

SUMMER RESEARCH 2024/25

PROJECT ABSTRACT



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

PROJECT # 31

| | |
|--------------------------|---|
| SUPERVISOR/S: | Dr Arthur Fang & Kris Roy |
| PROJECT TITLE: | Immersive virtual reality as a tool to improve engineering education for visualizing structural design process and BIM models |
| FIELD: | Engineering education; Construction 4.0; Virtual Reality; Structural engineering |
| DIVISION/SCHOOL: | HECS - Te Kura Mata Ao School of Engineering |
| PROJECT LOCATION: | Hamilton |

PROJECT ABSTRACT:

In the building and construction industry, the concept of Construction 4.0 has gained prominence due to technological advancements, such as digitization and automation. However, in New Zealand, the adoption of these technologies, particularly virtual reality (VR), in the construction sector remains relatively limited. There exists a significant research gap regarding the potential benefits and applications of VR in this industry, specifically in the context of construction projects. While VR has shown promise as an innovative tool in other fields, such as gaming and entertainment, its integration into construction practices has been slower. This gap hinders the widespread utilization of VR technology and its potential to revolutionize various aspects of the construction industry, including design visualization, construction planning, project coordination, and stakeholder engagement. Furthermore, within the realm of construction education, there is a lack of exploration and implementation of VR as a teaching tool. Although VR has the potential to provide immersive and interactive learning experiences, it remains underutilized in the construction curriculum.

This project aims to bridge the research gap by investigating the untapped potential of VR in the New Zealand building and construction industry. It seeks to identify specific areas within construction projects where VR can be effectively applied, demonstrating its value in enhancing design, planning, and collaboration processes. Additionally, the project aims to develop a virtual tour focused on steel building construction, providing an immersive learning experience that can supplement traditional teaching methods. By addressing this research gap and showcasing the practical applications of VR in construction projects and education, this project will contribute to the advancement of Construction 4.0 principles in New Zealand. Moreover, it will highlight the benefits and challenges associated with implementing VR as a transformative tool in the construction industry, promoting its wider adoption and utilization for improved project outcomes and enhanced construction education.

STUDENT SKILLS:

- Communication skills
- Research skills
- Software modelling (e.g., Unity, and AutoDesk Revit)
- Reporting/ writing article/report

PROJECT TASKS:

1. Conduct a comprehensive literature review on the use of virtual reality in structural design and construction risk mitigation.
2. Study and document the design process of basic structures, such as LSL building and the PA building.
3. Simulate the structural design and construction processes (including construction risk) using immersive virtual reality tools.
4. Develop a framework for an application (APP) that facilitates the visualization of the structural design and construction processes.
5. Collect feedback from engineers and teachers/students on the simulation and application framework.
6. Complete research paper on the findings of the study.

EXPECTED OUTCOMES:

- Student's Research Poster (as per clause 6 of the [Scholarship regulations](#))
- Virtual model for design process and construction process
- APP for virtual model
- Research paper on the findings of the study