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Development of a Web-Based Industrial Training Student Activity Management System

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Abstract

Background of study: Industrial training is essential for bridging academic knowledge and workplace practice, equipping students with technical and soft skills required for future employment. However, traditional documentation methods such as manual logbooks are often inefficient, error-prone, and limit effective supervision and timely feedback.
Aims and scope of paper: This paper presents the development of the Web-Based Industrial Training Student Activity Management System (WIT), designed to streamline industrial training management at the School of Computing, Universiti Utara Malaysia. The system aims to enhance communication, ensure accurate reporting, and support sustainable digital supervision.
Methods: The WIT system was developed using the Waterfall Model, with stakeholder input incorporated at each stage of requirements, design, development, testing, and maintenance. Usability testing was conducted with 30 participants (students and staff) using the WAMMI framework, which evaluates five key usability dimensions.
Result: The evaluation results demonstrated high levels of user satisfaction across all metrics: Attractiveness (91.67%), Controllability (97.5%), Helpfulness (94.17%), Efficiency (92.5%), and Learnability (96.67%). These findings confirm that WIT provides an effective, user-friendly platform for activity logging, reporting, and supervision.
Conclusion: WIT successfully addresses challenges in traditional training management by promoting transparency, accountability, and efficient supervision. The system contributes to ICT-driven educational innovation and has strong potential for future scalability, including mobile integration and advanced analytics.

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INTRODUCTION

Industrial training is a structured program that connects academic learning with practical work experience, allowing students to apply theoretical knowledge in real-world settings. Usually conducted over several months within organizations related to students' fields of study, this training helps improve employability, professional readiness, and soft skills such as communication and teamwork. Anjum (2020) highlights that internship and industrial training programs are essential for students' professional and personal growth by boosting their confidence, enhancing technical skills, and preparing them to meet the changing demands of the workplace.

The benefits of industrial training extend beyond students to the host organizations as well. These organizations gain fresh perspectives and potential future employees while fulfilling their corporate social responsibility by supporting higher education. Yusof et al. (2012) stress that authentic assessment during industrial training is vital to ensure that both students and organizations benefit. Through active involvement, organizations can identify promising candidates and help develop graduates whose skills better match industry needs.

Despite its importance, industrial training faces several challenges, particularly in monitoring and evaluating student progress. Traditionally, students document their daily activities in physical log books, which are reviewed periodically by supervisors and submitted to the university after training. However, this manual process is time-consuming, prone to delays, and vulnerable to incomplete or inaccurate records (Subramaniam et al., 2022).

The drawbacks of manual log books became more pronounced during the COVID-19 pandemic, which limited face-to-face interactions and made traditional monitoring difficult. Azahar et al., (2024) noted that the lack of adequate digital infrastructure during this period reduced engagement between students and supervisors and made tracking and evaluating activities challenging. These issues underscored the need for a more efficient, accessible, and reliable system to support industrial training documentation and supervision.

A central problem lies in activity reporting. Students often find it hard to keep consistent and timely records, while supervisors struggle to verify the accuracy of these reports. This situation affects the overall assessment and reduces the effectiveness of industrial training programs. Hatibu et al. (2024) recommend adopting information and management systems that streamline the reporting process by providing real-time access, standardized templates, and digital monitoring tools to benefit all parties involved. Similarly, Ishak and Ismail (2021) and Lee and Ishak (2023) demonstrate the potential of web-based platforms to improve information access and user experience through centralized systems that support efficient data management.

While many applications have been developed to tackle these challenges, as discussed in the literature review, this study introduces a new application tailored for students at the School of Computing, Universiti Utara Malaysia. The proposed Web-Based Industrial Training Student Activity Management System (WIT) uses information and communication technology (ICT) to modernize reporting and supervision. It allows students to record activities online and enables both organization and university supervisors to monitor progress remotely. This system aims to increase efficiency, improve documentation accuracy, and support more effective feedback throughout the training period.

