JOURNAL OF DIGITAL SYSTEM DEVELOPMENT

https://e-journal.uum.edu.my/index.php/jdsd

How to cite this article:
Husin, M. Z., Ganes, P. R., & Puteh, N. (2024). A Web-Based Industrial Training Management System: A Case Study of the School of Computing. *Journal of Digital System Developments*, *2*(2), 64-78. https://doi.org/10.32890/jdsd2024.2.2.5

A WEB-BASED INDUSTRIAL TRAINING MANAGEMENT SYSTEM: A CASE STUDY OF THE SCHOOL OF COMPUTING

[1]Mohd Zabidin Husin, [2]Pravin Raj Ganes & [3]Nurnasran Puteh
[1,2,3]School of Computing (SOC)
Universiti Utara Malaysia, Malaysia

[1]Corresponding author: zabidin@uum.edu.my

Received: 25/08/2024 Revised: 02/09/2024 Accepted: 04/09/2024 Published: 20/10/2024

ABSTRACT

Implementing an internship program is an integral part of an educational institution's academic operations, providing students with valuable experience in their chosen fields. However, effective program management ensures seamless collaboration between students and the university. This paper aims to develop and evaluate a prototype of a web-based industrial training management system tailored specifically for a university to address this need. Currently, the school uses online storage and an instant messaging application to manage student internships. Consequently, this implementation causes confusion, repeated questions, and redundant announcements that must be organised systematically. This development focuses on managing documentation, announcements, and communication among students and school members. The project employs a Rapid Application Development methodology to streamline the entire process from initiation to completion. The findings show high satisfaction with the system's usefulness, ease of use, and learning in improving the management of industrial training processes. In conclusion, the resulting prototype demonstrates the potential benefits, including improved accessibility, streamlined internship management processes, and efficiency within the university.

Keywords: industrial training management, practicum system, student internship system.

INTRODUCTION

Implementing an internship programme for students is one of an educational institution's academic business operations. Employers provide internships to students interested in obtaining experience in

specific fields. Students can learn how to enter the workforce through internship programs (Franks & Oliver, 2012). At the same time, students receive an excellent opportunity to put theories they have learnt into practice in the workplace through the internship process (ChanLin & Hung, 2015). The primary goal of the internship programme is to help students advance their abilities and skills and prepare for the workforce environment (Parveen & Mirza, 2012). Thus, collaboration with multiple companies plays a crucial role in achieving the goal in the university environment. These collaborations allow students to work on real projects within the companies, with placements tailored to their areas of expertise (Hasti et al., 2019).

At the School of Computing (SOC), Universiti Utara Malaysia (UUM), this emphasis on real-world experience is reflected in the mandatory practicum for final-year students. After accumulating at least 110 credit hours or reaching their sixth semester, students must complete a 24-week practicum at designated organisations, where they apply their knowledge and skills professionally.

The primary motivation of this project is that the SOC currently needs a system (one-stop centre) to manage students' internships efficiently. The current practice of managing this internship program uses two platforms, GitHub and WhatsApp. GitHub is used to disseminate information, including announcements, important dates (start and end of practicum, proposal and final report submission, etc.), and to download practicum guidelines documents and forms. Sometimes, students need the proper forms due to its multiple versions of GitHub that relate to the SOC's internship program. Meanwhile, WhatsApp is used to disperse additional information related to the internship and handle the Question and Answer (Q&A). The two-way communication happens only via WhatsApp medium for all student batches. The SOC Practicum committee must create a separate WhatsApp group for each batch. It will be tedious for the committee to disseminate information related to industrial training. When this information is handled in separate multiple platforms, it can lead to students needing clarification about where to properly look for practicum documents to be downloaded, and questions that students ask might be ignored or have already been answered by the committee multiple times. The given announcements might need to be more varied or valuable depending on the specific batch of students.

Thus, this paper aims to develop and evaluate a web-based industrial training management system with the primary objective of streamlining the process related to these matters within the SOC's environment. In order to achieve the primary objective, the second objective must be fulfilled, such as identifying, analysing, designing, developing, and evaluating the web-based industrial training management system. The project scope covers the management process of documents and forms, announcements, and Q&A. The project adopted the application development methodology, incorporating all stages, including requirement planning, user design, construction, and cutover. The primary implementation of the system was constructed using the PHP programming language and supported by the other related tools. The Unified Modeling Language (UML) diagrams were employed to analyse and design the system properly, which will make the system easier to understand.

In conclusion, the system significantly contributes to the stakeholders by providing students with more effective and efficient access to crucial training resources. The proposed system has solved the issues of finding the latest documents and forms, receiving irrelevant announcements via WhatsApp, and disorganised Q&A. The project also improves the administrative, supervisory, and student user experiences through role-based functionality and user authentication. Regarding the system evaluation, most users agree that the system benefits them in terms of usefulness, user-friendliness, ease of use, and learning. Overall, the system enhances the institution's overall quality of instruction. It promotes an environment

favourable for learning and development by facilitating effective information distribution, user-friendly interactions, and enhanced access to training materials.

