

From Heritage BIM to Historic Digital Twin

AIM

The aim of this study is to develop a **versatile conceptual framework** for the creation of virtual representations of heritage buildings that encompasses multiple approaches. The framework will enable the generation of an extensive geometric digital representation (**digital shadow**) of a building using AI incorporating intangible data sources, such as **oral histories**, alongside tangible data. Additionally, it facilitates the incorporation of historic operational and functional data to create an **Echo digital twin**, and the generation of a **confluent digital twin** that combines historic and sensor data.

METHODOLOGY

DESIGN SCIENCE RESEARCH

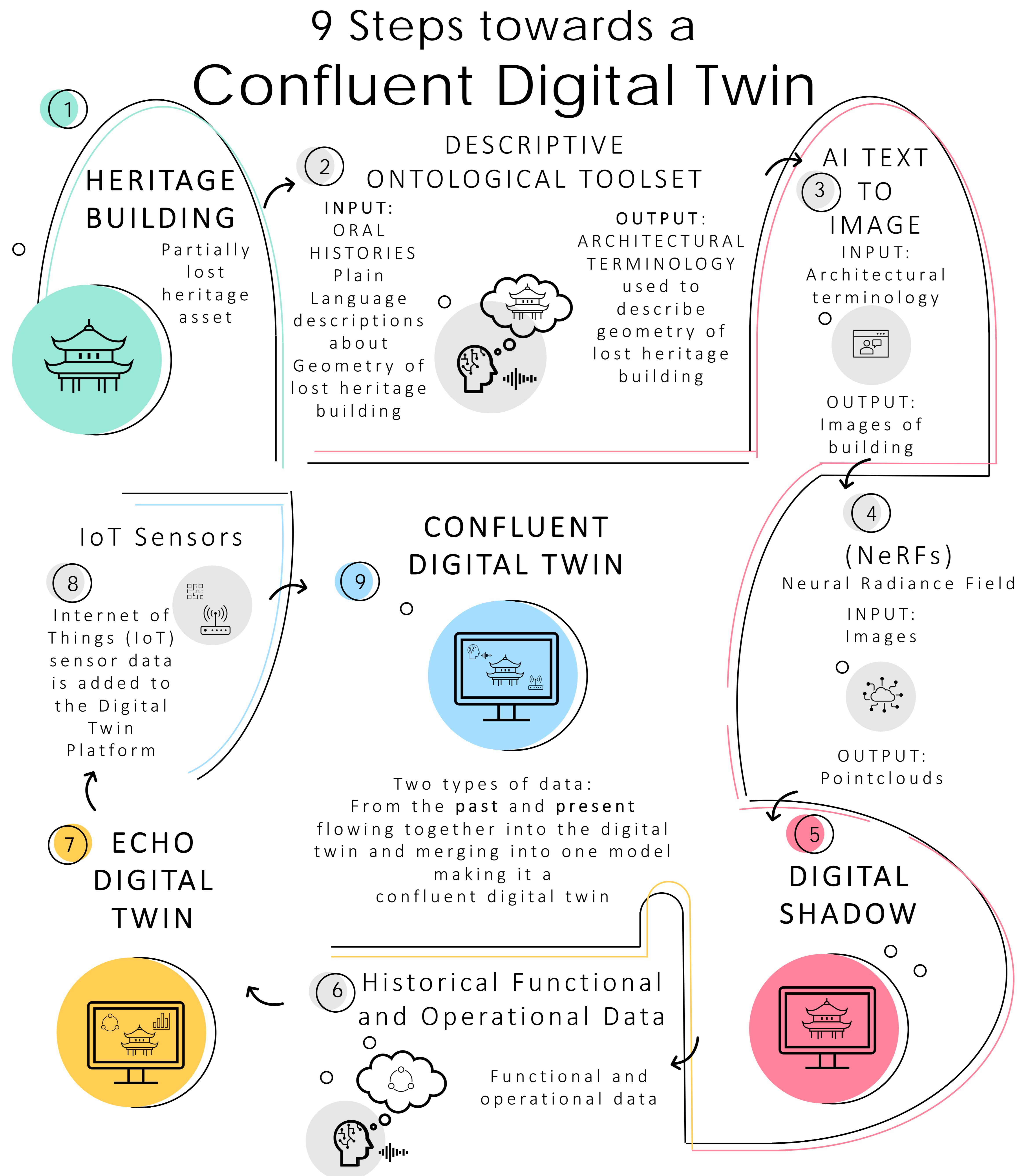
- Step 1: Problem identification and motivation
 - Objective 1: To analyse prevailing research and practice in the field of AH and specifically HBIM
- Step 2: Define the objectives for a solution
 - Objective 2: To investigate built environment applications of the digital twin
- Step 3: Design and development
 - Objective 3: To develop a framework for the integration of physical based geometry in an confluent digital twin environment
- Step 4: Demonstration
 - Objective 4: Based on a case study building to develop a digital workflow of the confluent digital twin
- Step 5: Evaluation
 - This will be achieved through observing how effective the proposed framework is in evaluating the research problem.
- Step 6: Communication
 - The developed artefacts through this research will be communicated to stakeholders through publishing a scientific research

Digital SHADOW

Digital Shadow steps:

- The creation of a descriptive ontological based toolset to support the transferring of plain language description into architectural vernacular.
- Implementing an AI based image generation toolkit for the creation of visual references to specific elements of the tangible cultural heritage asset.
- The use of (NeRFs) technology to convert the images into HBIM model.

Follow the journey



ECHO DT

Making use of memories from stakeholders related to the heritage asset, capturing and inclusion of historic building function and operational data within the digital shadow turning it into an Echo based Digital Twin.

CONFLUENT DT

By combining IoT sensor data from the heritage building with the historical operational and functional data, this digital twin platform effectively integrates information from both past and present sources, resulting in what is known as a Confluent Digital Twin.

CONCLUSION

This research uses AI based image generation to convert descriptions of lost architectural heritage asset features into architectural vernacular within a BIM environment. It also incorporates historical building data from previous occupants into a digital twin platform, revolutionising heritage management.

References

