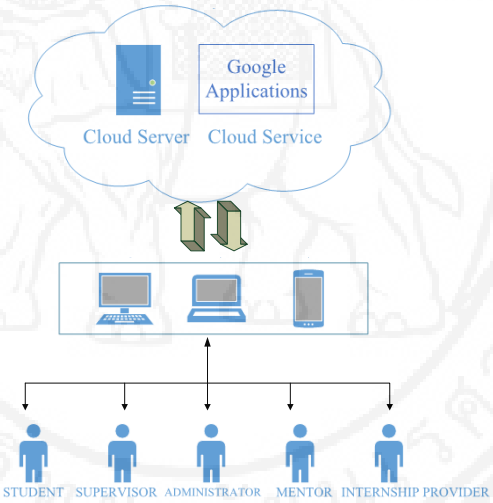


Figure 1 Proposed system diagram

1. Problem Identification and Requirement Analysis

The first step was problem identification and requirements analysis. Both functional requirements and non-functional requirements were considered. The data collection was achieved by conducting literature studies, interviews, field observations, brainstorming sessions and focus groups. The process began with studying the work activities and processes as explained in the current system documentation. Field observations were made and the managing operator was interviewed. The focus groups and brainstorming sessions are conducted together to validate the requirements.

2. System Analysis

The system analysis activity comprises user analysis, document analysis, function analysis and tool analysis. The system requirement specification (SRS) is the output of this process. The details of each step are shown.

2.1 User Analysis

User analysis is the method by which users who interact with the system are tracked. This step helps the developer understand who the users are and what level of skill and experience each user group has in interacting with the system.

There are five main users involved in the internship system:

1. **Students** who take an internship course. Students normally take an internship course during their last year of study.

2. **Supervisors** are the teachers in the department. The supervisors supervise particular students after the students' applications are accepted. The supervisor must provide assessments and recommendations.

3. **Administrators or department coordinators** are perhaps department secretaries or an assigned person or teacher who is a coordinator of the internship course.

4. **Internship providers** include academic libraries, public libraries, technology companies, business companies and other organizations.

5. **Mentors** who are responsible to train and give assessments to the students at the work site.

2.2 Document Analysis

Document analysis is the step in which system documentation is analysed. All documents are collected and reviewed. The authorship of each document, when it was written and where it is sent are questions that must be answered. The original paper-based documents will be converted to e-documents. Some document formats and data are modified to fit the new user requirements. There are many required documents. The documents are listed as follows: student portfolio, internship pre-application form, internship application form, internship cover letter, internship acceptance letter, intern's daily timesheet, intern's weekly timesheet, internship mentor evaluation form, internship supervisor evaluation form and internship final report.

2.3 System Function Analysis

System function analysis is the process of decoding system requirements into detailed functional requirements. The system was divided into smaller parts. Different types of users use different parts of the system. There are five main activities undertaken by users that need to be computerised. These include viewing data, accessing data, filling out forms, evaluating and scoring student work, and submitting documents and reports. The system functions are classified by the user as follows:

Student: The student can log in to the system. Personal information or a portfolio can be uploaded. All information needed is gathered in one place. All applications are downloaded, uploaded or submitted and stored in the cloud server. A student can register and log in to their account to search for an internship provider and can pre-apply for it. A student can track their submission's progress. The pre-registration stage is for the student to register their requirements and interests viz-a-viz their potential internship provider or host. The student can track an internship provider's acceptance of their application or when they decline. Students can receive information from internship providers through the web-based system. An intern's daily/weekly timesheet and internship full report can be uploaded via the website.

Supervisor: The supervisor can log in to the system and the students under their supervision are listed. Supervisors will be able to view internship details and input assessment scores and comments, as well as track responses from mentors.

Administrator: The administrator is the person who coordinates between students, supervisors, internship providers and mentors. The administrator manages access rights, website content, the database and its data content, internship applications and all documents. The administrator can access and edit/update/delete information and automatically generate documents such as the internship cover letter. The administrator manages the student's supervisor. Overall, the administrator manages and monitors the application process and manages all files.

Internship provider: The internship provider can log in to a system and register an internship opportunity. Any organization that offers an internship program can send an email to update its internship offering and the result of any internship application.

Mentor: A mentor is a person who is assigned to supervise the student at the work site. The mentor can log in to the system, input assessment scores and comments and evaluate the student via an online form or by uploading files.