The rest of this paper is organised as follows: Section 1 presents the introduction, while Section 2 elaborates on the related works. Section 3 explains the methodology, followed by Section 4, which presents the design and development of the system. Section 5 discusses the evaluation of the system. The last section concludes.

RELATED WORKS

This section provides a thorough summary of previous research and literature that is relevant to the study that is being proposed, which helps the project to build a solid importance and necessity of the work. Hasti et al. (2019) conducted a study that aimed to solve the problems in each stage of the internship process, starting from registration, selecting an internship place, selecting a supervisor, submitting an internship report, and appraisal of internship reports. The author developed a system using the object-oriented approach, and the system development method is the Prototype Method. The result of this study is a web-based internship information system that can minimise errors in managing the internship as a whole and provide information about internships to students quickly. The authors found that the web-based information system is essential for managing internships in educational institutions.

Meanwhile, Bharamagoudar et al. (2013) have proposed and developed a system for Student Information Management System (SIMS). The reason was to help educational institutes record student data conveniently. This is important to manage accurate data and to have up-to-date information about the student's academic career in the university. Additionally, the student information system handles a variation of students' details such as their academic-related reports, curriculum, batch, course they are taking and many more resource-related details. The system tracks all the data about the students from day one until they graduate, which in turn can be used for reporting purposes: their attendance and progress in the course, the details about the exam, assignment details, and final exam results. All this information will be easily viewed through an online interface website, which the college will secure and implement. The method that is used in the project consists of a detailed flow graph, requirement analysis, data flow diagram, and the design process of the front end and back end of the student information management system. It has been found that the project is vital to universities and colleges as it reduces the workforce required by automating a manual system, and information errors will be reduced.

Abdullah et al. (2017) developed a web-based application of the internship management system for Universiti Teknologi Mara (UiTM), Perlis. The authors identified the main problem as the manual management of the internship program, which caused inefficiency, paper waste, and poor communication among students, coordinators, and employers. The authors designed and implemented a web-based system using case-based reasoning, which matched the industry's requirements with the student's qualifications and automatically generated the placement for the students. The authors conducted two methods of testing: heuristic evaluation and user acceptance test. The authors measured the user interface satisfaction, usefulness, ease of use, and usability of the system by the users. The authors discovered that the system achieved excellent performance and solved the manual management problem.

Jaafar et al. (2017) developed a web-based system named iMAPS for internship monitoring and supervising at UiTM using the Software Development Life Cycle (SDLC) methodology. The system was built to address the problem of inefficient and manual processes of internship management, such as eligibility checking, registration, visit scheduling, and evaluation. The authors have analysed the current

system, designed the system architecture and interface, implemented the system using web technologies, and tested the system using black-box and user acceptance methods. The authors found that the system can improve the internship process's efficiency, accuracy, convenience, and transparency and benefit the stakeholders.

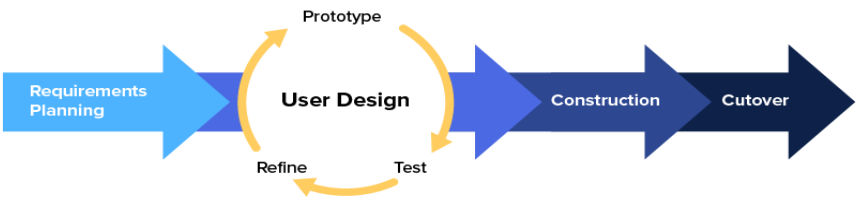
Yannuar et al. (2018) addressed the problem of low utilisation of information technology in internship programs at vocational schools. The authors designed and implemented a web-based internship information system to facilitate students, supervisors, and coordinators in the internship process. The system is called LK-99, and it has various features such as information, schedule, signup, journal, report, backup, and guidance. The authors used the Design Science Research Methods (DSRM), a research approach to producing products and services information systems. The authors validated the system by two experts (material and media validator) and obtained scores of 80 and 82.05, respectively. The authors also tested the system with 30 students and found that it can improve the internship program's communication, coordination, and evaluation. The authors concluded that the system can support the internship program for all parties involved.

METHODOLOGY

This system followed the Rapid Application Development (RAD) methodology. Figure 1 shows the RAD methodology, a sequential linear system development method that stresses a system development cycle with a relatively short time frame. This led to time savings and speedier system development procedures (Awaliah et al., 2019; Iskandar, 2022). The RAD approach to software design made system development and maintenance more effective. A typical application development scenario requires at least 180 days to complete; however, using the Rapid Application Development (RAD) method, the software application could be finished in 30 to 90 days (Wahyuningrum et al., 2021). With this approach, a Web-based Industrial Training Management System was quickly developed and released, as RAD facilitated ongoing feedback and collaboration throughout the project lifecycle, ensuring it followed the needs of students; furthermore, by adopting RAD, the Web-based Industrial Training Management System project aimed to centralise the platform, allowing for two-way communication between students and the SOC's practicum committee and providing easier access for students to access documents related to industrial training.