Industrial training systems and activity management platforms have evolved significantly to tackle ongoing challenges in monitoring, documenting, and evaluating students' industrial training experiences. A variety of initiatives—from academic theses to scholarly articles—reflect growing efforts to use information and communication technology (ICT) to enhance the efficiency, accuracy, and reliability of activity reporting during industrial training. The literature reviewed offers valuable insights into common problems and the innovations introduced to address them.

A frequent issue across industrial training programs is the inefficiency of manual logbooks, which hampers effective supervision and evaluation. Several student-developed systems have sought to digitize this process. For instance, Ismail (2013) developed an e-Activity Management System at Universiti Teknologi MARA, allowing students to record their activities online and enabling supervisors to verify submissions remotely. While this system improved accessibility and reduced paperwork, it lacked integration with academic databases and automated evaluation features.

Similarly, Suhaimi (2019) proposed an Industrial Training Management System that supports document uploads, supervisor comments, and basic performance tracking. Although the system offered a practical interface, it was limited to simple functions and did not include data analytics tools to track student progress over time. This limitation aligns with the concerns raised by Subramaniam et al. (2022), who pointed out in their systematic review that many systems focus mainly on documentation, often overlooking comprehensive performance analysis, user experience, and integration with institutional platforms.

More recently, Husin et al. (2024) presented a more comprehensive Web-Based Industrial Training Management System designed for the School of Computing. This system features structured student profiles, automatic reminders, real-time feedback, and supervisor dashboards. It addresses key challenges such as delays in evaluation, poor communication, and inconsistent reporting. However, the study also noted challenges in maintaining continuous user engagement and scaling the system to other faculties.

Hatibu et al. (2024) developed an Industrial Practical Training Information and Management System in East Africa. This system focuses on automating approval workflows, digital attendance logging, and report generation. It reduced administrative delays and improved data consistency but relied heavily on constant internet access, which limited its effectiveness in remote areas with poor connectivity (Hughes, 2003).

Adetiba et al. (2012) developed the e-SIWES portal to support registration, report uploads, and evaluation. Similarly, Zeng (2019) built a database management system for industrial training that efficiently stored and retrieved data but lacked real-time collaboration features.

Other systems address broader student activity management beyond industrial training. For example, Tiware et al. (2018) and Kumar et al. (2018) developed College Activity Management Systems that centralize event coordination, attendance tracking, and task assignments. While useful for general academic activities, these platforms do not cater specifically to the unique requirements of industrial training, such as multi-stakeholder supervision and detailed performance tracking.

Several projects also highlight the interest of undergraduate students in this area, with many systems developed as part of final year projects (Ku Mangsor, 2005; Darshini, 2020). This trend shows a strong student motivation to solve practical problems using software and underscores the need for institutions to support scalable and sustainable solutions. Table 1 compares selected applications based on their core features, target users, limitations, and unique contributions.

Table 1. Comparison of the application features

System/Author	Key Features	Target Users	Limitations	Unique Contribution
Ismail (2013)	Online logging, supervisor validation	FSKM students	No performance analytics	Early digital logbook innovation
Suhaimi (2019)	Document upload, comments	UMP students	Basic functionality, lacks insights	Simplifies supervisor feedback process
Husin et al. (2024)	Real-time feedback, reminders, supervisor dashboard	UUM School of Computing	User engagement, scalability	Comprehensive and structured system tailored for UUM
Hatibu et al. (2024)	Attendance tracking, automated workflows	East African training institutions	Connectivity issues	Workflow automation and administrative streamlining
Adetiba et al. (2012)	Registration, reporting, supervisor evaluation	Nigerian SIWES participants	Outdated UI, limited mobile support	Early portal-based SIWES management

Zeng (2019)	Training record database	UNIMAS students	No collaboration or feedback features	Strong data retrieval functionality
Tiware et al. (2018), Kumar et al. (2018)	Activity scheduling, attendance management	College students	Not designed for industrial training	Generalized academic activity tracking
Darshini (2020), Ku Mangsor (2005)	Report generation, calendar integration	Final year project students	Prototype-level, limited deployment	Highlights academic interest in ICT-driven training management

METHOD

The Waterfall Model was selected for this study because it provides a structured, sequential, and well-documented development process that aligns with the requirements of the WIT. The project's scope and requirements were well defined from the outset through consultations with students, mentors, and coordinators. Since the system's objectives, namely digitizing activity logging, report submission, and feedback mechanisms were clear and stable, the linear phases of the Waterfall approach ensured that each stage (requirements analysis, design, development, testing, and maintenance) was thoroughly completed before moving to the next.