2.4 Tool Analysis

With the limitation that the users may have little computer experience, a simple, easy and effective tool was considered essential. Software as a Service (SaaS) type of cloud computing is used. Users can access all services provided via the Internet which makes the system easy for online management. The system is based on a public cloud infrastructure in which all services are managed through a third-party service provider, the Google App Engine, which is considered to be one of the most powerful public cloud applications. All applications are linked together to build a large system on shared infrastructure. No software installation is required. Data management can be done without coding experience. No programming or database skills are required. Users can access tools on an AnyTime/AnyWhere/AnyDevice basis. Many products are included in the Google Suites program that meets a large variety of requirements. Google Drive, Calendar, Mail, Forms, Sheets, Doc and Site are used. Furthermore, there is a variety of strong add-ons; for example, an add-on to convert Word® .doc files to .pdf files. The details of each program used are declared. Since all academic users have a Google account and most of them have already used some Google services, the Google application is then easy to apply.

Drive: Google Drive provides storage and sharing of files, real-time editing of documents, and access to all files from anywhere. Accessibility to files is controlled by the access control module.

Calendar: Scheduling is performed on the Google Calendar. The importance of appointments and events can be set and shared with others.

Mail: This is a powerful communications collaboration tool for Google Mail account holders. The user's identity can be verified and accessibility controlled. The notification will be sent to the student by email to state the status of the submission process.

Form: The online form and submission form are generated using Google Forms. The data entered in the form will be stored in Google Spreadsheets automatically. .doc and .pdf files are generated from Google Forms.

Spreadsheet: Google Spreadsheet serves as a backend database. There are backups and version history. The information inputs from Google Forms, such as student information, supervisor information, internship provider information, evaluation information and scoring information, are automatically stored in the sheet.

Doc: Google Doc is like a document generator. Users can work on the same document at the same time. Feedback and change are saved automatically to Google Drive. Drive stores each save as a separate revision, making it possible to reverse changes.

Site: The web-based internship system is implemented using Google Site. Google Site is accessible and simple to construct. There are many templates and ease of use via drag-and-drop operations. The user has to login into the system and the system will be redirected according to the permission of each account.

3. System Design

System design is a phase in which the SRS document is transformed into a system in implementable form. System design represents the data flow and input/output of the system. An activity diagram is used in the design phase to break down the complex flow of a Use Case. The diagram shows the transitions which trigger the activity and overall flow of control. The Activity Diagram describes activities of and between students, the administrator, internship provider, supervisor and mentor. Users participated throughout the design process according to the tenets of Human Centered Design. The User Interface was designed with Google Site. The system design workflow and processes are shown in Figure 2 and the Google Usage Diagram is shown in Figure 3.

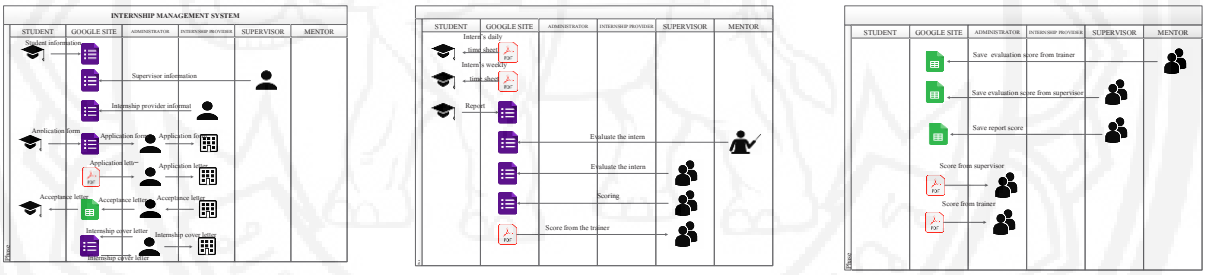


Figure 2 Proposed internship filing system activity diagram between student, administrator, internship provider, supervisor and mentor on the Google site