Figure 1

The Phases of the RAD Methodology



The requirement planning phase will include several tasks, including investigating the current issue with this project, defining the project's requirements, and finalising the requirements with the approval of each stakeholder. In this case, developers must understand the requirements of the students, staff, and the practicum committee and translate them into comprehensive specifications. Several interviews were conducted with them during the requirement phase to obtain precise requirements. The gathered

requirements were then used to conduct a thorough analysis. Aside from the interview, several studies were conducted using various Internet resources and research papers. The deliverables of this phase will include a list of functional and non-functional requirements for the system. Then, several UML diagrams were created, such as use case diagrams.

Once this project's scope has been defined through its requirements, it will proceed to the user design phase, which will involve multiple prototype iterations. This phase will investigate and validate ideas, collect early feedback, and identify potential issues or improvements before devoting significant time and resources to developing a fully developed prototype or final product. The prototype was created during this phase using Figma, PHP, CSS, HTML, JavaScript, MySQL, Bootstrap, and Visual Studio Code. The system must allow easy navigation, document categorisation, and search capabilities. Furthermore, during this phase, the SOC staff worked with the developer to ensure that her requirements were met at all stages of the design process.

The prototypes created during the design phase will then be converted into working models during the rapid construction phase. Because most problems and changes were addressed during the extensive iterative design phase, developers can complete the final working model more quickly than they could with a traditional project management approach. This phase has been broken down into smaller steps: rapid construction preparation, application development, and system testing of code. This phase ensures everything runs smoothly and that the finished product meets the client's expectations and objectives.

Finally, the final phase, cutover, consists of several activities, such as final testing, deployment, and training. Before releasing the system, it goes through final testing to meet all functional requirements. This includes usability and user acceptance testing with the system stakeholders. The usability testing evaluation followed a systematic approach, encompassing the following steps: defining the evaluation criteria, formulating evaluation questions, selecting appropriate measurement methods and procedures, collecting data, processing and analysing the data, and applying the evaluation findings. The questionnaire addressed critical aspects of the system, including its usefulness, ease of learning, and ease of use. A quantitative method was employed to analyse the results. Several stakeholders participated in the evaluation process by responding to structured questions. After passing all tests and receiving the stakeholders' approval, the system is deployed and hosted on a live web server. The stakeholders were then trained on how to use and maintain the system.

DESIGN AND DEVELOPMENT OF INDUSTRIAL TRAINING MANAGEMENT SYSTEM

The Web-based Industrial Training Management System was designed and developed using a four-phase development methodology, as explained in the previous section. In order to make sure that the particular demands of the students and staff were met, requirements were obtained through consultations. A functioning model of the system was developed during the prototype development phase, displaying its key functionalities and user interface layout. Through constant input and improvement, this iterative process ensured that the results satisfied the user's requirements and offered a practical, user-friendly industrial training management solution.

The system requirements were documented with input from the staff and students. The design and development of a web-based solution that meets users' needs, boosts productivity, and increases the industrial training management process was based on these requirements. Managing student accounts, changing passwords, managing documents, viewing announcements, asking questions, logging in,

downloading documents, and viewing announcements are among the eight critical requirements in Table 1 of the requirements-gathering process.

The requirements are divided into three priority categories: mandatory (M), desirable (D), and optional (O). This helps set development priorities and guarantees that critical features are completed first. These specifications cover every necessary component of the industrial training management system. The capabilities of the computer system were translated into the specifications shown in Table 1.

Table 1

List of Requirements for a Web-based Industrial Training Management System

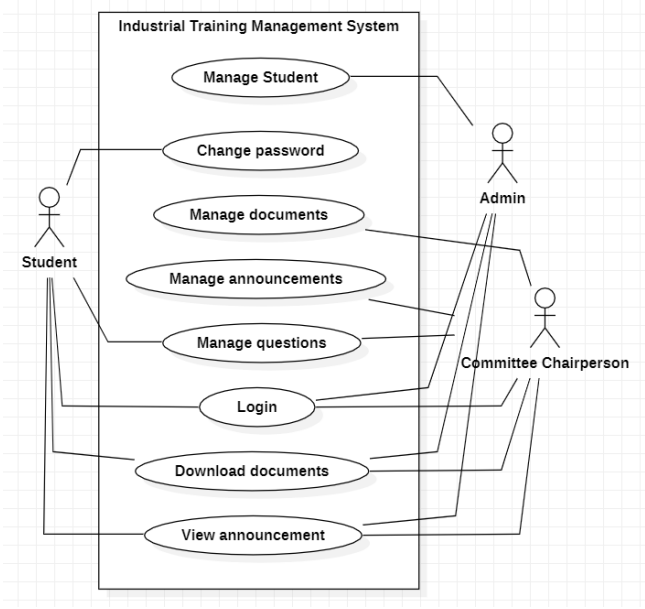
No.	Requirement ID	Requirement Description	Priority
1	ITMS_01	Manage Students Account	
	ITMS_01_01	Admin can register a new student	High
	ITMS_01_02	Admin can delete student data	Desirable
	ITMS_01_03	Admin can edit details of student	Optional
	ITMS_01_04	Admin can view details of student	High
2	ITMS_02	Change password	
	ITMS_02_01	Students can change old passwords to new ones in case of a forgotten	High
3	ITMS_03	Manage documents	
	ITMS_03_01	The committee chairperson can add documents	High
	ITMS_03_02	The committee chairperson can delete documents	Desirable
	ITMS_03_03	The committee chairperson can edit documents	Optional
	ITMS_03_04	The committee chairperson can search for documents	Optional
	ITMS_03_05	The committee chairperson can display all documents	High
4	ITMS_04	Manage Announcement	
	ITMS_04_01	The committee chairperson can add announcements to students in specific or all batches.	High
	ITMS_04_02	The committee chairperson can delete announcements for students in specific batches or all.	Desirable
	ITMS_04_03	The committee chairperson can edit student announcements in specific or all batches.	Optional

