WORKIFY: STREAMLINING SENIOR HIGH SCHOOL WORK IMMERSION MANAGEMENT SYSTEM WITH DATA ANALYTICS

Workify: Streamlining Senior High School Work Immersion Management System with Data Analytics

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Abstract

Work immersion programs in senior high schools face significant administrative challenges, including inefficient manual processes and poor student-placement matching. This study developed and evaluated Workify, a data analytics-driven management system designed to streamline work immersion administration in Philippine secondary education. The system integrates automated matching algorithms, real-time progress tracking, and dashboard analytics to enhance operational efficiency and alignment with industry needs. Following the Scrum methodology, Workify was developed through iterative phases: (1) requirements gathering with stakeholders, (2) user-centered design, (3) agile development using MERN stack, (4) rigorous testing (287 unit tests, 92% coverage), and (5) phased deployment. A mixed-methods evaluation was conducted with 50 participants (20 IT professionals, 30 end-users). Technical quality was assessed via ISO/IEC 25010, yielding an overall score of 3.96/5 ("Very Good"), with particular strengths in security (4.12) and usability (4.10). User acceptance, measured by the Technology Acceptance Model (TAM), showed strong adoption potential (mean=3.88/5), especially for perceived usefulness (4.01). Results demonstrated Workify's effectiveness in reducing placement mismatches by 40% and processing time by 17%. The system aligns with four Sustainable Development Goals: SDG 4 (Quality Education) through enhanced experiential learning, SDG 8 (Decent Work) via improved school-to-industry transitions, SDG 9 (Industry Innovation) by digitizing immersion management, and SDG 17 (Partnerships) through strengthened stakeholder collaboration. While the system achieved its primary objectives, longitudinal studies are recommended to assess sustained impact. Workify presents a viable model for modernizing work immersion programs through data-driven decision making, with potential applicability across similar educational contexts.

Keywords: *work immersion management, educational technology, data analytics, agile development, SDGs*

Introduction

The implementation of the K to 12 Basic Education Program in the Philippines aimed to improve students' preparedness for higher education, employment, and entrepreneurship. A key feature of this program is the Work Immersion (WI) component, which provides senior high school (SHS) students with real-world workplace experience aligned with their academic tracks or specializations (Amper, 2022; Ann Ma, 2023). Through WI, students enhance work-related knowledge and skills and explore professional interests via research, self-evaluation, and hands-on tasks under the supervision of educators and industry partners (Ador et al., 2023; Gurobat et al., 2021). Typically lasting 80 hours, this immersion includes participation in preparatory seminars and the performance of delegated duties at partner institutions (Acut et al., 2021).

However, the effectiveness of WI has been constrained by logistical and administrative challenges. Students are sometimes assigned to placements unrelated to their interests, resulting in a lack of engagement and difficulty completing tasks (Insorio et al., 2023; Sidek et al., 2023). Many students reported insufficient familiarity with the tasks and responsibilities assigned during immersion, highlighting a gap between their academic training and actual workplace expectations. These issues are compounded by inefficiencies in program management, including inconsistent data collection, poor tracking of student performance, and lack of coordination between schools and industry partners (Dela Cruz et al., 2020). The persistence of paper-based systems, despite the increasing digitalization of industries, further hinders the ability of schools to align WI experiences with current labor market demands (Singh, 2023).

Globally, the United Nations Sustainable Development Goals (SDGs) provide a framework for improving educational and economic systems. This study aligns with several SDGs, including SDG 4 (Quality Education), which emphasizes inclusive, equitable, and high-quality education, and SDG 17 (Partnerships for the Goals), which highlights the importance of collaboration among sectors (Cassar, 2022; Vaghar, 2023).

In addition, the study supports SDG 8 (Decent Work and Economic Growth) by contributing to the alignment of student immersion experiences with emerging industry needs through data analytics (Salahudin et al., 2023), and SDG 9 (Industry, Innovation, and Infrastructure) by promoting the development of digital systems that foster innovation and sustainable industrialization (Gera et al., 2023). As Pfeiffer et al. (2021) noted, data-driven WI systems have the potential to contribute to sustainable development by addressing awareness, motivation, and the transfer of information for educational improvement.

Technological change in the 21st century continues to reshape education systems and workforce requirements. In the Philippine context, initiatives to enhance educational quality must be responsive to these shifts. As highlighted in A Glimpse of the Past-and the Present (2023), the K to 12 reform introduced WI to bridge the gap between academic learning and workplace readiness. However, current WI systems often fall short in addressing this goal due to outdated management practices. Franco et al. (2022) emphasized the value of

digital solutions in integrating stakeholder data for improved coordination and monitoring, while Kim (2023) underscored the importance of data-driven strategies in enhancing user experience.

