A Digital Innovation Environment

powered by **Open | Models Laboratory**

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Management Summary

The **Digital Innovation Environment (DiEn)** powered by OMiLAB enables design, engineering and training activities for organisations pursuing Digital Transformation initiatives. Stakeholders from multi-disciplinary backgrounds are supported to create innovative ideas as **Digital Business Models**, to materialise them in proof-of-concept implementations using **Digital Twins** and to evaluate their feasibility in a laboratory setting as/through the **OMiLAB Innovation Corner**, within a corporate or academic context focusing on Digital Innovation.

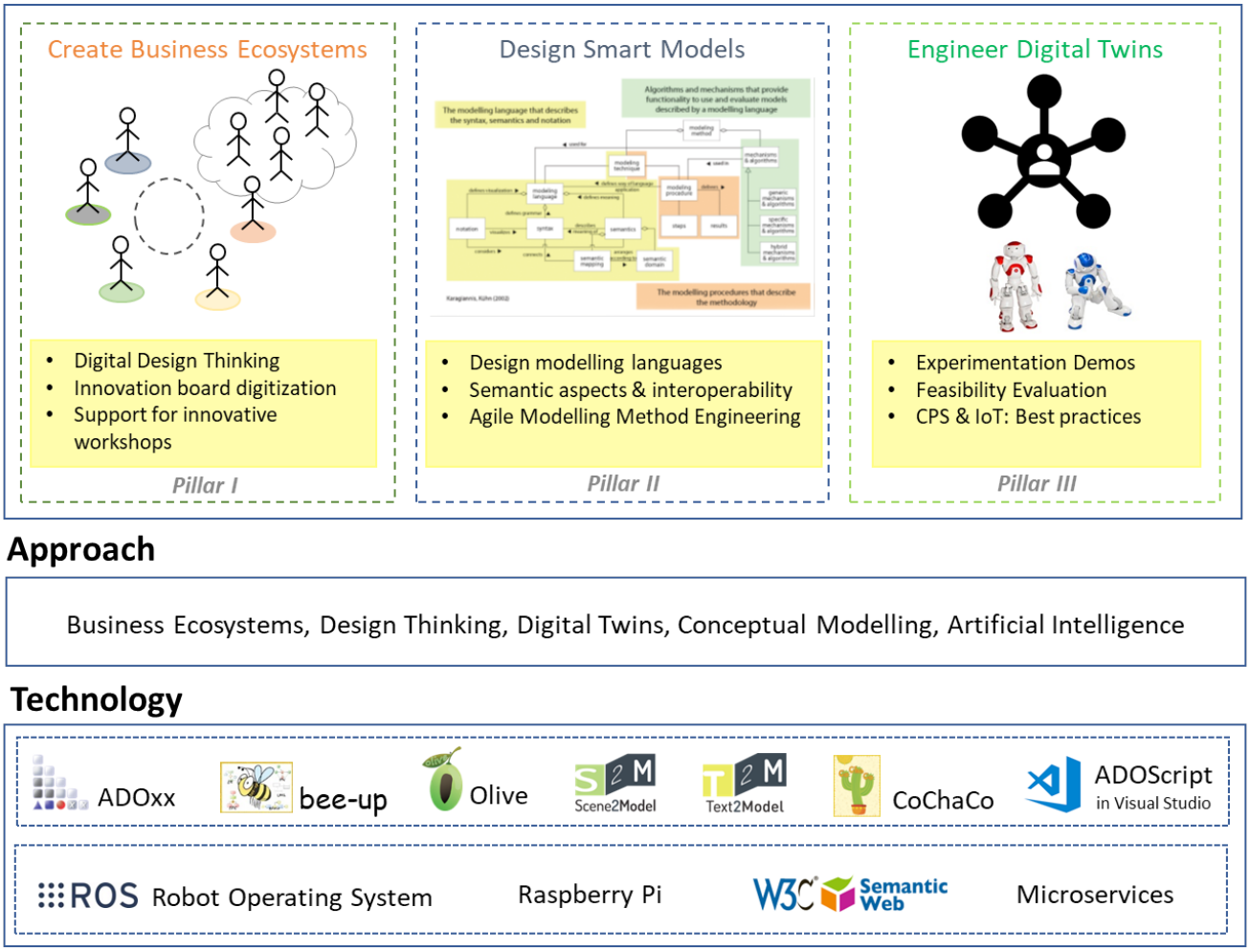


Figure 1: The pillars of the Digital Innovation Environment

Basic Concepts

The **Digital Innovation Environment of OMiLAB** builds on the notion of **Digital Business Models** and employs a **Digital Twin** as a conceptual representation of an intelligent offering, which **a)** must be co-designed by domain experts and innovators from different backgrounds, **b)** provides an adequate virtualisation of reality, considering domain-specificity and the value to be created, and **c)** enables experimentation and evaluation based on "**Smart Models**".