	ITMS_04_04	The committee chairperson can search for announcements to students in specific or all batches.	Optional
	ITMS_04_05	The committee chairperson can display announcements to students in specific or all batches.	High
5	ITMS_05	Manage Questions	
	ITMS_05_01	Students can ask questions to the committee chairperson	High
	ITMS_05_02	The system will notify the committee about the incoming question via email	High
	ITMS_05_03	The committee chairperson can answer(add) student questions through the system.	Desirable
6	ITMS_06	Login	
	ITMS_06_01	Users (Student, Committee chairperson, Admin) can log in to the system	High
7	ITMS_07	Download documents	
	ITMS_07_01	Users (Students, Committee chairperson, Admin) can download practicum documents in the system.	High
8	ITMS_08	View Announcement	
	ITMS_08_01	Users (Student, Committee chairperson, Admin) can view the announcement	High

The next step in the process is visualising and modelling the requirement using the proper modelling technique and tools. A use case diagram was used for this purpose, which made it possible to depict the system's functional requirements from the viewpoint of its stakeholders. The diagram shows the interactions between actors and particular use cases, which stand in for the system's functionalities. Figure 2 shows that the use case diagram has three actors interacting with the eight major use cases: manage students, change passwords, manage documents, manage announcements, manage questions, log in, download documents, and view announcements.

Figure 2

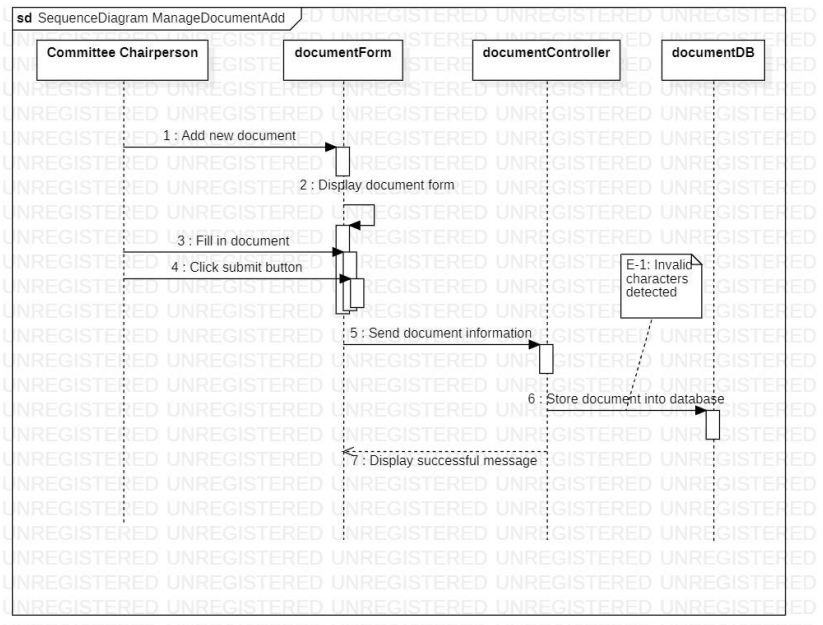
Use Case Diagram



These models accurately represent the structure and functioning of the system, offering essential insights for the development process. The sequence diagram in Figure 3 illustrates how multiple classes add a document to a database through a designated form. The committee chairperson is the sole actor in this scenario who can interact with the appropriate classes like DocumentForm, DocumentController, and DocumentDB.

Figure 3

Sequence Diagram of Add Document functionality



To illustrate the needs stated in the previous section, a web-based system prototype was developed. Users can engage with this prototype, which is an actual model of the program requirements and offers constructive criticism. Software prototyping is a popular technique that involves giving people a hands-on experience with the prototype to get feedback and suggestions. The prototype can be enhanced and modified through this iterative approach to better suit the demands of the consumers. The prototype's creation guarantees that the system's features and functionality meet the criteria as stated, laying a solid basis for the project's further phases. Thus, the following screenshot example will explain briefly how to manage document use cases that are only accessible by the committee chairperson. Figure 4 depicts the add document page that provides the functionality to upload documents with any allowed file format. In the add document form, the Committee chairperson can fill in the form such as Document Name, File Path, Publish Date and click the ‘Add Document’ button after filling up the form.