1. Requirements Analysis
In the initial phase, system requirements were identified through interviews and consultations with key stakeholders including students, academic mentors, and industrial training coordinators from the School of Computing, Universiti Utara Malaysia. The objective was to understand the existing challenges in managing and monitoring industrial training activities. Issues such as manual documentation, delayed feedback, lack of transparency, and difficulties in supervisor-student communication were identified. These insights guided the specification of functional and non-functional requirements, which served as the foundation for system design.

2. System Design
The system design phase translated the gathered requirements into a structured blueprint. High-level architectural modeling was performed using Unified Modeling Language (UML) to define system behavior and interactions. Entity-Relationship (ER) diagrams were developed to model the underlying database schema, ensuring data integrity and efficient data management. For the user interface, Figma was used to design wireframes and prototypes, focusing on user experience, ease of navigation, and mobile responsiveness. This phase ensured that both technical and user-facing aspects of the system were well-structured before development began.

3. System Development
During this phase, the actual system was built based on the design specifications. The backend was developed using PHP and MySQL, chosen for their compatibility with web-based applications and their support in the XAMPP development environment. The frontend was implemented using HTML, CSS, and JavaScript to deliver an interactive and responsive user interface. This combination of technologies ensured seamless integration between the database and user interface, supporting essential features such as activity logging, supervisor feedback, and document uploads.

4. System Testing
The testing phase focused on evaluating the system's functionality, usability, and performance. The WIT was assessed through a usability survey administered via Google Forms using the WAMMI framework, which measures five dimensions: Attractiveness, Controllability, Helpfulness, Efficiency, and Learnability. WAMMI is particularly well suited for evaluating web applications because it captures user experience systematically and provides validated metrics for usability analysis (Ishak

et al., 2025). Thirty participants from the School of Computing were purposively selected, comprising 80% students and 20% university staff. Students were included as the primary users who log activities and submit reports, while staff members (mentors, coordinators) play critical roles in review, feedback, and supervision. This purposive sampling ensured that feedback reflected both major user roles, increasing the relevance and validity of the findings.

The sample size of 30 respondents is supported by usability testing literature (Turner et al., 2006), which indicates that ~20–30 participants are often sufficient to uncover most usability issues. Participants completed key tasks (logging in, recording activities, submitting reports, reviewing feedback) and then rated the system on the WAMMI dimensions via structured questionnaires; observations were also recorded. Identified issues were documented and addressed before moving to the final stage.

5. Maintenance
Following testing and deployment, the system entered the maintenance phase, where ongoing support and improvements were provided based on user feedback. This included minor bug fixes, interface adjustments, and the refinement of features to enhance usability. Although the Waterfall Model traditionally minimizes changes after deployment, this phase was essential for ensuring the long-term relevance and usability of the system within the academic context.

RESULTS AND DISCUSSION

Result:

System Features and Functional Requirements

The Web-Based Industrial Training Student Activity Management System (WIT) was developed to overcome the inefficiencies and challenges associated with managing industrial training activities through manual logbooks. Designed specifically for the School of Computing at Universiti Utara Malaysia, the system was developed following the Waterfall Model, progressing through the stages of requirement analysis, system design, development, testing, and maintenance. Input from students, mentors, and coordinators helped identify key issues such as poor communication, lack of transparency, and delayed feedback. As a result, WIT incorporates essential features summarized in Table 2.

