The Value of Digital Twins of Design Thinking in Digital Agility: The Scene2Model Approach

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Abstract

The emergence of disruptive ecosystems leads to new dimensions also in IS development and operation, which poses a challenge in managing change across multi-disciplinary teams and leading innovation initiatives at a global level. Design thinking is introduced to tackle this, as it applies problem-solving techniques through co-creation among stakeholders. It enables early exploration and validation of design(s) of new services and disruptive business models. The Scene2Model tool allows the creation of the digital twin of the design thinking artifacts to be shared among globally distributed networks, IS developers, and stakeholders, and maximize collective intelligence efforts in the digital age. In this context, the digital twins are digital conceptual models that can be further enriched with domain knowledge to be integrated with existing business assets. The interplay of conceptual modelling and design thinking establishes a connection between unrestrained design artifacts and formal abstractions, facilitating digital agility and innovation in IS development.

Keywords: conceptual prototyping, conceptual modelling, storyboarding, digitalization of design artifacts, digital twins.

1. Design Thinking in the Digital Age

The digital age requires a re-evaluation of the infrastructures, networks, and processes needed in designing and managing innovative solutions. The need for new and disruptive business ecosystems is rising due to the influences of globalization, continuous technological advances, and the business's journey toward digital transformation to meet market demands [1]. This comes with challenges not only in creating, implementing, and deploying software-based products and digital services but also in managing and leading the changes that this imposes in a software-intensive business ecosystem. Within this context, experimentation environments are necessary for facilitating collaboration, knowledge transfer, and idea generation among stakeholders from various domains in a joint effort. Any innovation process must enable stakeholders to exchange ideas and seamlessly co-create and assess design artifacts [2]. One significant aspect of the digital age is the human-oriented focus of innovative business models in their offering of products and services [3]. Based on these observations, design thinking is one of the approaches that facilitate human-centered visions, as it applies designer problem-solving techniques for agile, ideation, prototyping, and testing in innovative processes through collaboration [4]. For software-intensive businesses striving for digital agility, it is an instrument to define and discuss novel ideas on an adequate level of abstraction, to establish a shared level of understanding for all stakeholders enabling them to develop an intelligent offering as input for further conceptualization and feasibility assessment. By involving the customer, multi-

disciplinary teams, and stakeholders in the early exploration and design process of new services and smart products, the response to technological change will be more positive, as it embeds an innovation-led mindset from early on and gathers early (user) feedback, that is used afterward to improve the service, product, or idea itself [5]. Design Thinking workshops with human interaction in a physical design space spark creativity. The interaction is supported using haptic elements, such as sticky notes and paper figures, which facilitate knowledge transfer and a common understanding among the participating stakeholders. However, it restricts to location and temporal availability of stakeholders. Absent stakeholders must be informed afterward, which is often not directly supported by the design thinking methods applied.

2.   Digital Twins of Design Thinking

Transforming tangible artifacts from design thinking workshops into digital artifacts is a significant benefit for designing innovative business models with the added value of facilitating model dependency and further analysis of models through a specific flavor of digital twin supporting design thinking [6]. Storyboards, as a design thinking method is selected for realizing the tangible artifacts using haptic paper figures of SAP Scenes™[1]. The stakeholders present develop collaboratively an innovative idea and start creating haptic scenes, to build a visual storyboard of the identified challenge and proposed innovative solution/offering. The design artifacts from the haptic environment, namely the co-created scenes, can be transformed into digital twins of design thinking. The representation of digital twins as conceptual models from a haptic design is input for a detailed analysis on different levels of abstraction: business, organizational, and technological aspects to be assessed on the design level before experimental validation. These models play an essential role in connecting the innovation to its business context and work environment as they capture relationships between different facets of the targeted problem. The interplay of conceptual modelling and design thinking fosters this relation and establishes a connection between unrestrained design artifacts and more formal abstractions (e.g., business process models) [7]. Dedicated software tools, that implement this middle ground, support a richer representation of the problem and ideation space. Machine-readable semantics are needed to enable model-value functionalities such as analysis and simulation, while at the same time supporting understanding and interpretation through visual means. Two layers of interpretability are enabled – one for users, and the other for machines, as automated mechanisms are enabled in support of design assessments and decision-making [7].

3.   The Scene2Model Tool

The Scene2Model[2] software tool, not only enables the transformation from haptic scenes into digital twins of the realized design artifacts, but also semantically enriches the digital twins and facilitates their sharing to embed the collective intelligence of distributed teams in an organization and the larger community of stakeholders and collaborators in iterative cycles [2]. It also acts as a software-supported design thinking environment for co-creation in a Digital Innovation Environment [8], aiming to break the limitations of the working environment and distributed teams, facilitating the transfer of ideas from the physical to the virtual world and the collaboration of globally distributed networks and stakeholders, implied by the digital transformation and globalization of businesses [6]. The Scene2Model software tool supports early prototype development in any domain, as well as further processing of desired specifications for the outcomes, such as LLM-based object description and attribute generation to support the digital agility of businesses.