Figure 4

Screenshot of Add Document Page

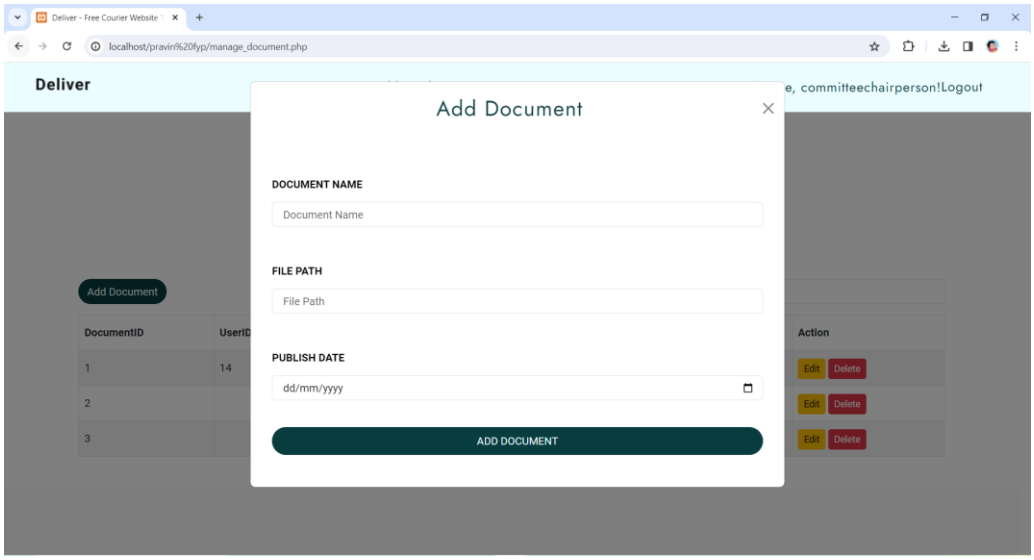


Figure 5 shows the edit document page, which provides the functionality to edit documents if the document sent requires additional fixing. In the edit document form, the Committee chairperson can edit the selected data, such as Document Name, File Path, and Publish Date and click the 'Edit Document' button after editing the form.

Figure 5

Screenshot of Edit Document Page

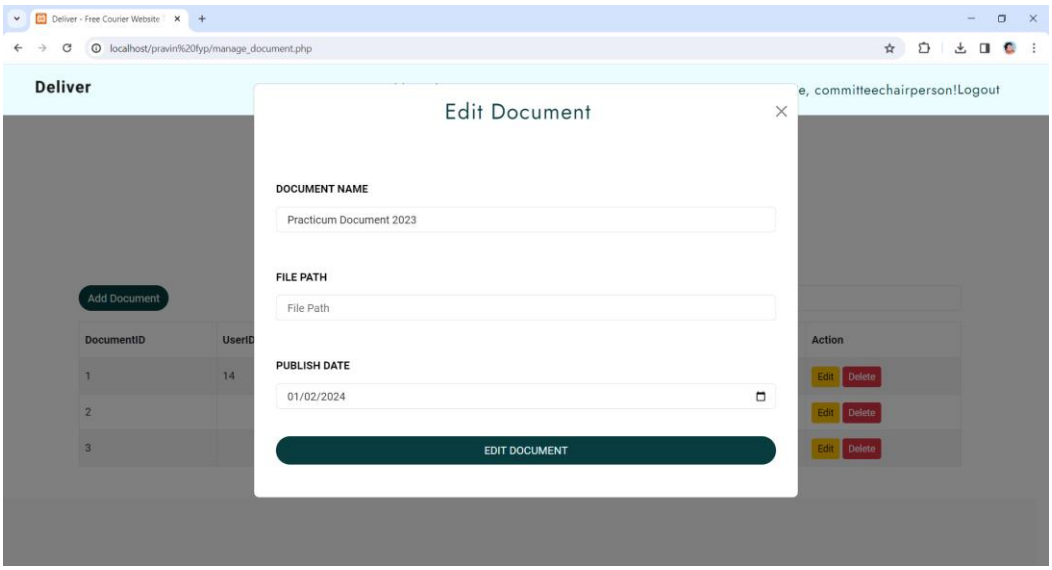


Figure 6 illustrates the delete document page that provides the functionality to delete documents. In the delete document form, the Committee chairperson clicks the 'Delete' button from one of the document's data in the table. A confirmation message will be displayed to prevent accidental deletions.