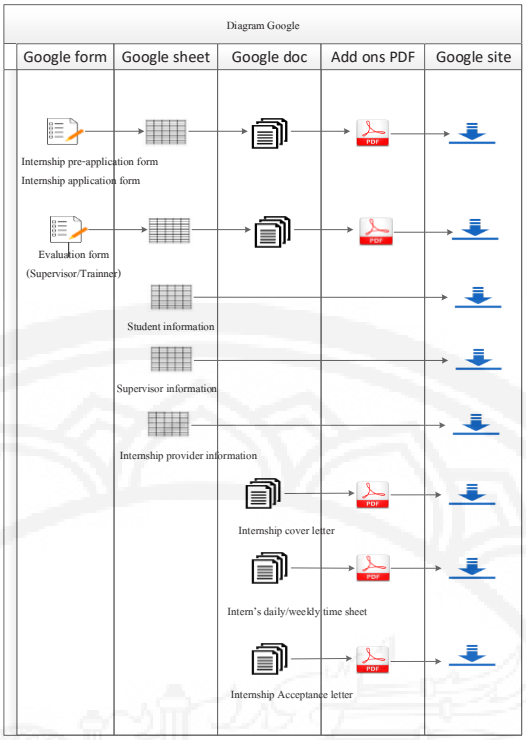
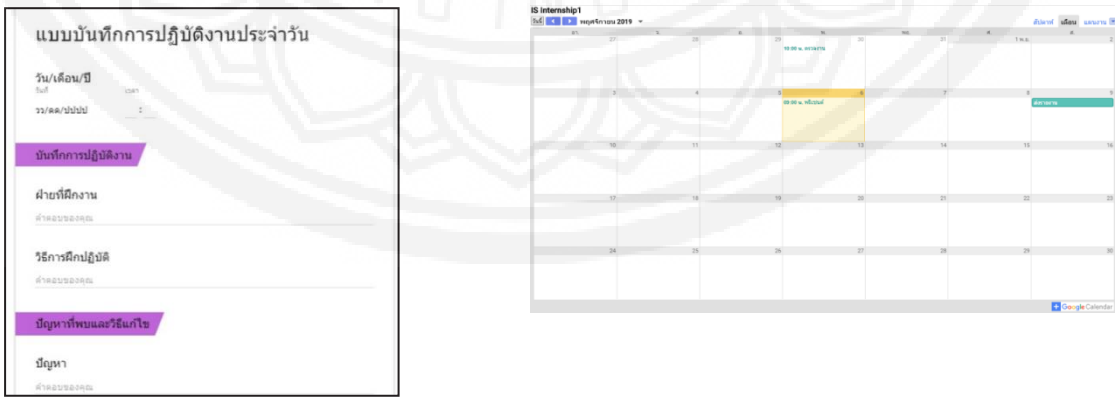


Figure 3 Google Suite usage diagram including Google Form, Google Sheet, Google Doc, Add on PDF and Google site

4. System Implementation

Administrator module functions include website content, organizational data, session data, participant data, user data, competency management, identity management, chart viewing, and database. Teachers in the system called supervisors have roles that are capable of handling reports, managing guidance, monitoring and accessing internship information. Students or participants who perform internships have functions that fill daily reports, view guidance, view placement status, view information and internship assessment. In the development or implementation stage, the system interface is created using Google Suite applications in a cloud-based computing platform. Users access the system from the website. Compared with other web development programs, the implementation time of the proposed system is very small. To optimize user requirements the web-based system is implemented in the Thai language. An example of the interface is shown in Figure 4.



(a) (b)

Figure 4 Internship provider information (a) daily report form with Google Form, and (b) schedule with Google Calendar

5. System Testing

There is a need to ensure that both functional requirements and nonfunctional requirements are met. The non-functional requirements are known as usability requirements. For functional requirements, user experience testing is performed. The standard testing approaches are heuristic evaluator/expert testing and user experiences (Dharod, 2004; Shazeeye & Shanmugam, 2007; Tan, Liu, & Bishu, 2009; Bastien, 2009; Karousos et al., 2010; Niranjanamurthy, Archikam, Himaja, & Puneeth, 2014; Iskandar, Thedy, Alfred, & Yonathan, 2015, Harijanto & Marisa, 2016).

In this development, heuristic evaluation criteria were modified from Nielsen and Molich (1990); Sivaji and Downe (2011) and system functionality testing was used with Black Box testing applied. A case-based approach was developed to obtain the results. The heuristic evaluation criteria included compatibility, consistency, error prevention and correction, explicitness, flexibility and control, functionality, informative feedback, language and content, navigation, privacy, user guidance and support, visual clarity, administrator manageability and ease of use.

To measure usability in the user interface design, six criteria based on Shneiderman & Plaisant (2005) were applied. These were

(i) the rate of errors by users: a simple counting of the number of errors made by the users.