Figure 1 presents the proposed Use Case Diagram of WIT. This diagram illustrates the interactions between four main actors; students, mentors, coordinators, and the system administrator and the system's core functions. Students log in to record daily activities and submit reports documenting their industrial training progress. They also receive feedback from mentors and coordinators, which supports their learning and helps improve their performance. Mentors review and approve submitted work, providing feedback on student activities, while coordinators oversee overall training progress to ensure alignment with program objectives. The system administrator manages user accounts and maintains system integrity through user registration and administration.

The diagram further shows relationships between use cases, such as include and extend associations, which clarify dependencies within the system. For example, providing feedback is included as a required step linked to students receiving feedback, ensuring that mentor evaluations are visible to students. The extend relationship indicates that students can access feedback after logging in, but viewing feedback is not mandatory during every session. Overall, the WIT system fosters a collaborative environment by promoting clear communication, transparency, and accountability among students, mentors, and coordinators, while the system administrator supports smooth platform operation and user management.

Table 2. WIT Features

Feature	**Description**
User Registration and Roles	Users can register as students, mentors, coordinators, or admins. Role-based access controls determine permissions.

Student Activity Log	Students can record daily activities with details like date, time, and task descriptions.
Report Submission	Students upload reports summarizing their training experiences, supported by file attachments.
Mentor Feedback	Mentors review student activities and reports, providing feedback and approvals directly in the system.
Coordinator Monitoring	Coordinators access dashboards summarizing student activities, feedback, and overall progress.
Document Sharing	Secure document upload feature with notifications and role-based access control.
Dashboards	Tailored interfaces for students, mentors, and coordinators, showing relevant data, notifications, and progress tracking.
Progress Visualization	Graphical representation of student activity completion and feedback history.
System Performance	Optimized for up to 1000 concurrent users; responds within 2 seconds under typical loads.
Security Features	Password encryption, role-based access control, and data backups to ensure reliability.
Responsive Design	Accessible on desktops, tablets, and mobile devices, compatible with major browsers (Chrome, Firefox, Safari, Edge).