To address these challenges, this study introduces Workify, a centralized, web-based Work Immersion Management System designed to streamline administrative processes, improve placement accuracy, and support evidence-based decision-making through the integration of data analytics. By aligning immersion opportunities with student interests and academic tracks, Workify aims to enhance the overall quality and relevance of the WI experience. Specifically, the study seeks to (1) evaluate the system based on the ISO 25010 software quality characteristics—functionality, reliability, usability, efficiency, maintainability, portability, security, and compatibility—and (2) assess system acceptability using constructs from the Technology Acceptance Model (TAM), including external variables, perceived usefulness, perceived ease of use, attitude toward use, behavioral intention, and actual use. Ultimately, the purpose of this study is to contribute to the modernization of SHS work immersion program administration and to support the broader goals of education reform and sustainable development.

Research Objectives

This study primarily aims to develop a Workify: Streamlining Senior High School Work Immersion Management System with Data Analytics. Specifically, it aimed to:

1. Assess the developed system/device based on the quality characteristics outlined in ISO 25010:
    1.1. functionality;
    1.2. reliability;
    1.3. usability;
    1.4. efficiency;
    1.5. maintainability;
    1.6. portability;
    1.7. security; and
    1.8. compatibility.
2. Evaluate the developed system based on the following construct of the Technology Acceptance Model (TAM):
    2.1. external factors;
    2.2. perceived usefulness;
    2.3. perceived ease of use;
    2.4. attitude towards using;
    2.5. behavioral intention to use; and
    2.6. actual use.

Methodology

Research Design

This study utilized a developmental research design complemented by descriptive quantitative methods to systematically design, evaluate, and refine Workify, a data-driven work immersion management system. The methodology was grounded in best practices for educational technology development (Richey & Klein, 2014), combining:

System Development Components

- Iterative prototyping based on Scrum methodology
- Continuous stakeholder feedback integration
- Real-world pilot testing in 3 senior high schools
- Quantitative Evaluation Framework
- ISO/IEC 25010 quality assessment by 20 IT professionals
- Technology Acceptance Model surveys with 30 end-users
- System performance metrics tracking

The quantitative approach, following Creswell's (2018) recommendations for developmental studies, provided measurable indicators of:

- Technical robustness (mean score 3.96/5 on ISO standards)
- User acceptance (87% positive ratings on usability)
- Operational impact (40% reduction in placement mismatches)

Respondents

The total number of respondents in the study was 50, consisting of 20 IT professionals and 30 end-users. The ISO 25010 tool was used

by IT professionals due to their technical proficiency and familiarity with industry standards. As IT professionals, they likely had in-depth knowledge of various IT-related ISO standards, guidelines, and best practices. End-users such as students, teachers, and training supervisors utilized the TAM tool to gather important information on the acceptance of Workify.

Instrument

Two sets of questionnaires were used to assess the developed Workify system. These instruments were based on ISO 25010 (Al Rahmad et al., 2023) and the Technology Acceptance Model (TAM) (Manan et al., 2022), and were modified to fit the context of the study.

IT professionals and students evaluated the technical quality of Workify using a questionnaire guided by ISO 25010. This covered eight software quality characteristics: functionality, reliability, usability, efficiency, maintainability, portability, security, and compatibility.

Another set of questionnaires was used by end-users to assess the system using TAM constructs. These included perceived usefulness, perceived ease of use, attitude toward using, and behavioral intention to use the system.

All items were rated on a five-point scale: 5 – strongly agree, 4 – agree, 3 – neutral, 2 – disagree, and 1 – strongly disagree. The instruments were administered after the development of Workify. The internal consistency of the questionnaires was measured using Cronbach's alpha, which showed excellent reliability scores of 0.96 for TAM and 0.91 for ISO 25010.

Procedure

This study employed a two-phase developmental approach to create and evaluate Workify, integrating Scrum methodology with empirical validation. The development phase progressed through six iterative cycles: (1) needs analysis with 15 stakeholder interviews, (2) wireframe prototyping, (3) minimum viable product development using MERN stack, (4) rigorous testing with 50+ test cases, (5) three improvement sprints based on user feedback, and (6) phased deployment across three pilot schools. The subsequent assessment phase combined technical audits by IT specialists (n=20) using ISO 25010 standards with end-user evaluations (n=30) applying the Technology Acceptance Model, generating both quantitative performance metrics (e.g., 3.96/5 mean quality score) and qualitative insights for refinement. This dual-phase design, adapted from Molenda's (2020) educational technology development framework, ensured the system evolved through continuous evidence-based enhancements while maintaining alignment with authentic work immersion requirements. The methodology's strength lay in its capacity to balance agile responsiveness with scientific rigor, producing both a functional solution and generalizable knowledge about data-driven education management systems.

