Agile Business Modelling Using Digital Twins: The Scene2Model Platform for Design Thinking

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Abstract

Human-centered design has become essential for navigating the complexity of digital transformation in today's globally connected business environments. Navigating change within multidisciplinary teams and driving disruptive innovation on a global scale calls for novel methodologies to engineer business models. Observed limitations relate to the complex knowledge requirements in the design of these models. Design thinking offers a powerful approach to address these complexities by promoting designer-led problem-solving through agile ideation, prototyping, and validation. Encouraging stakeholder co-creation enables the exploration of diverse perspectives within a structured solution space, placing collaboration at its core. Methodologies and tooling are required for these design teams that enable them to collaboratively elaborate, engineer, evaluate, and iterate through design alternatives and explore the solution space. The Scene2Model Platform is proposed and presented as a non-intrusive environment that supports the digitalization of the design results, enabling knowledge processing algorithms and elevating outcomes to model-based representation.

Keywords: digital design thinking, conceptual prototyping, digital twins, Scene2Model

1. Introduction

Design thinking methodologies widely rely on haptic, physical tools—such as paper figures, sticky notes, and storyboards—to externalize participants' knowledge and to co-create solutions in interdisciplinary settings. These tangible artifacts support collaboration, foster shared understanding, and capture collective intelligence during workshops. However, capturing these physical outputs in a machine-processable format often remains manual, inconsistent, and discontinuous, hampering knowledge reuse across distributed teams and limiting the usability of results for following phases such as prototyping. [8] Traditional design thinking practices rely on the physical presence of participants. This enables interaction and development of a common understanding as a team, but limits inclusivity and continuity. Remote or unavailable stakeholders are typically updated retrospectively (follow-ups, documentation). Technical capabilities, e.g., intelligent agents that encapsulate algorithms and mechanisms, can only be used after semantically enriching the achievement as knowledge structures for processing.

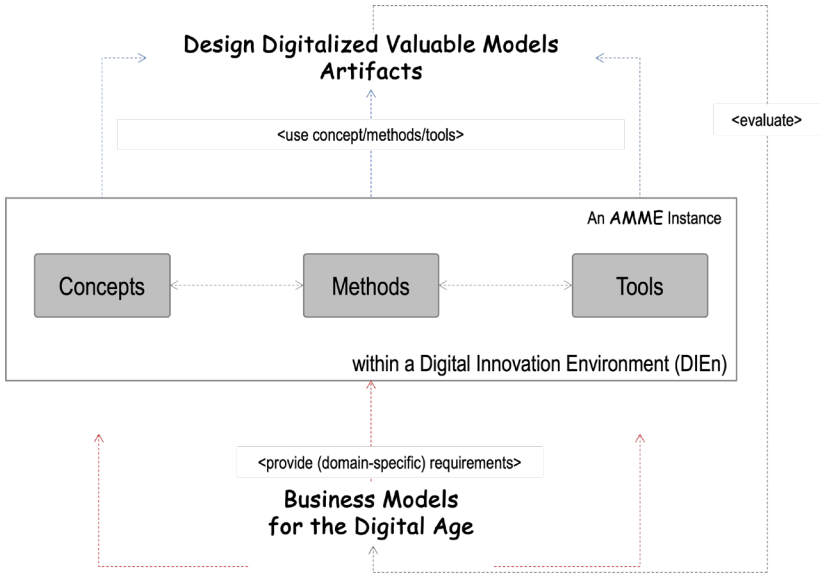

Figure 1 Business Model Design Environment using Agile Modelling Method Engineering (AMME) [1]

This results in the requirement to have adequate domain-specific concepts, methods and tools enabled, realized within a Digital Innovation Environment (DIEN) as presented in Figure 1: (a) the domain of the business model and related design practices are considered as requirements, (b) establishing candidates for concepts, methods and tools to be instantiated and (c) enact the selected in a domain-specific environment for the business model design team. An approach to how such a selection and hybrid combination process can be supported using conceptual structures is presented in [6]. The Agile Modelling Method Engineering (AMME) framework provides the required boundaries for the composition steps as preparation [1], whereas the instantiation of the innovation environment, specifically in a distributed, community-supported manner, is discussed in [4].

