

Pre-study

Digital Twins in the Built Environment

By Smart Built Environment



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The strategic innovation program (SIP) Smart Built Environment is a plan that outlines how the built environment sector can contribute to Sweden's journey to the global forefront of the new opportunities of digitalization, so that we can achieve intelligent, sustainable cities, manage our resources more efficiently and reduce carbon emissions.

The goals of the programme are to:

- Reduce environmental impact in new builds and renovations by 40%
- Reduce planning and construction time by 33%
- Reduce total construction costs by 33%
- Enable new business logic in the built environment sector

Agenda

- Pre-Study Goals
- Definition and Characteristics of a Digital Twin
- Recommendations from Pre-Study
- Next Step and Ongoing Activities

Pre-Study



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Pre-study Goals

Winter 2020 -
Spring 2021

- Bring forward a definition of digital twins in the built environment.
- Execute a mapping process of ongoing initiatives within the sector.
- Categorize the mapping process in different perspectives.
- Identify challenges for an efficient development of digital twins.

Based on the findings, propose one or more strategic projects within the concept of digital twins in the built environment, governed by Smart Built Environment.

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Definition



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Definition

'A Digital Twin is a realistic digital representation of something physical. What distinguishes a digital twin from any other digital model is its connection to the physical twin'

Digital Built Britain, the Gemini Principles

Characteristics

A Digital Twin is:

1. based on **3D-objects** with accurate position (geodata).
2. enriched with **semantic data**.
3. **scalable** (spatial and temporal).
4. **multi-modal** and uses a variety of approaches to modelling, e.g., including geometric or numerical modelling, or artificial intelligence.
5. **realistic** as it looks and feels like the real environment.
6. **interactive** i.e., is intuitive, accessible, and supports multi-user interaction.
7. **simulated** i.e., is a simulation, based on a mathematical model of the physical twin.
8. **integrated and connected** i.e., is continuously synchronized with the physical twin.
9. **open** i.e., is driven by open data and models.
10. **predictive** as it simulates models forward.
11. **real-time** reflection of physical space in the virtual space.



Varies depending on
context and area of use



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Mapping of Projects



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Mapping of Projects

The mapping process identified **46 digital twin projects** or closely related initiatives of which **35 were Swedish and 11 international** projects. While this shows that the Swedish digital twin landscape is vibrant most of the Swedish projects are rather small both in scope and in terms of budget. Apart from **Chalmers' Digital Twin Cities Centre and the RISE initiative Digital Vision 2030**, which serve (to a degree) as national arenas, all projects have a limited geographical scope. Most initiatives are **not connected** and do not utilize synergies. Information about projects and related initiatives are difficult to find and sometimes outdated. An open and national information platform that provides resources and brings all stakeholders together is currently not available in Sweden. The strategic innovation programmes Viable Cities, Smart Built Environment, IoT Sweden all support digital twin projects or related initiatives. However, there seems to be **no coordinated approach between the programmes** to address the challenges more strategically.

*Pre- Study
Findings and
Recommendations*



Findings

- Vibrant but scattered landscape in Sweden
- No coordinated effort to utilize synergies, no national arena
- No common understanding, lack of general digital twin principles
- Little focus on value creation and organizational aspects such as business models, public welfare, sustainability, citizen engagement, knowledge gaps, collaboration, organization, competencies and roles

Recommendations

- 1. Create a Cross Sectoral Digital Twin Hub in Sweden.** Similar to existing Digital Twin Hubs in the UK, Australia, and the U.S. Sweden should develop their own Digital Twin Hub to give Swedish initiatives a unified platform, share knowledge, and facilitate new **projects**. The Hub would be steered by an impartial group of experts from academia, government, and industry.
- 2. Development/Decide upon of a Common Set of Definitions and Principles for Digital Twins in Sweden**
- 3. Rapid development of National Open and Shared Data Services**
- 4. Support the development of Testbeds, Pilots and Demonstrators that focus on Value Creation**

Next Step



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New Strategic Project funded by *Smart Built Environment*

Goal

Deliver a proposal on how a Swedish Digital Twin Hub for the Built Environment can be set up, organized and financed.

Time plan

Dec 2021 – April 2022

Ongoing activities

- Market analysis of by existing Digital Twin Hubs in the UK, Australia, and the U.S.
- Identify and discuss scope with major stakeholders.
- Propose a financing model
- Define and propose scope and areas of responsibility
- Is there an existing organization whom is willing to host the hub

Thanks

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