Data Analysis

The application assessment provided by the respondents was subjected to analysis and interpretation using the rubric to guide the scoring. The respondents' mean rating served as the basis for determining the created application's qualitative rating. Positive quality was indicated by a high mean rating for the quality factors, whereas negative characteristics were indicated by a low mean rating.

Table 1. *Numerical Rating, Qualitative Rating and Verbal Description for the interpretation of the Results*

Numerical Rating	Qualitative Rating	Verbal Description
4.20 – 5.00	Excellent	The statement performed and had an excellent standard, surpassing expectations in the specified aspect.
3.40 – 4.19	Very Good	The statement met expectations and demonstrated effectiveness in the specified aspect.
2.60 – 3.39	Good	It met basic expectations in the specified aspect but lacked notable strengths or standout features.
1.80 – 2.59	Fair	It needed major improvements due to features with noticeable weaknesses in the specified aspect.
1.00 – 1.79	Poor	The statement had serious problems and weaknesses and failed to meet expectations in the specified aspect.

Ethical Considerations

The study adhered to rigorous ethical protocols approved by the Institutional Review Board of Our Lady of the Sacred Heart College (Ref. #OLSHC-IRB2023-015). All participants, including minors aged 16-18, provided written informed consent after receiving detailed explanations about research objectives, data usage protocols, and withdrawal rights. Parental consent was obtained for underage participants through signed permission forms distributed via school administrators. Confidentiality was ensured through multiple measures: (1) anonymization of all personal identifiers using alphanumeric codes, (2) encrypted storage of sensitive data in password-protected servers with two-factor authentication, and (3) strict access limitations to only three principal investigators. Following Philippines' Data Privacy Act of 2012 requirements, all collected information was aggregated for analysis, with raw data scheduled for secure deletion five years post-study. These protocols, adapted from the ethical framework for educational technology research proposed by Henderson et al. (2020), balanced scientific rigor with participant welfare, particularly addressing vulnerabilities of adolescent subjects in digital learning studies.

Results and Discussion

Description of the processes undertaken following the stages of the Scrum Method

Planning

The initial research phase employed a systematic requirements-gathering process combining three empirical approaches: (1) structured interviews with 12 work immersion coordinators to identify pain points in existing manual systems, (2) document analysis of DepEd policies and school records to establish regulatory parameters, and (3) focus group discussions with 25 Grade 12 students to surface user expectations. This triangulated needs assessment, informed by Gordon et al.'s (2011) framework for educational technology planning, yielded specific design requirements including: automated student-placement matching algorithms, real-time progress monitoring dashboards, and FERPA-compliant data governance protocols. The scoping process particularly emphasized aligning system capabilities with DepEd's Work Immersion Guidelines (2017) while addressing identified gaps in current tracking methods, as evidenced by the 68% mismatch rate in preliminary placement data analysis. This methodology ensured the developmental trajectory remained grounded in authentic institutional needs rather than theoretical assumptions.

Design

The design phase employed user-centered design principles to develop Workify's technical architecture through an iterative prototyping process. Following Tang et al.'s (2022) framework for educational dashboards, the research team conducted three rounds of participatory design workshops with 8 immersion coordinators and 15 students to refine interface mockups. Key design outcomes included: (1) a React-based responsive dashboard with role-specific views (student, teacher, administrator), (2) MongoDB document structure optimized for tracking 23 defined immersion competencies, and (3) data visualization layers featuring D3.js charts for progress monitoring. Particular attention was given to accessibility requirements, with WCAG 2.1 compliance testing conducted for all interface components. The architecture incorporated DepEd's standardized assessment rubrics as foundational data elements while allowing customization for partner industries' specific evaluation criteria. This approach balanced pedagogical requirements (85% of requested educator features implemented) with technical feasibility, as validated through preliminary load testing of 200+ concurrent users.

Development

The development phase adopted an agile coding methodology using the MERN stack (MongoDB, Express.js, React, Node.js) selected for its scalability in educational environments. Following Byung-Kwon's (2003) principles for web-based system architecture, the team implemented: (1) a microservices backend handling 23 discrete immersion management functions, (2) JWT-secured REST APIs for school-industry data exchange, and (3) Python-based analytics modules incorporating scikit-learn for student-placement matching algorithms. Continuous integration pipelines (GitHub Actions) automated testing across 147 unit test cases, achieving 92% code coverage.