Figure 6

Screenshot of Delete Document Page

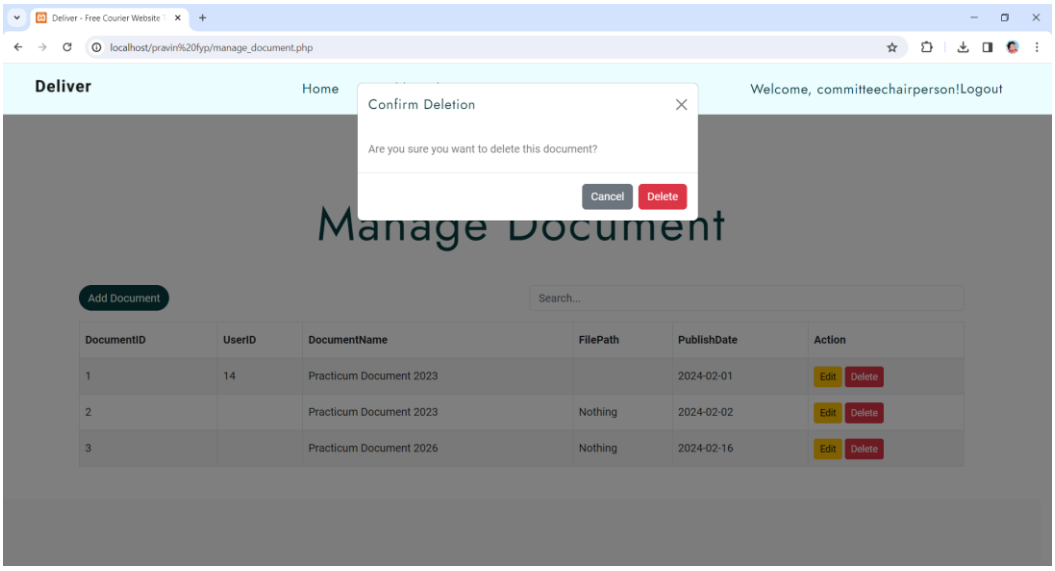
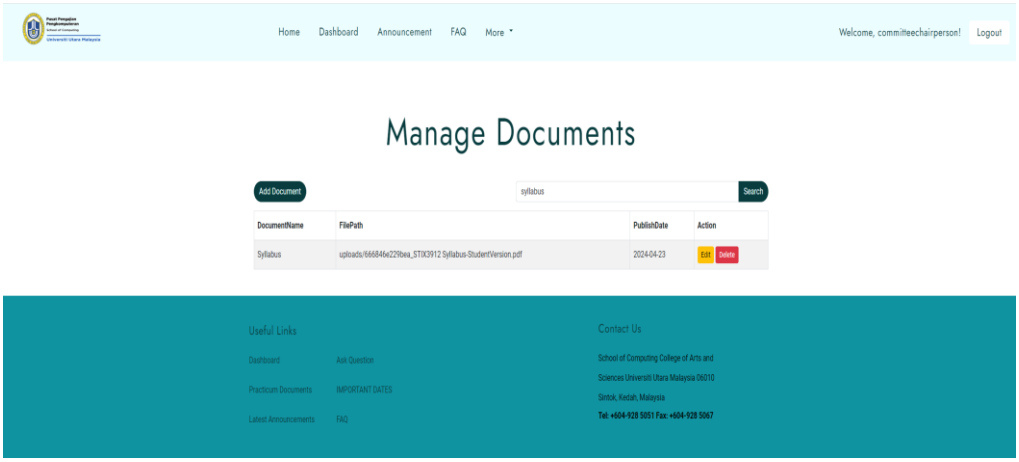


Figure 7 depicts the search document page, which provides the functionality to search documents based on specific keywords, such as document names. This is easily accessible for the committee chairperson to lessen the struggle of finding specific documents, enhancing the efficiency of document retrieval.

Figure 7

Screenshot of Search Document Page



EVALUATION OF THE INDUSTRIAL TRAINING MANAGEMENT SYSTEM

Usability testing has been chosen as one of the evaluation techniques for examining the industrial training management system (ITMS). Respondents from the stakeholders were asked to participate in the study. This online survey included about 30 people. Each participant must answer questions regarding demographic factors, how the system is used, how simple it is to use, how easy it is to learn and use the system, and how useful it is for the respondents. Respondents' demographic data was gathered in Section A. Section B used a five-point Likert scale where the respondents rated their opinion on the ITMS with the following scoring: SD (Strongly Disagree), D (Disagree), N (Neutral), A (Agree), and SA (Strongly Agree). Respondents were shown how the system worked. Then, based on what they observed and understood about the system being shown, the respondents will use a Google Form to answer the related questions.

In the first section, an analysis of the respondents' demographic information revealed that for gender, 20 respondents identified as male, and 10 respondents identified as female. Out of the total number of respondents, 24 respondents fell in the range of age 22–24, 4 respondents in the range of 19–21, and 2 in the range of 25–27. For the analysis of respondents' years of experience at university, 26 respondents have experience at the university in the range of 1–5 years, while only four respondents have experience of less than one year at the university. Out of the total number of respondents, the majority, which consists of 24 respondents, have never used any practicum website before, but six respondents have used it before.