(ii) speed of performance: measures the time users needed to accomplish tasks.

(iii) time to learn: was the average time that users needed to learn the accomplished task.

(iv) retention over time: the number of users who showed that they had retained knowledge on how to use the system.

(v) proper function: the level of satisfaction with the proper functioning of the system.

(vi) subjective satisfaction: the level of user satisfaction which was assessed as excellent, very good, good, fair and poor.

To ensure the reliability of the system, system availability is computed using Eq. 1. The completion rate is also noted to be highly dependent on the context of the task being assessed. To measure the completion rate, effectiveness is calculated using Eq. 2.

$$\text{Availability} = \frac{\text{Number of access} - \text{Stability}}{\text{Number of access}} \times 100\% \quad (1)$$

$$\text{Effectiveness} = \frac{\text{Number of tasks completed successfully}}{\text{Total number of tasks}} \times 100\% \quad (2)$$

Results

Heuristic ranking and reflection on successes and failures of system functions were tested. Table 1 shows the heuristic scoring and Table 2 shows the system functionality testing results. The usability measure is shown in Table 3 and the subjective satisfaction comparison is shown in Table 4.

Table 1 Heuristic scoring results

Heuristics	Minor	Major	Critical	Total
1. Compatibility	0	0	0	0
2. Consistency	3	0	0	3
3. Error prevention & correction	3	0	0	3
4. Explicitness	0	0	0	0
5. Flexibility & control	0	0	0	0
6. Functionality	1	0	0	1
7. Informative feedback	1	0	0	1
8. Language & content	1	0	0	1
9. Navigation	0	0	0	0
10. Privacy	0	0	0	0
11. User guidance & support	0	0	0	0
12. Visual clarity	1	0	0	1
13. Administrator manageable	0	0	0	0
14. Ease of use	0	0	0	0
Total	10	0	0	10

The 10 defects found in the heuristic test results were consistency, error prevention and correction, functionality, information, language and content, and visual clarity.

Table 2 System functionality testing results

Users	Functions		Success	Fail
Overall (38 users)	1.	No broken link	38	0
	2.	User registration	38	0
	3.	Login/logout	38	0
	4.	View student data	38	0
	5.	View supervisor data	38	0
	6.	View internship provider data	38	0
	7.	View internship information	38	0
	8.	Download/upload	38	0
	9.	Fill form	38	0
Administrator (3 users)	10.	Manage user/ grant access	2	1
	11.	Manage website	2	1
	12.	Manage Information/guideline	3	0
	13.	Manage Administrator data	3	0
	14.	Manage Internship data	3	0
	15.	Manage Student data	3	0
	16.	Manage Supervisor data	3	0
	17.	Manage Internship provider data	3	0
	18.	Manage Mentor data	3	0
	19.	Manage Accept/Reject data	3	0
	20.	Manage Cover letter	3	0
Student (20 users)	21.	Manage Portfolio/profile	20	0
	22.	Manage Pre-application	20	0
	23.	Manage Application	20	0

Table 2 (Cont.)

Users	Functions	Success	Fail
Student (20 users)	24. Manage Daily/weekly report	20	0
	25. Upload Daily timesheet	19	1
	26. Upload Weekly timesheet	20	0
	27. Upload Full report	20	0
	28. Upload Video Presentation	20	0
	29. Upload Slide Presentation	20	0
	30. Search for vacant internship provider	20	0
	31. View application result	20	0
Supervisor (5 users)	32. Add/edit evaluation sheet	5	0
	33. Add/edit student score	5	0
	34. View/monitor students under supervision	5	0
Internship Provider (5 users)	35. Add/edit information	5	0
	36. View student information	5	0
	37. Assign mentor	5	0
Mentor (5 users)	38. View list of assigned student	5	0
	39. Add/edit evaluation sheet	5	0
	40. Add/edit comment	5	0
Total		637	3

The system functionality test has a success rate of 99.53%. There were three errors found during the usability testing. One mistake was made by a student who uploaded incorrect file types and two mistakes were made by the administrator when the administrator wrongly assigned a user right and was unable to add a menu.