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[1] SAP Scenes available at: https://apphaus.sap.com/resource/scenes
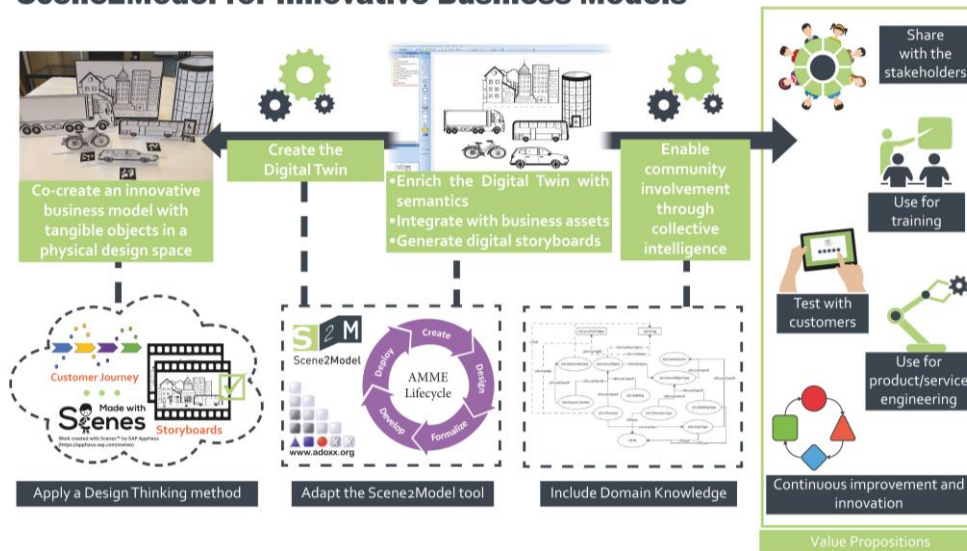[2] Scene2Model open-source tool: https://scene2model.omilab.org/

Fig. 1. Scene2Model for Innovative Business Models[2]

Moreover, it addresses researchers who want to experiment with the digital transformation of diagrammatic models and their semantical enrichment, students to learn and understand the prototyping phase of design thinking, and all users interested in developing their expertise in digital design thinking and the co-creation process of disruptive business ecosystems. Sharing the experience of different stakeholders and backgrounds (levels of expertise, domain knowledge) will stimulate discussion and reflection on (a) how disruptive business models can be created, (b) the value of digital design thinking for software-intensive businesses, (c) model value in relation to diverse business-related purposes, (d) software potential and applicability for innovation projects and disruptive business models. The approach of Digital Twins of Design Thinking using Scene2Model was evaluated in both academia and industry through domain-specific workshops from customer-centric software-related use cases to personalized service delivery in the hospitality industry. The tool is available open source to be downloaded, installed, and used by everyone interested. It is one of the tools used within the OMiLAB Community of Practice[3] and is continuously extended with new functionalities driven by the community.

References

1. Moser, D., Wecht, C.H., Gassmann, O.: Digitale Plattformen als Geschäftsmodell. ERP Management 15, 45-48 (2019)
2. Karagiannis, D., Buchmann, R.A., Boucher, X., Cavalieri, S., Florea, A., Kiritsis D., Lee, M.: OMiLAB: A Smart Innovation Environment for Digital Engineers. In: Boosting Collaborative Networks 4.0. PRO-VE 2020. IFIP Advances in Information and Communication Technology (2020)
3. Deguchi, A., Hirai, C., Matsuoka, H., Nakano, T., Oshima, K., Tai M., Tani, S.: What is Society 5.0? In: Society 5.0. A People-centric Super-smart Society, Springer, Singapore (2020)
4. What is Design Thinking? [Online]. Available: https://www.ideou.com/blogs/inspiration/what-is-design-thinking. [Accessed 28 09 2023].
5. Karagiannis, D., Buchmann, R.A., Utz, W.: The OMiLAB Digital Innovation environment: Agile conceptual models to bridge business value with Digital and Physical Twins for Product-Service Systems development. Computers in Industry 138, 103631 (2022)
6. Karagiannis, D.: How Digital Twins for Design Thinking Support Innovative Business Models. The Kyoto Economic Review 198, S123-S146 (2024)

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[3] OMiLAB Community of Practice: https://www.omilab.org/community/

7. Muck, C., Palkovits-Rauter, S.: Conceptualizing Design Thinking Artefacts: The Scene2Model Storyboard Approach. In: Domain-Specific conceptual Modeling: Concepts, Methids and ADOxx Tools, Springer, Cham, (2022)

8. OMiLAB Team: A Digital Innovation Environment powered by Open Models Laboratory. (2020)