In the next section, an analysis was performed on the responses given by the respondents in Section B of the post-task questionnaire during the usability testing. This part reflects the respondents' opinions of the system's usefulness, ease of learning, and ease of use.

Figure 8 shows unanimous agreement or strong agreement across all statements. Respondents believe that ITMS helps them be more effective, makes tasks more manageable, saves time, and meets their needs. Figure 9 indicates that the respondents generally find ITMS simple and user-friendly, with the majority agreeing or agreeing with statements about ease of use, including simplicity, user-friendliness, and the ability to recover from mistakes.

Figure 8

Usefulness Results of ITMS

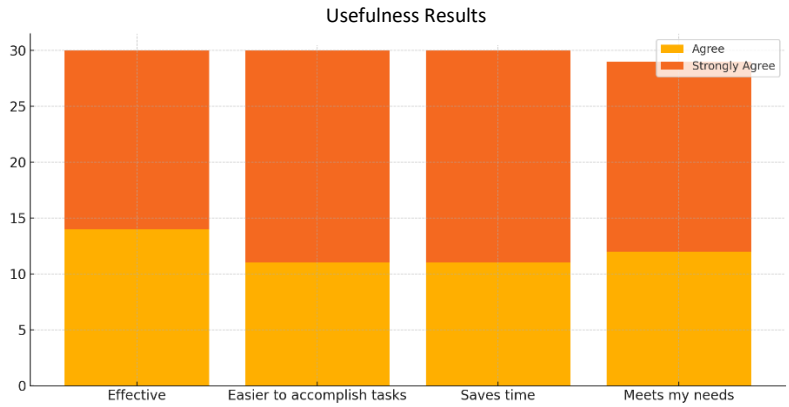
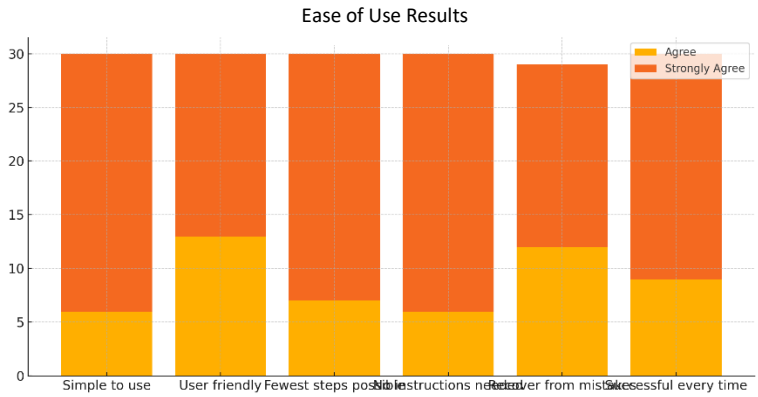


Figure 9

Ease of Use Results of ITMS



Then, Figure 10 illustrates that the responses suggest that ITMS is easy to learn and use, with all respondents agreeing or strongly agreeing that it is easy to learn, remember, and use. Lastly, Figure 11 shows that the satisfaction results indicate high satisfaction with ITMS, with all respondents agreeing or strongly agreeing that they are satisfied with the system, that it works as expected, and is pleasant to use.

Figure 10

Ease of Learning Results of ITMS

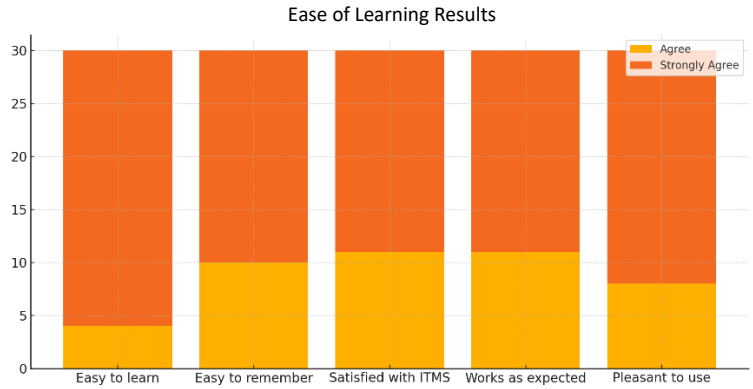
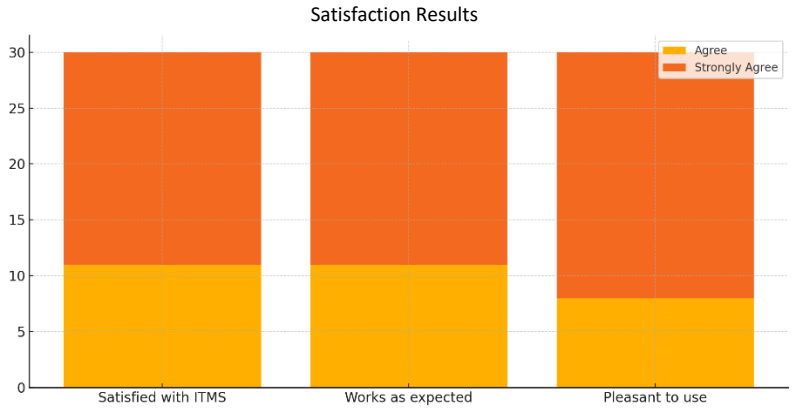