2. Approach: Scene2Model for Digital Design Thinking

Scene2Model [5] has been realized with these requirements in mind, as seen in Figure 2. It is positioned as a platform to support arbitrary domains and related functionalities in a non-intrusive manner. This means that the design interactions are not interrupted, but Scene2Model continuously observes and constructs digital twins based on the design results achieved. These results are considered digital twins for the purpose of design as they capture the physical design environment, elevate it with semantics as required, construct semantically enriched model representations, and expose those to a larger audience (human experts, agents, algorithms).

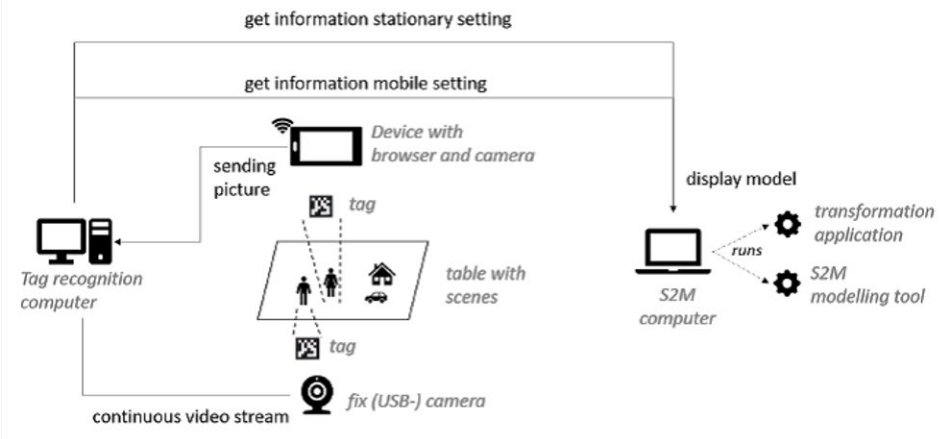

Figure 2 Scene2Model Architecture [5]

Scene2Model is considered a platform as it combines hardware components, software artefacts, and intelligent service implementation into a coherent, domain-specific instantiation.

The important consideration relates to the platform nature, as it allows the design team to adapt functionality on-the-fly to new requirements, establish new processing capabilities, or update the design vocabulary. The core functionality of Scene2Model builds upon the open-source ADOxx meta-modelling platform and applies the Agile Modeling Method Engineering (AMME) lifecycle. This enables the rapid definition and customization of domain-specific modeling languages (DSMLs) that match the vocabulary and structure of the design context. Through computer vision and structured interpretation, the tool extracts semantic content from haptic materials and represents them as conceptual models. These models serve as starting points for further formalization and can be linked with existing enterprise data, supporting continuity from ideation to implementation in software-intensive projects. Scene2Model is a core building block of the OMiLAB Digital Innovation Environment (DiEn), which fosters experimentation with modeling methods and digital twins for product-service system development. Its use of digital twins extends beyond physical systems to include conceptual constructs—models that encapsulate shared understanding and evolving requirements. As such, Scene2Model contributes to digital agility by facilitating iterative refinement, stakeholder engagement, and traceability in early design phases. The tool has been applied in various co-creation scenarios, including living labs, innovation labs, and educational workshops, where it enhances both the process quality and the integration of design outcomes into structured engineering pipelines.

3. Evaluation: NEMO 2025 Innovation Camp

One of the most recent applications of the Scene2Model platform in an educational workshop was at the NEMO2025 Innovation Camp, organized in July 2025 at the Ecole des Mines de Saint-Etienne (https://nemo.omilab.org/2025). A group of 35 international participants representing over 15 different nationalities was guided during one week through the 5.0 innovation process, from “Haptic Co-Creation” to “Digitalization” and “Digital Prototyping”. After being assigned a use case, which depicted a current challenge provided by one of the industry partners, they had to first conceptualize a business model with an innovative solution using the Scene2Model platform. Through the advanced functionalities of Scene2Model and an iterative design process, participants examined next how the digital model artifacts, originating from business model design, guide the realization of digital prototype experimentation. The workshop sessions from NEMO2025 showed that the Scene2Model platform can be used in various application domains, as the use cases that the participants worked on represented the construction industry, healthcare sector, automotive parts manufacturer, and production.