Traditionally a business model is understood as a conceptual artefact that enables stakeholders to "describe the rationale of how an organisation creates, delivers, and captures value"[1]. When elevating this viewpoint to the digital age, a **Digital Business Model** is defined as "a form of creating value based on the development of customer benefits using digital technologies. The aim of the digital solution is to generate a significant advantage for which customers are willing to pay"[2] that builds on the three pillars: "Content" for an intelligent offering, "Experience" as the user centric paradigm and "Platform" to support its realisation[3].

The term **Digital Twin** is understood as a digital replica of a material or immaterial object or process from the real world in the digital world. It is irrelevant whether the counterpart of the digital twin already exists in the real world or will come into existence in the future[4]. Beyond data it also describes the behavior of the replicated object/process, as analytical capabilities like simulation via algorithms[5].

"**Smart Models**" hereby represent Conceptual Models of varying domain-specificity that manifest two key qualities: a) they integrate multiple perspectives and levels of detail in order to ensure consistency and semantic mediation across multiple viewpoints on the same socio-technical system, b) they make rich semantics available to both, humans and machines, thus covering a semantic spectrum that can range from highly abstract business ideas down to the level of executable artefacts.

1 Osterwalder, A. & Pigneur, Y., (2010). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers.* Wiley.
2 Innolytics (2020). *What is a digital Business Model?* Retrieved from: https://innolytics-innovation.com/digital-business-model/.
3 Weill, P., & Woerner, S. L. (2013). *Optimizing Your Digital Business Model.* MIT Sloan Management Review.
4 Saddik, A. E. (2018). *Digital Twins: The Convergence of Multimedia Technologies*. IEEE MultiMedia, vol. 25, no. 2, pp. 87-92.
5 Gesellschaft für Informatik (2017). *Digitaler Zwilling.* Retrieved from: https://gi.de/informatiklexikon/digitaler-zwilling/.

Basic Technologies

The **Digital Innovation Environment** of OMiLAB builds on technologies supporting the digital transformation process, either with physical assets (eg. CPS, IoT) or virtual assets (eg. virtual software, conceptual modelling tools).

We hereby employ the notion of "**Virtual Services**" as a working term for Information System components that deliver value and support decision-making within a business model with the help of intelligent agents, digital task assistants or orchestrations of knowledge and web services.

A **Cyber-Physical System** (CPS) is defined as a combination of IT/software components with mechanical and electronical parts, that are capable to communicate over a network and exchange information as they are connected, controlled and monitored by computer-based algorithms[6].

The **Internet of Things** (IoT) introduces a large variety of smart connected objects which constantly transmit and receive real-time data about their environment, communicating with one another and with humans via the Internet.

Open source software for **conceptual modelling in *DiEn*** is provided out of the box to support the integrated approach. For example: Scene2Model®[7], which can capture business scenarios from haptic representations created with SAP Scenes®[8], is aided by the Scene2Model® Design Thinking tool, Bee-Up®[9], which provides multi-language and multi-perspective conceptual modelling support, as well as connectivity with physical objects through open interfaces, and Text2Model® using Neural Networks.
All conceptual modelling software tools are built on the ADOxx® Meta-Modelling Platform and are available in the integrated virtual environment Olive®.

6 Khaitan, S. K., & McCalley, J. D. (2015). *Design Techniques and Applications of Cyberphysical Systems: A survey.* IEEE Systems Journal, vol. 9, no. 2, pp. 350-365.
7 Miron, E. T., Muck, C., & Karagiannis, D. (2019, January). Transforming Haptic Storyboards into Diagrammatic Models: The Scene2Model Tool. In Proceedings of the 52nd Hawaii International Conference on System Sciences.
8 SAP Scenes https://experience.sap.com/designservices/resources/scenes
9 Karagiannis, D., Buchmann, R. A., Burzynski, P., Reimer, U., & Walch, M. (2016). Fundamental conceptual modeling languages in OMiLAB. In Domain-Specific Conceptual Modeling (pp. 3-30). Springer, Cham.

