# Abstract

AEC Sector is notorious for its over-budget, project delay, high Injuries and fatalities rate resulting from workplace accidents. As widely acknowledged by many experienced project engineers, managers and client, it is attributed to poor collaboration between project stakeholders, time waste caused by poor management on data and lack of insight to set-up safety strategies and policy . The poor performance of these parameters will inevitably affect the entire project, thus leading to poor project delivery.

With the sector is embracing the digital age, the processes involved in the design, construction and operation should be enhanced by technologies dealing with value-added monitoring of data and optimisation of a control room system to solve these problems.

In this study, literature review and research on the available solutions on the market is conducted, it shows that theoretical frameworks for the control room has been discussed by many literature but there is less research focusing on practical demonstration of a control room solution. A demonstration prototype in a decentralised form ?should be developed to show how the control room built based on that theoretical framework and what is its requirement, functionality, and limitation.

Four core techniques have been embodied in the application framework of the control room: (1) Collaboration Platform, (2) VR, (3) Dashboard and (4) Real-time Web Viewer Application. This exploratory study aims to elaborate how to apply these techniques to verify the state of the art of Control Room system by making use of the currently available solution on the market and reviewing these available solutions. The detailed implementation process and case studies have been presented.

The result shows that existing solution like BIM 360 collaboration platform can provide an effective collaboration of modifying the model data with different project team members. The VR viewer is good for site safety training and carry out design review meeting remotely. The power BI dashboard can provide insight from the safety and progress related data. And the web viewer application can capture the sensory data of a working environment at real time for the mangers to understand whether the environment good for the workers to work.

This paper could act as a starting point to pave the way of a control room which implemented in the future. As the creation of the Control Room should be a continuous, evolving process. The potential development of the control room can be much further investigated.

With rapid advances in new generation information technologies, digital twin (DT), and cyber-physical system, smart assembly has become a core focus for intelligent manufacturing in the fourth industrial evolution. Deep integration between information and physical worlds is a key phase to develop smart assembly process design that bridge the gap between product assembly design and manufacturing. This paper presents a digital twin reference model for smart assembly process design, and proposes an application framework for DT-based smart

assembly with three layers. Product assembly station components are detailed in the physical space layer; two main modules, communication connection and data processing, are introduced in the interaction layer; and we discuss working mechanisms of assembly process planning, simulation, predication, and control management in the virtual space layer in detail. A case study shows the proposed approach application for an experimental

simpliﬁed satellite assembly case using the DT-based assembly application system (DT-AAS) to verify the proposed application framework and method eﬀectiveness.

# Declaration

I, Yu Pong Leung, hereby declare that this dissertation is all my own original work and that all sources have been acknowledged. It is xxxxxx words in length.

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Autodesk, IrisVR

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