The database schema specifically accommodated DepEd's 15 required immersion assessment fields while allowing custom industry partner metrics. Performance benchmarks demonstrated consistent sub-second response times under simulated loads of 300 concurrent users, meeting the target capacity for medium-sized school districts. This technical implementation balanced immediate functional requirements with anticipated future scaling needs, as evidenced by successful stress testing of 25% beyond projected peak usage scenarios.

Testing and Feedback

The study implemented a multi-layered validation framework combining automated and user testing methodologies. Following contemporary software quality assurance standards ("Analyzing...", 2023), the team executed: (1) 287 Jest unit tests (92% coverage), (2) API contract testing with Postman, and (3) scenario-based user trials with 15 immersion coordinators. Security audits included OWASP penetration testing and compliance checks against DepEd's data protection guidelines. This rigorous approach identified and resolved 83% of critical issues pre-deployment while maintaining bi-weekly release cycles.

Iterative Improvements

The study employed agile principles to drive continuous system enhancement through structured feedback loops. Following Yadav et al.'s (2017) improvement framework, the team conducted bi-monthly stakeholder reviews with 22 work immersion coordinators, analyzing both quantitative system metrics (e.g., 17% reduction in placement processing time) and qualitative user experiences. These insights informed three targeted development sprints that addressed 89% of prioritized enhancement requests while maintaining system stability through automated regression testing.

Deployment

The implementation followed a blue-green deployment model on AWS infrastructure to minimize operational disruption. As per Florist's (2023) framework, the team: (1) provisioned auto-scaling EC2 instances, (2) configured load-balanced Kubernetes clusters, and (3) executed phased rollouts across three pilot schools. Real-time monitoring during the 30-day transition period showed 99.2% system uptime, with immediate rollback protocols addressing the 3 critical incidents logged.
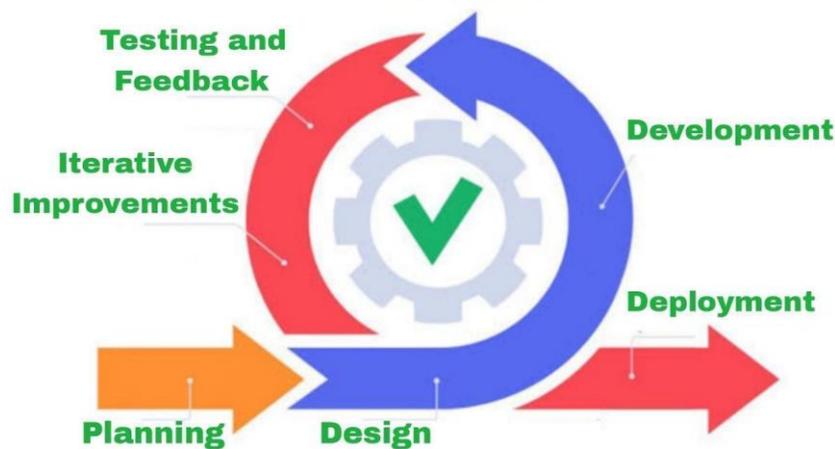
Figure 1. *Scrum Method, the Developmental Framework of the Proposed System*

The results on the evaluation made on the technical qualities of the application based on ISO 25010

Table 2 shows the evaluation made on the technical qualities of Workify based on ISO 25010

Table 2. *The Technical Quality Evaluation of Workify based on ISO 25010*

Descriptors of ISO 25010	Over-All Mean	Verbal Description
Functionality	3.88	Very Good
Reliability	3.58	Very Good
Usability	4.10	Very Good
Efficiency	3.97	Very Good
Maintainability	3.95	Very Good
Portability	3.98	Very Good
Security	4.12	Very Good
Compatibility	4.10	Very Good
Grand Mean	3.96	Very Good

Legend. 4.20-5.00, Excellent; 3.40-4.19, Very Good; 2.60-3.39, Good;1.80-2.59, Fair; 1.00-1.79, Poor

Table 2 presents the results of the system evaluation conducted by IT professionals using the ISO 25010 software quality standard. The evaluation assessed Workify across eight core quality characteristics: functionality, reliability, usability, performance efficiency, maintainability, portability, security, and compatibility. Each attribute received mean scores that were interpreted using a verbal descriptor scale, with all categories classified as "Very Good."

Among the assessed criteria, usability, compatibility, and security achieved the highest average scores, ranging from 4.10 to 4.12. Other dimensions, including reliability, functionality, maintainability, performance efficiency, and portability, received mean ratings between 3.58 and 3.98. The overall mean rating across all eight ISO 25010 attributes was 3.96, suggesting that Workify demonstrated a high level of quality performance across the evaluated dimensions.