Table 3 Usability testing result

	Student	Supervisor	Administrator	Internship provider	Mentor
Rate of errors by users	1	0	2	0	0
Speed of performance	5 minutes	10 minutes	15 minutes	10 minutes	10 minutes
Time to learn	10 minutes	10 minutes	30 minutes	15 minutes	15 minutes
Retention over time	1 time	1 time	1 time	1 time	1 time
Proper function	excellent	excellent	excellent	excellent	excellent
Subjective satisfaction	excellent	excellent	excellent	excellent	excellent

On the usability test, all subject satisfaction is rated as excellent. Users could complete tasks in a few minutes. As a user-friendly interface, the simple configuration of the form and menus makes the system easy to use and shortens the learning time.

Table 4 Subjective satisfaction comparison

	Student	Supervisor	Administrator	Internship provider	Mentor
Manual system	poor	poor	poor	fair	fair
Cloud-based system	excellent	excellent	excellent	excellent	excellent

The system availability was 100%. The effectiveness value was 92% (based on 40 functions). With the Google Suite applications, our system development and deployment were fast, simple and easy. The simple administration functionality enables self-reliance, stability and long-term use. The result shows that users felt more comfortable and productive with the system.

Discussion

The objective of this research was to design a cloud- based internship management system that makes work more manageable and improves the processing and procedures of the Internship Management activity, especially in circumstances when remote or distance work is needed. The system requirements meant that the system must be easily used and managed by both inexperienced and experienced users, as a cloud- based system that allows AnyTime/AnyWhere/AnyDevice basis accessing. Using Google Suite as the cloud-based system, there are no hardware or software costs meaning that Google Suite suits organizations that have a small IT budget. The use of Google Suite also reduces the cost of learning, understanding and remembering the system. The result showed that the cloud approach can be applied to both simple and specific systems, as well as complicated systems. The implemented system significantly improved user access and operations, especially for the administrator. The framework can be considered as an exemplar of an internship management tool for other education institutions that have an internship course. Notwithstanding the specific requirements of an internship management system, the design proposals and guidelines apply to both specific and complicated systems as well as to regular management systems.

The research shows that an integrated HCD approach with the software development process that enables users to engage in the design phase gives system developers a better understanding of user needs. The system met the user requirements to the maximum. The combination of HCD and SDLC reduced the number of

unnecessary steps and elicit only the essential data . The balance between technology and human needs is a very important process. To reduce the complexity of the system and increase the user experience and usability of a complicated internship management system, the system must be divided into particular functions and the design of a complex system is expedited by the removal of redundant parts and unnecessary user data (Garett 2011).

In the system testing step, Black Box testing was applied which has the advantage of enabling testers to test without the need for specific knowledge of the programming languages used in the development. Testing can be done from the perspective of a user, not the person who designed the program which may sometimes fail to meet the needs of the users. A test case can be designed immediately after a requirement is identified without waiting for the program to finish. As shown by the heuristic scores achieved, defects highlight error prevention and correction, while also highlighting a lack of consistency and functionality in language and content and visual clarity. Consistency problems arose when developers used different words to describe the same concept or process: "log in … sign in", "remove … delete". The solution to the problem of inconsistency was to create a word library before developing the system so that developers use the same word throughout the system. The solution to the problem of error prevention is to have a confirmation before an action takes place. Simple error correction can be performed by creating a page that gathers the most common errors and basic troubleshooting methods.

To measure usability, effectiveness, efficiency, safety, utility, learnability and accessibility are evaluated (Preece, Pogers & Sharp 2015; Krug 2014). As illustrated in Table 3, each metric is discussed below:

1) Effectiveness: Effectiveness is measured by error rates. As a complex task, there was one error by a student and two errors by the administrator. The errors occurred due to a lack of expertise. These are not major mistakes and can be eradicated through skill training.

2) Efficiency: To measure efficiency, Rubin and Chisnell (2008) suggest that the accuracy and completeness of a user action are the measurable factors. Speed of performance was measured and the result shows that the administrator took the longest time because of the complexity of the administration tasks. Students took the shortest time to accomplish tasks. Overall, the performance speed was very fast which can be attributed to the people involved in the design process, especially students who were familiar with the technology and operational processes.

3) Safety: Safety includes mistakenly activating unwanted functions. This problem was overcome by providing reversing/undo options. Subject satisfaction from all participants was at an excellent level. This satisfaction level was measured by workflow, traceability, redo options, recovering previous versions, deleting unwanted data, and providing help support and error prevention.