Experimental and Educational Objectives of *DiEn*

Best Practices Setup and Validation of Experiments

Each of the three pillars (see Fig. 1) may be employed independently for projects where the scope can be confined to one of their corresponding workspaces. However, complex projects may require a combination of activities across these pillars. In such cases, the Digital Twin pillar takes centre stage to integrate the abstraction layers, where solution Co-Creation and Agile Engineering are performed – e.g. between the characteristics of an innovative business service and the properties of **experimental prototypes** that demonstrate the service execution or **validate** their feasibility. For this purpose, the Digital Twins are described with the help of semantically-rich **Conceptual Models**, to advance the setup of a best practice experiment, respectively of a network of Cyber Physical Systems.

Teaching Digital Innovators and Digital Engineers

The design of the Digital Innovation Environment is particularly suited to facilitate the emergence of two novel professional roles and skill profiles - **Digital Innovators** (with a business focus) and **Digital Engineers**[10] (with an engineering focus) - as well as to support the alignment of their work towards successful Digital Transformation projects.

To conclude, the focal point in OMiLAB's Digital Innovation Environment is the integration of conceptualisation and engineering activities, leading to the creation of Digital Twins and the assessment of digital business models. A variety of assets – software and hardware based on open platforms and open interfaces – are offered for each of the pillars, to facilitate the collaboration between these two professional roles.

10 Karagiannis, D., Buchmann, R., Boucher, X., Cavalieri, S., Florea, A., Kiritsis, D. (2020). OMiLAB: a Smart Innovation Environment for Digital Engineers. 21st IFIP / SOCOLNET Working Conference on Virtual Enterprises, PRO-VE 2020, Valencia, Spain.

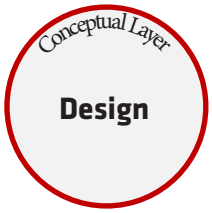
Materializing *DiEn*:
The OMiLAB Innovation Corner

In the two selected OMiLAB Innovation Corners, shown in Fig. 2 (page 8) and Fig. 3 (page 9), namely an *Academic* and *Industrial* instance, the three pillars of *DiEn* take the form of three operational layers - each employing toolkits and dedicated workspaces with specific foci:

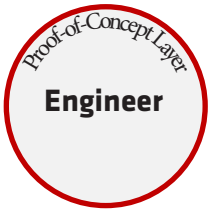
The **creation of Business Ecosystems**, including Digital Business Models, through co-creation and problem-solving workshops supported by a Digital Design Thinking toolkit.

The toolkit enables the transfer of ideas between physical "innovation boards" (typically involved in Design Thinking workshops) and conceptual modelling tools where those ideas become machine-processable.

The **design of Smart Models** as interactive knowledge structures on which Digital Twins are built, by using out-of-the-box modelling tools or adapting them for domain-specific problems.



The toolkit includes a metamodelling environment for creating or adapting modelling methods and for implementing interactivity and interoperability of model contents.



The **engineering of Digital Twins** and their manifestations as either Cyber-physical systems (e.g. robotic components driven by multi-agent systems) or purely Virtual services (e.g. simulation assessments, process-aware apps).

The toolkit includes technological components – both robotic and software - to enable the experimentation and feasibility evaluation that are necessary in research or educational projects.

Would you like to establish your own

Academic

OMiLAB Innovation Corner ?

Figure 2: An Academic OMiLAB Innovation Corner[11]

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11 Bork, D., Buchmann, R., Karagiannis, D., Lee, M., & Miron, E.-T. (2019). An Open Platform for Modeling Method Conceptualization: The OMiLAB Digital Ecosystem. Communications of the Association for Information Systems, vol. 44. Retrieved from: http://www.omilab.org/assets/docs/CAIS-OMiLAB_2018.pdf

Would you like to establish your own

Industrial

OMiLAB Innovation Corner ?