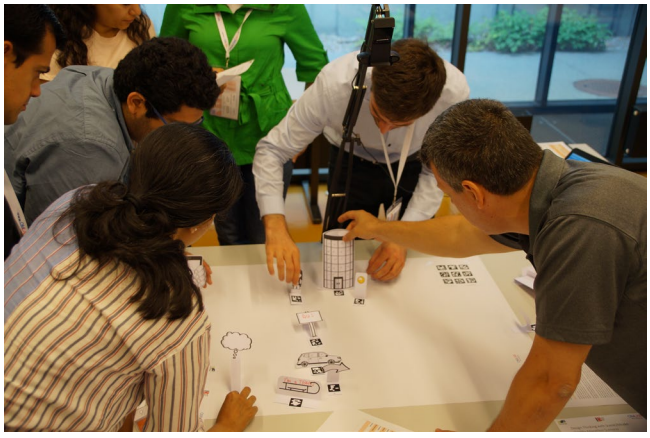

Figure 3 Scene2Model Usage: NEMO Innovation Camp

Acknowledgements

Scene2Model[1] is an implementation powered by the open-source metamodelling platform ADOxx[2] [3, 7], realized as a community effort by the OMiLAB Community of Practice (https://community.omilab.org).

References

1. Karagiannis, D., Utz, W., Oberweis, A., Fill, H.G.: Conceptual Modelling Methods: The Agile Modelling Method Engineering (AMME) Approach. In: Proceedings of the 19th Panhellenic Conference on Informatics. ACM (2015). https://doi.org/10.1145/2801948.2802040
2. Muck, C., Palkovits-Rauter, S.: Conceptualizing Design Thinking Artefacts: The Scene2Model Storyboard Approach. In: Karagiannis, D., Lee, M., Hinkelmann, K., Utz, W. (eds.) Domain-Specific Conceptual Modeling, pp. 567–587. Springer, Cham (2022). https://doi.org/10.1007/978-3-030-93547-4_25
3. OMiLAB Community: ADOxx: The Open Source Meta-Modelling Platform for Domain-Specific Modelling Tools. ADOxx.org (2025), https://www.adoxx.org, official website of the ADOxx platform.
4. OMiLAB Team: A Digital Innovation Environment powered by Open Models Laboratory. Zenodo, DOI:10.5281/zenodo.3899990 (2020), version1.0—Introduction Brochure available via Zenodo
5. OMiLAB Team: Scene2Model – OMiLAB Modelling Environment Combining Physical and Digital Modelling. OMiLAB Webpage (2024), https://www.omilab.org/activities/scene2model/, official website description of Scene2Model
6. Utz, W.: Design of Metamodels for Domain-Specific Modelling Methods using Conceptual Structures. Ph.D. thesis, University of Vienna, Faculty of Informatics (2020). https://doi.org/10.25365/thesis.63113, ph.D. thesis
7. Völz, A., Amlashi, D.M., Burzynski, P., Utz, W.: ADOxx: A Low-Code Platform for the Development of Modeling Tools. HMD – Praxis der Wirtschaftsinformatik 61, 1295–1316 (2024). https://doi.org/10.1365/s40702-024-01096-X
8. Völz, A., Vaidian, I., Muck, C.: Digital Twins for Haptic Design Thinking: Application within CoDEMO 5.0. In: Joint Proceedings of RCIS 2024 Workshops and Research Projects Track. pp. 1–14. Proceedings of the 18th International Conference on Research Challenges in Information Science (RCIS 2024) (May 2024), https://ceur-ws.org/Vol-3674/RP-paper2.pdf, CEUR Workshop Proceedings

[1] Download available at https://scene2model.omilab.org/

[2] Download available at https://www.adoxx.org/