4) Utility: Utility refers to having an adequate number of proper functions available. This satisfaction level was measured by the user being able to use the function provided to complete the task.

5) Learnability: Learnability was measured by the time spent learning how to use a system. Skills such as rapid learning, group work, collaboration, and knowledge sharing are typical of young generation skills.

6) Accessibility: Accessibility refers to the clarity and simplification of the system. Retention over time was used. The result showed that the proposed system was simple to use with users competent to access the system by themselves without assistance after a very short learning period.

Table 4 shows that the cloud-based system had a much higher satisfaction level than the manual one, based on subjective indications of user satisfaction. Overall, the results of the study show that the Google Suite

applications are relatively easy to use for most users. Sharing over the Internet is the most useful function (Maury 2015). Sharing and collaboration capabilities enable participants to improve their composing skills and increase beneficial outcomes of the internship management.

With limited resources and a requirement for rapid development of a system, our approach showed a significant increase in development productivity. The cloud computing system benefits both users and operators. The system is accessible on an AnyTime/AnyWhere/AnyDevice basis, is easy to use, easy to access, supports users, is easy to manage, and provides a high-performance service. Based on the results of the system testing, it can be concluded that users can perform the system efficiently and accomplish tasks expeditiously. When distance learning is necessary, for whatever reason, the system can help to manage the internship system. The administrator can manage the website easily. No software cost was incurred. User feedback and comments were used to create a more robust and effective system. The system was tuned according to the testing result to maximize the user requirement; less time is required to learn for new users.

Cloud computing-based systems have been compared most favourably to web-based systems (Dharod, 2004; Xue, 2015; Afiza et al., 2017; Yannuar et al., 2018). To create a web-based internship system, advanced computer programming skills would have been required and funding for ongoing maintenance is necessary. With a cloud-based system, administrators can customize the system on their own without having high-level programming skills. A study by on another internship system's administration identified several issues, including communication problems, which included failure to deliver correct and clear information as well as scheduling notifications. However, our results based on user satisfaction evaluation indicate that these issues can be easily resolved. The impact of cloud-based usage (Najiyabanu et al., 2019) was proposed but only the effect on internal users like students, administrators, and faculty were examined. External users, such as internship supervisors and mentors, were included in our research, ensuring that it covers all of the system's requirements. In our development, using the Google Suite tool yielded excellent results. Discovering the most appropriate tool in a cloud computing system, on the other hand, remains a challenge.

Due to cloud computing advantages, the cloud model has become increasingly popular but there are challenges when using a public cloud computing system. Security and privacy are key concerns. Viruses, phishing, malware and spoofing, and hacking are potential threats to networks and servers. Users do not know where their data is stored and have no control over it. Data leakage is a big problem for data security. It happens when the data is electronically transferred without the owner's permission to unsanctioned outsiders. Reliable internet connections are required and problems occur when connectivity to the Internet is not strong. Higher bandwidth is required when all cloud access is provided over the Internet. Another issue is a third-party stabilization of the services and add-ins. The users do not have full power over the system. In addition, some cloud systems only provide support for particular platforms and languages.

Conclusion and Suggestions

In this research, a cloud-based system to manage internship courses using Google's Suite services was developed. The developed computerized system facilitated work efficiency and productivity. The system is simple to use and learn, user-friendly, flexible, effortless, and consistent. All information and documents are stored in the Google Suite tool in which every user can access the information on an AnyTime/AnyWhere/AnyDevice

basis. The computerized internship management system will mainly benefit the student, as well as all parties involved in the internship program. Topics which need to be considered to implement the cloud-based approach to the complex system are also presented. The system is a successful example of a development that can be considered as a guideline to the development of a distance management system in a rapid time. This research provides a cloud-based approach that can be employed in internship management systems related to educational management applications with similar functionalities.

For further research, more functionality can be added, for example, the device should be able to send a message automatically when there is a new notification or response to an action. To minimize the amount of printed paper, an electronic signature system should be added. With broad career support and students from a variety of organizations applying, such as libraries and IT organizations, the internship provider recommendation system is another challenge for the future in which student skills can align with the most appropriate organization. Turning Google Suite apps into a mobile applications is another challenge for the most convenient use. On the cloud side, hybrid cloud computing is studied to ensure data security and privacy. A hybrid cloud combined with private and public cloud infrastructure needs to be secure and data protected by storing on a private cloud while other applications will be located in the public cloud.

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