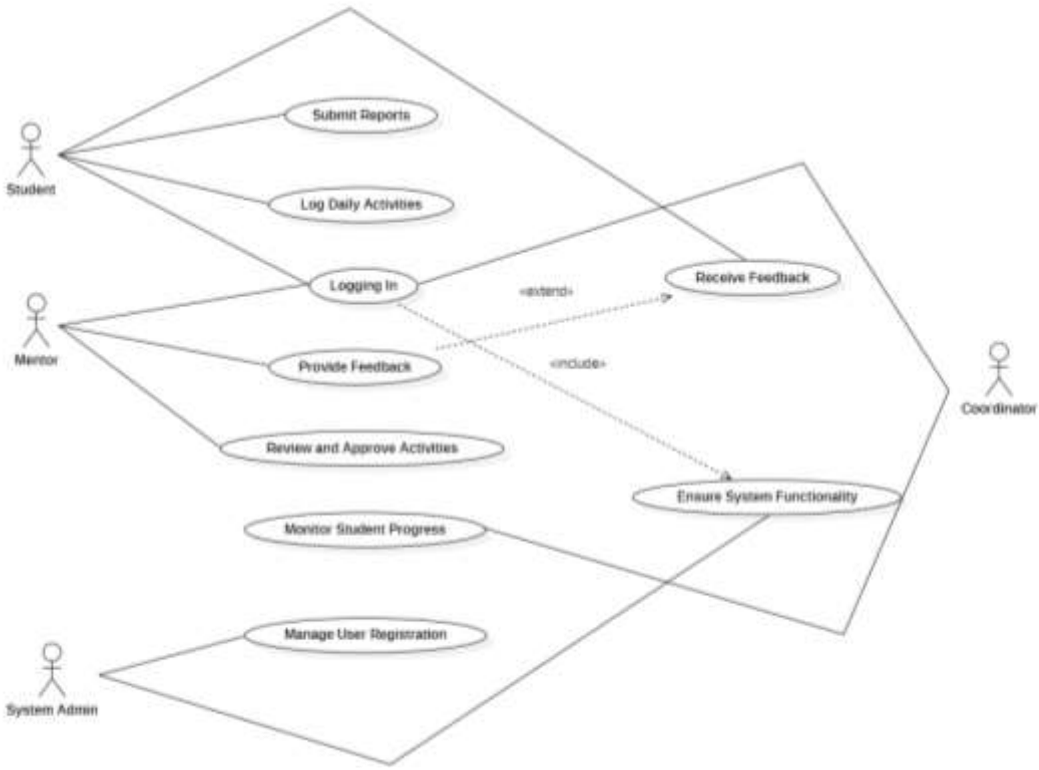


Figure 1. Use Case Diagram

The interface design of the WIT prioritizes usability and accessibility for students, mentors, coordinators, and system administrators. It features a clean, organized layout that makes essential functions easy to find and use. The system employs responsive design principles, ensuring smooth operation across various devices such as desktops, tablets, and smartphones. This flexibility allows users to access the platform conveniently from different locations or while on the move.

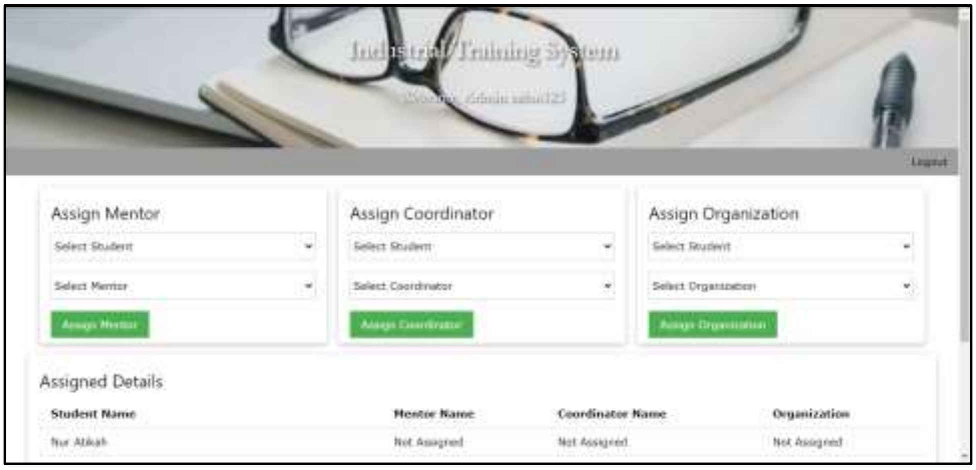
For students, the interface includes a personalized dashboard that displays daily activity logs, report submission areas, received feedback, and progress tracking through visual tools like charts and progress bars. Mentors have a dashboard showing summaries of student activities, pending reviews, and feedback history, which helps them provide timely and effective evaluations. Coordinators can view a comprehensive overview of all students' progress and feedback, with options to monitor specific students or activities as needed. The system administrator interface supports user registration, role management, and system maintenance tasks. Throughout all user interfaces, clear navigation menus, consistent color schemes, and standard form elements are applied to enhance usability and minimize the learning curve for new users.

a

b

c

d



e

Figure 2. Selected Interfaces of WIT (a. landing page; b. student dashboard; c. coordinator dashboard; d. mentor dashboard; e. admin dashboard)

Discussion:

Participants rated their experience using a Likert scale after completing essential tasks such as logging in, recording daily activities, submitting reports, and reviewing feedback. The results showed high satisfaction across all metrics, with Attractiveness scoring 91.67%, Controllability 97.5%, Helpfulness 94.17%, Efficiency 92.5%, and Learnability 96.67%. These scores suggest that users found the system engaging, easy to navigate, and effective in managing their industrial training activities. The positive feedback supports the design and development approach of WIT, confirming its ability to streamline training processes and improve communication among students, mentors, and coordinators.

These findings align well with previous studies emphasizing the need for well-designed digital platforms to overcome challenges in traditional industrial training management. Earlier research by Yusof et al. (2012) and Azahar et al. (2024) highlighted issues such as poor communication, limited interaction, and inefficient reporting linked to manual logbook systems. WIT effectively addresses these concerns by offering an intuitive interface and role-specific dashboards, promoting clearer communication and timely feedback.

