

Project Summary for IAL Website

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Project Title:	IMPROVING PROFESSIONAL DEVELOPMENT THROUGH AN INTELLIGENT ADAPTIVE LEARNING APPROACH: AN IN-DEPTH STUDY ON CONSTRUCTION PROJECT MANAGERS
Project Number:	GA21-04
Year of Approval:	2021
Funding Source:	WDARF
Objectives and intended outcomes of the project:	<p>Deliverables:</p> <ol style="list-style-type: none"> 1. A general framework for using adaptive learning in professional development that is applicable locally and internationally 2. An adaptive learning system prototype for construction professionals' project management skill development in Singapore 3. A toolkit of adaptive learning features which caters to different learning needs across various industries
Project Team	
Principal Investigator	Goh Yang Miang
Summary of Project (up to 300 words)	
<p>This study focuses on the use of an adaptive learning approach to improve professional development for construction project managers. Despite efforts from SkillsFuture Singapore (SSG) and other agencies, professionals in Singapore continue to struggle with upskilling due to busy work schedules and diverse learning needs. Adaptive learning, which has been successful in higher education, offers personalised learning pathways that can address the time constraints faced by professionals. However, there is limited research on the effectiveness of adaptive learning in professional development.</p> <p>The research aims to answer three main research questions:</p> <ol style="list-style-type: none"> 1) Is adaptive learning effective for professional development? 2) What are the barriers faced by training providers and enterprises when implementing adaptive learning? What support is needed? 3) What barriers prevent professionals from engaging in adaptive learning? What support is needed? <p>The study will adopt a mixed-methods approach using a quasi-experiment design. The study will be divided into three stages. In the first stage, the researchers will examine the current adoption of adaptive learning and gather general viewpoints on its effectiveness. This will help identify existing barriers and build a framework for adaptive professional development. In the second stage, a prototype of adaptive professional development will be developed based on the findings from the first stage. This prototype will include features like a knowledge unit recommender (KUR) and personalised feedback (PF). In the third stage, a quasi-experiment will be conducted to evaluate the effectiveness of the framework and prototype. Surveys, interviews, and focus group discussions will be conducted to gather professionals' perceptions of the adaptive learning approach.</p> <p>Overall, this study aims to evaluate the effectiveness of adaptive learning in professional development</p>	

and engage training providers in incorporating adaptive learning into their courses. Additionally, the study will collect data on professionals' learning needs and expectations to facilitate understanding of adult learners' career choices.

Summary of Project Findings, Deliverables and Impacts (up to 500 words)

Summary of Key Findings

1. A questionnaire survey, completed by 341 professionals in Singapore, indicated that 77.8% of them predicted that they would use an adaptive learning system if they had access to it.
2. The behavioural intention towards using an adaptive learning system was predicted by the perceived learning value (perception of the benefits gained from the learning system) of the adaptive learning system and self-efficacy (an individual's confidence in their ability to use the system), with statistical significance, and by the perceived performance expectancy (perceived benefits of using the system), with predictive importance, among 188 construction professionals.
3. A quasi-experiment with 94 professionals suggested that a commercial adaptive learning platform did not significantly affect professionals' knowledge gains in an online short course on project management.
4. From qualitative feedback, professional learners expressed the desire for greater transparency and control when receiving personalised learning path recommendations.
5. From the second quasi-experiment, using the adaptive quiz feature resulted in greater gains in estimated latent proficiency.
6. The behavioural intention to use the personalised feedback feature was predicted by perceived fairness of the feedback messages and engagement with the feedback, from 81 valid responses to a structured questionnaire.

Deliverables

All project deliverables have been met:

1. Adaptive learning framework: the adoption framework has been published in a peer-reviewed journal, and the overall framework has been further elaborated in the third deliverable (the toolkit).
 - Hu, X., Goh, Y. M., & Tay, J. (2024). Construction professionals' perspectives of adaptive learning adoption: An SEM-machine learning approach. *Engineering, Construction and Architectural Management*. <https://doi.org/10.1108/ECAM-07-2024-0896>
2. Adaptive learning system prototype: working prototypes for the Adaptive Quiz, Personalised Feedback, and Knowledge Unit Recommender were developed and integrated into Canvas LMS during the study. The development and evaluation of Personalised Feedback have been published in a peer-reviewed journal:
 - Hu, X., Goh, Y. M., & Tay, J. (2026). Mixed-methods evaluation of automated personalised feedback in construction management training using RAG and LLMs. *Automation in Construction*, 182, 106745. <https://doi.org/10.1016/j.autcon.2025.106745>
3. Adaptive learning for professional development toolkit: the toolkit provides training providers with implementation guidance, practical examples, and reusable design templates. It is publicly accessible and was shared with practitioners in a dedicated dissemination workshop held in 2025.
 - Adaptive learning for professional development toolkit GitHub repository: <https://github.com/NUS-DBE/ALS-Toolkit>

Impacts

This study contributes both adoption and implementation insights into adaptive learning in the professional development context and delivers practical guidance for future implementation through the deliverables. The findings are relevant to policymakers, training providers, and industry practitioners who intend to improve professional development through adaptive learning.

In 2025, a dissemination workshop was held with 25 attendees, including 22 trainers. With the toolkit and main findings of the study shared, the workshop received favourable feedback. Attendees reported that they see value in the toolkit for them “to better handle the training course”, and they were willing to “share with those instructors interested in implementing adaptive learning”. They also indicated the intention to incorporate adaptive learning in their training.