Figure 11

Satisfaction Results of ITMS



Overall, the post-task questionnaire responses analysis during usability testing revealed a highly positive perception of ITMS across all evaluated aspects. Respondents consistently agree or strongly agree that the system is functional, easy to use, learn, and satisfying. These findings suggest that ITMS effectively meets user needs and is well-received by those who interact with it.

CONCLUSION

In conclusion, developing a web-based industrial training management system for UUM's School of Computing represents a significant step in streamlining the internship process for students and the SOC. This system addresses the challenges of using multiple platforms, such as GitHub and WhatsApp, resulting in confusion, redundant communications, and document management issues. By consolidating all relevant information, communications, and documentation into a user-friendly interface, the system improves the overall efficiency and effectiveness of internship management processes. The findings show high satisfaction with the system’s usefulness, ease of use, and learning in improving the management of industrial training processes. The resulting prototype demonstrates the potential benefits, including improved accessibility, streamlined internship management processes, and efficiency within the School of Computing. The system's functionality will be enhanced for future work by integrating advanced

communication tools that facilitate seamless interaction between school supervisors and industry partners. Additionally, comprehensive student activity monitoring features will be implemented to allow for detailed tracking and documentation of students' daily activities and progress, ensuring accurate and up-to-date records. Furthermore, a centralised document repository will provide a secure platform for students to upload, manage, and store essential documents, ensuring accessibility for both students and supervisors for review and updates.

Overall, the web-based industrial training management system is poised to become an invaluable asset to the School of Computing at UUM. It addresses current inefficiencies and lays the groundwork for ongoing improvements in how internships are managed. By embracing this technological solution, the School of Computing proactively enhances the educational experience and ensures students are better prepared for their professional careers.

ACKNOWLEDGMENT

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

Abdullah, F. S., Abu Seman, A., Ibrahim, N., Majid, N. A., Abdul Wahab, N. M., Mustafa, M. S., & Mohd Sani, N. F. (2017). Web-based application of the internship management system. *Journal of Computing Research and Innovation (JCRINN)*, 2(3), 46-51.

Awaliah, N., Justika, A., Laswi, A. S., & others. (2022). Library Information System on Public Elementary School 108 Home Base Based on Android. *Ceddi Journal of Education, 1*(2), 8–12.

Bharamagoudar, S. R., Geeta, R. B., & Totad, S. G. (2013). Web-based student information management system. *International Journal of Advanced Research in Computer and Communication Engineering*, 2(6), 2342-2348.

ChanLin, L. , & Hung, W. (2015). Evaluation of An Online Internship Journal System for Interns. *Procedia - Social and Behavioral Sciences, 191*. 10.1016/j.sbspro.2015.04.700

Franks, P. C., & Oliver, G. C. (2012). Experiential learning and international collaboration opportunities: Virtual internships. *Library Review, 61*(4), 272–285. https://doi.org/10.1108/00242531211267572

Hasti, N & Lesari, S & Gustiana, Iyan. (2019). Web-Based Internship Information System. IOP *Conference Series: Materials Science and Engineering*. 662. 022090. 10.1088/1757-899X/662/2/022090.

Iskandar, A. (2022). Developing a Word Composition Educational Game for Young Children After the Covid-19 Pandemic. *Ceddi Journal of Education, 1*(2), 19–24. https://doi.org/https://doi.org/10.56134/cje.v1i2.27

Jaafar, A. N., Rohafauzi, S., Mohd Fauzi, F. D. H., & Amron, M. T. (2017). Development of internship monitoring and supervising web-based system**.** *2017 IEEE 15th Student Conference on Research and Development (SCOReD)*, 193-197. IEEE

Parveen, S., and Mirza, N. (2012). Internship program in education: effectiveness, problems and prospects. *International Journal of Learning and Development, 2*(1), 487-498.

Wahyuningrum, T., Fitriana, G. F., Wardhana, A. C., Sidiq, M.A., & Wahyuningsih, D. (2021). Developing suicide risk idea identification for teenager (SERIINA) mobile apps prototype using extended rapid application development. *2021 9th International Conference on Information and Communication Technology (ICoICT)*, 92–97.

Yannuar, Y., Hasan, B., Abdullah, A. G., Hakim, D. L., & Wahyudin, D. (2018). Design and implementation of a web-based internship information system at a vocational school. *IOP Conference Series: Materials Science and Engineering*, *434*(1), 012301. IOP Publishing. https://doi.org/10.1088/1757-899X/434/1/012301