Figure 3: An Industrial OMiLAB Innovation Corner[12] [13]

Please contact:
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12 Woitsch, R. (2020). Industrial digital environment in action: The OMiLAB Innovation Corner. In proceedings of the 13th IFIP WG 8.1 working conference on the Practice of Enterprise Modelling, PoEM 2020, Riga, Latvia.
13 DigiFoF Project, https://www.digifof.eu/

Notes

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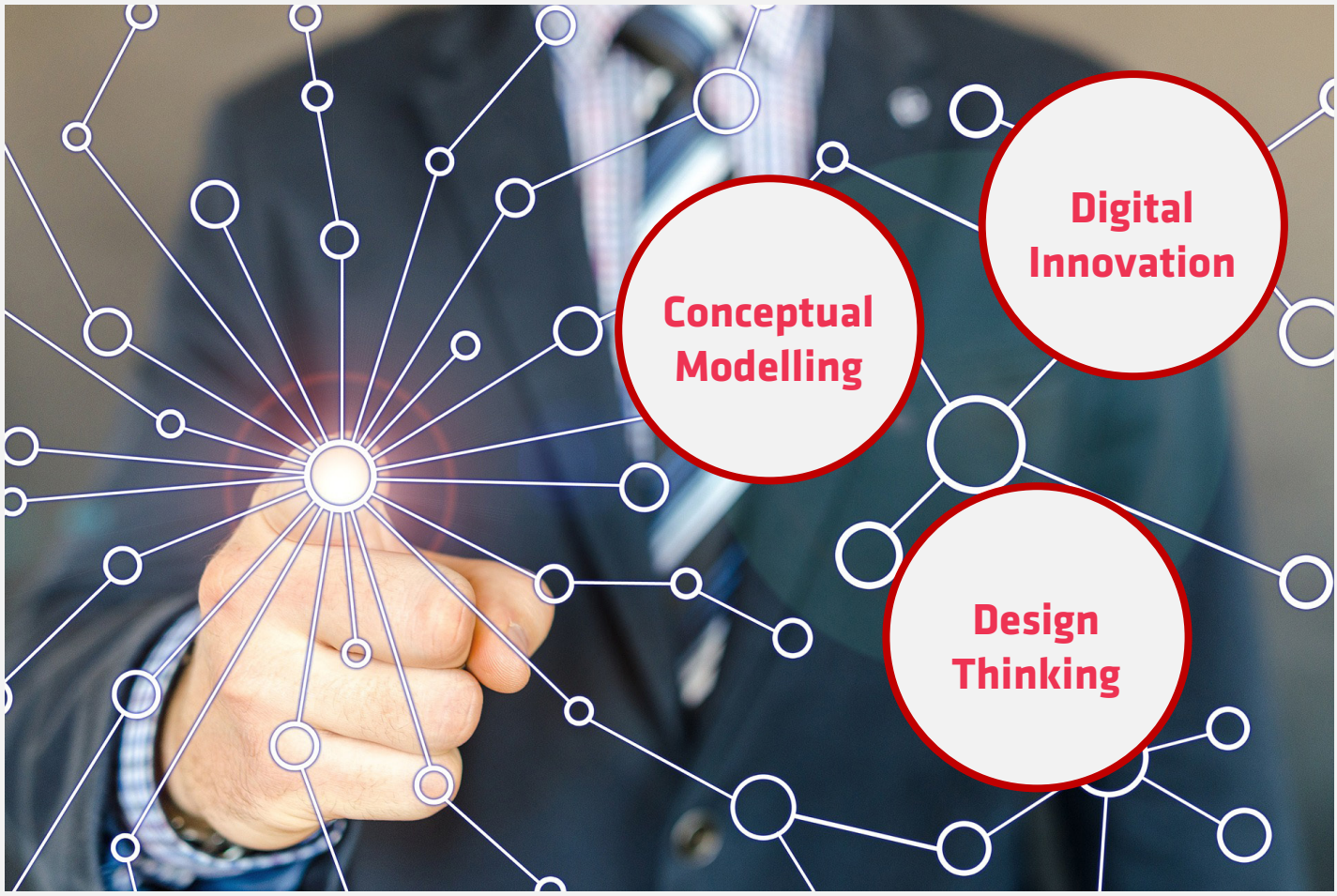

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