The high ratings for controllability and learnability reflect the user-centered design principles advocated by Hatibu et al. (2024), who stressed the importance of easy navigation and empowering users to manage their activities independently. Similarly, the positive feedback on efficiency and helpfulness corresponds with findings from Husin et al. (2024), who developed a web-based system that improved documentation and feedback flow. WIT's responsive design and tailored user interfaces also respond to gaps identified by Subramaniam et al. (2022), who noted the absence of real-time collaboration and customized dashboards in many existing systems.

Despite the overall positive evaluation, users suggested improvements in areas such as progress visualization and notification features. These suggestions echo challenges reported in earlier works by Jaafar et al. (2017) and Zeng (2019), where early system prototypes lacked advanced analytics and engagement tools. Nevertheless, the strong usability scores across multiple dimensions validate WIT's current design choices and demonstrate its potential to enhance the industrial training experience.

Overall, this study reinforces the value of integrating feedback mechanisms, collaborative tools, and secure data management in digital platforms to support industrial training. It contributes to the growing recognition of how ICT can enhance experiential learning and professional development in higher education (Anjum, 2020; Adetiba et al., 2012).

Implications:
The implementation of WIT provides practical implications for higher education institutions by enhancing transparency, efficiency, and communication in industrial training supervision. It also supports sustainability through paperless documentation and scalable digital monitoring, which can be adapted by other faculties or institutions.

Research Contribution:
This study contributes to the field of sustainable software engineering and information systems by demonstrating how a structured development approach (Waterfall Model) combined with usability evaluation (WAMMI framework) can produce a reliable and user-friendly platform. WIT offers novel features such as multi-role dashboards, real-time feedback mechanisms, and responsive design tailored to the needs of industrial training management.

Limitations:
The evaluation was limited to usability testing with 30 participants from a single institution. Other aspects such as system scalability, data security, and performance under high concurrent usage were not extensively tested. Additionally, the study focused only on the School of Computing, which may limit the generalizability of findings to other disciplines.

Suggestions:
Future research should extend the evaluation to include scalability, security, and integration with institutional learning management systems. The system could also be enhanced with advanced features such as mobile applications, real-time analytics, and adaptive user interfaces to increase accessibility and engagement. Broader implementation across multiple faculties and institutions would further validate its effectiveness.

CONCLUSION

The development and evaluation of the WIT demonstrate its potential to address long-standing challenges in managing industrial training activities. By digitizing key processes such as activity logging, report submission, and feedback provision, WIT replaces the traditional, inefficient manual logbooks with a centralized, collaborative platform designed to meet the needs of students, mentors, and coordinators. The system's high usability scores across important metrics—attractiveness, controllability, helpfulness, efficiency, and learnability—validate its design and functionality, confirming its role in improving communication, transparency, and the overall industrial training experience.

This study adds to the growing literature supporting the use of ICT solutions in experiential learning settings and underscores the importance of role-based dashboards, secure data management, and responsive design in enabling smooth collaboration among multiple stakeholders.

Looking ahead, future work will focus on expanding WIT's features to ensure long-term sustainability and scalability. A key development area is creating a dedicated mobile application to improve accessibility, allowing students and supervisors to interact with the system easily across different devices and locations. Addressing scalability will also be critical as the number of users grows, ensuring the system can manage increased data volume and concurrent usage without affecting performance. Adding advanced functions such as real-time analytics, offline access, and adaptive interfaces will further enhance WIT's usefulness and relevance.

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AUTHOR CONTRIBUTION STATEMENT

Siti Nur Aisyah Binti Abdullah: Conducted the literature review, gathered system requirements, developed the system model, and implemented the web-based application. She also carried out system testing and prepared the initial draft of the manuscript. Wan Hussain Wan Ishak: Supervised the overall research and development process, provided guidance on system design and methodology, validated the findings, and refined the manuscript for final submission.

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