

APPLICATION OF AUGMENTED REALITY AND VIRTUAL REALITY TECHNOLOGIES IN THE SRI LANKAN CONSTRUCTION INDUSTRY

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The Sri Lankan construction industry has yet to adopt emerging digital technologies that offer enhanced precision, efficiency, and collaboration throughout the project lifecycle. This research investigates the potential of Augmented Reality (AR) and Virtual Reality (VR) technologies to improve project delivery in Sri Lanka's construction sector by addressing inefficiencies in conventional practices. The study evaluates their effectiveness within the local context while identifying the barriers and strategies for effective implementation.

Globally, AR and VR are widely used in construction for design visualisation, communication, and training, but adoption in Sri Lanka is limited due to low awareness, high costs, technical challenges, and lack of local research. This study addresses the gap by exploring how AR/VR can reduce rework and miscommunication. A mixed-method approach was used, including a literature review, a questionnaire of industry professionals, and expert interviews to identify current applications, barriers, and recommendations for future adoption.

The study revealed that while awareness of AR and VR technologies among Sri Lankan construction professionals is gradually increasing, their actual implementation remains minimal. Out of the 58 survey respondents, 56% indicated some level of familiarity with AR and VR; however, 78% of those familiar had never applied these technologies in a construction project. Current applications were limited almost exclusively to VR, primarily used in the planning phase for design visualisation and client walkthroughs, with no significant evidence of AR usage in practice. The findings further highlighted the barriers hindering adoption. High initial investment costs, limited access to equipment and software, inadequate technical expertise, and resistance to change emerged as the most significant obstacles. Perspectives varied by role: engineers highlighted technical limitations, project managers stressed resistance to change, and architects focused on high costs. Importantly, less experienced professionals were more concerned with skill gaps, whereas senior practitioners emphasised financial constraints and entrenched practices. Despite these challenges, participants identified clear support mechanisms that could accelerate adoption, including hands-on training workshops, trial access to AR/VR software and hardware, and greater industry academia collaboration.

In conclusion, while immediate widespread use in Sri Lanka is constrained, the long-term potential of AR and VR technologies in the Sri Lankan construction sector is substantial. The study recommends greater collaboration between academia and industry to develop cost-effective, locally relevant solutions. By connecting theoretical knowledge with real-world applications, this research provides a pathway for the successful integration of AR and VR into the Sri Lankan construction sector. For this purpose, a roadmap with four phases was recommended. This includes awareness and capacity building, pilot applications, industry capacity building, standardisation and scaling.

Keywords: Augmented reality, Virtual reality, Industry 4.0, Digitalisation

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AUGMENTED REALITY (AR) AND VIRTUAL REALITY (VR) IN CONSTRUCTION: CURRENT AWARENESS, CHALLENGES, AND FUTURE DIRECTIONS IN SRI LANKA

INTRODUCTION

- AR capabilities include real-time visualisation, automation, remote collaboration, knowledge transfer, and tracking.
- VR enables immersive environments for safety training, design walkthroughs, and stakeholder communication.

OBJECTIVES

- Review the global applications of AR and VR
- Identify the opportunities and challenges in the implementation of AR/VR in the Sri Lankan construction industry
- Identify methods for integrating AR/VR into local construction practices for improved efficiency, safety, and sustainability

METHODOLOGY

Literature Review

- Global AR/VR uses in the construction industry
- Challenges in implementing in the Sri Lankan construction industry

Data Collection

Questionnaire Survey

- Current awareness and implementation of AR/VR in Sri Lankan construction industry

Expert Interviews

- Challenges and opportunities in implementation in the Sri Lankan context

Development of a pathway for integrating AR/VR into the Sri Lankan construction industry

RECOMENDATIONS

Phase 1: Awareness & Capacity Building

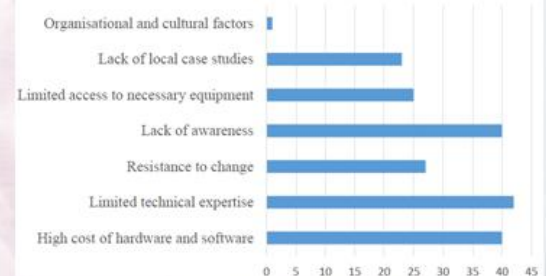
CPD sessions (IESL, SLIA), student projects, low-cost VR demos, showcase case studies

Phase 3: Industry Capacity Building

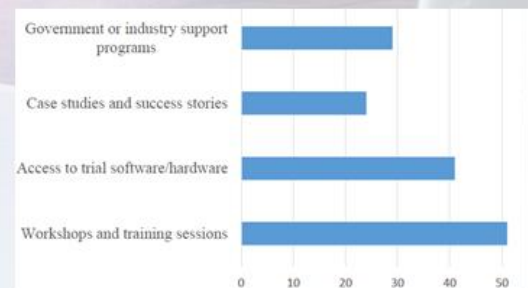
Short courses (UOM + ICTA), Unity upskilling, shared VR labs, discounted licenses

RESULTS

Identified barriers for adoption



Type of support required for overcoming challenges



Phase 2: Pilot Applications (Planning Stage)

Pilot housing/institutional projects, trial Enscape & GAMMA AR, VR walkthroughs, AR site overlays

Phase 4: Standardisation & Scaling

Develop guidelines with ICTA & UDA, foster local AR/VR startups, integrate into digital construction policies