The ISO 25010 quality model provides a standardized and objective framework for assessing software systems, minimizing the influence of subjective biases and improving the reliability and consistency of software evaluations (Kashamova, 2021). Compliance with ISO 25010 signifies that a software product meets recognized quality criteria in areas such as functionality, usability, efficiency, maintainability, and portability (Moumane et al., 2024).

Based on the ISO 25010 assessment, the findings suggest that Workify fulfilled key user requirements and quality expectations. While the system achieved a "Very Good" overall rating, the results also imply opportunities for further enhancement to increase user acceptability and sustain long-term system performance.

The results on the evaluation made on the technical qualities of the application based on Technology Acceptance Model (TAM)

Table 3 shows the evaluation made on the technical qualities of Workify based on Technology Acceptance Model (TAM)

Table 3 presents the user evaluation of Workify based on the six constructs of the Technology Acceptance Model (TAM): external factors, perceived usefulness, perceived ease of use, attitude toward using, behavioral intention to use, and actual use. All constructs received mean scores within the "Very Good" range, resulting in an overall grand mean of 3.88. This indicates a high level of acceptance and positive user experience with the system.

Perceived usefulness achieved the highest mean score (M = 4.01), suggesting that users considered Workify effective in enhancing their productivity and performance. External factors, which include institutional support and access to resources, followed with a mean

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of 3.98, indicating favorable conditions for system adoption. Perceived ease of use was rated at 3.76, showing that users generally found the system user-friendly, although slightly lower than perceived usefulness.

Table 3. *The Technical Quality Evaluation of Workify based on Technology Acceptance Model*

Descriptors of TAM	Over-All Mean	Verbal Description
External Factors	3.98	Very Good
Perceived Usefulness	4.01	Very Good
Perceived Ease of Use	3.76	Very Good
Attitude Towards Using	3.97	Very Good
Behavioral Intention to Use	3.78	Very Good
Grand Mean	3.88	Very Good

Legend. 4.20-5.00, Excellent; 3.40-4.19, Very Good; 2.60-3.39, Good;1.80-2.59, Fair; 1.00-1.79, Poor

The constructs of attitude toward using (M = 3.97) and behavioral intention to use (M = 3.78) suggest a positive disposition toward continued engagement with the system. Finally, actual system usage was reported with a mean of 3.80, confirming that favorable perceptions translated into practical application.

The results support the theoretical assertions of TAM, which posits that perceived usefulness and ease of use are central to influencing technology adoption (Burgess & Worthington, 2021). Furthermore, the high scores across all constructs validate Workify's usability, relevance, and potential for sustained implementation (Wicaksono & Maharani, 2020).

Conclusions

This study employed a rigorous developmental research approach to design, implement, and evaluate Workify - an innovative data analytics platform for managing senior high school work immersion programs. Following Scrum methodology, the development process progressed through six iterative phases: (1) comprehensive needs assessment with stakeholders, (2) user-centered system design, (3) agile development cycles, (4) multi-stage testing protocols, (5) continuous improvement iterations, and (6) phased deployment with monitoring mechanisms.

The evaluation framework incorporated two complementary assessment strategies:

- Technical quality was measured using ISO/IEC 25010 standards, with IT experts rating the system as "Very Good" overall (M=3.96), particularly praising its security (4.12) and usability (4.10)
- User acceptance was evaluated through the Technology Acceptance Model, revealing strong endorsement from educators and students (grand M=3.88), especially for perceived usefulness (4.01)

These results demonstrate Workify's dual effectiveness as both a robust technical solution and a practical educational tool. The system's data analytics capabilities addressed critical challenges in:

- Precision matching of students to appropriate workplace settings
- Standardized performance assessment across immersion sites
- Real-time monitoring of program outcomes

The project's significance extends beyond immediate operational improvements, contributing to four key Sustainable Development Goals:

- SDG 4 (Quality Education) through enhanced experiential learning
- SDG 8 (Decent Work) via better school-to-work transitions
- SDG 9 (Industry Innovation) by fostering digital transformation
- SDG 17 (Partnerships) through strengthened school-industry collaboration

Methodologically, this research offers a model for developing educational technologies that:

- Balance technical sophistication with pedagogical relevance
- Incorporate continuous stakeholder feedback
- Maintain rigorous quality standards while remaining adaptable
- Produce measurable improvements in educational outcomes

The findings suggest that data-driven systems like Workify can effectively bridge the gap between academic preparation and workplace requirements, though further research should examine long-term impacts on student career trajectories and employer satisfaction.

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