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Abstract Software tools hold great promise to support the modeling, analyzing, and innovation of business models. Current tools only focus on the design of business models and do not incorporate the complexity of existing interdependencies between business model components. These tools merely allow simulating inherent dynamics within the models or different strategic decision scenarios. In this research, we use design science research to develop a prototype that is capable of modeling and simulating dynamic business models. We use system dynamics as a simulation approach and containers to allow deployment as web applications. This paper represents the first of three design cycles, realizing six out of 59 requirements that are collected from the literature on software tools for business models. We contribute toward the design of novel artifacts for business model innovation as well as their evaluation. Future research can use these results to build tools that consider and address the complexity of business models. Lastly, we present several options for extending the proposed tool in the future.

Keywords: dynamic business model, tool, simulation, design science, system dynamics.

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1 Introduction

Companies need to develop innovative offerings to remain competitive (Amit and Zott, 2010). Business model innovation (BMI) has manifested itself as an important concept for theory and practice (Haaker et al., 2017; Marolt et al., 2018), and managers, in particular, should pay more attention to it (Pang et al., 2019). The impact of BMI has been regarded as superior to technological innovation (Chesbrough, 2007; Still et al., 2017; Teece, 2010). Thus, research on the methods and tools to implement BMI has become an important aspect in managing innovation (Amit and Zott, 2010; Becker et al., 2017; Schneider and Spieth, 2013; Teece, 2010).

With the abundance of data and computing power, software tools can perform the required modeling and analysis of business models (BMs) for innovation (Osterwalder and Pigneur, 2013; Szopinski et al., 2019). Numerous contributions have called for further advancement of the topic (Ebel et al., 2016; Szopinski et al., 2019; Veit et al., 2014) and even suggest to explore "…the application of computer-aided design tools to design tasks such as prototyping, simulating, iterating and versioning business models…" (Osterwalder and Pigneur, 2013). At the same time, the complexity to model and analyze BMs is rising. Particularly, the optimization of a BM for profit, growth, innovation, and robustness, while ensuring dynamic adaptation and strategic flexibility, are core use cases for managers (Cosenz and Noto, 2018).

However, most concepts, frameworks, and tools for BMs and BMI presented in the literature are inflexible and therefore limited in their use cases. For example, they allow for analyzing and representing the current state of a company's BM but fail to account for dynamic behavior or future states of a particular BM (Augenstein et al., 2018; Schaffer et al., 2019). Managers can be assisted in evaluating available alternatives of BMI and supported in ongoing decision making, through software-based artifacts, by performing simulations on a diverse set of strategic scenarios and BM configurations (Schaffer et al., 2019).

Therefore, the goal of this paper is to present a prototype of a tool that is capable of modeling and simulating inherent dynamics in BMs. With this study, we contribute to research on BM tooling and provide practitioners with a first version of an applicable artifact based on the completion of the first iteration within a design science research (DSR) cycle (Peffers et al., 2007).

2 Background and Related Work

2.1 Business Models and Dynamics

In prior research, numerous concepts and frameworks for developing and innovating BMs have been proposed (Arreola González et al., 2019; Marolt et al., 2016). According to Massa et al. (2017) BMs can be understood, among other interpretations, as formal conceptual representations of how an organization operates. As such, these concepts and frameworks describe the value creation, value delivery, and value capture logic of a venture (Teece, 2010). The Business Model Canvas, as a conceptual representation, has become the quasi-standard for representing BMs (Massa et al., 2017). Further, a variety of other frameworks are available. In our study, we utilize the business model component framework by Krumeich et al. (2012), which uses a component-based description similar to the Business Model Canvas, yet allowing to describe a BM in more detail, as it consists of 20 components.

With external upsets, rapid changes in legislation, and increasing competition, a BM and its underlying factors are subject to ongoing adaptation. This has led to the perspective of dynamic BMs, which can be defined as "…a complex system of interrelated sub-components of the value creation, delivery and capture mechanisms, which is interacting with heterogeneous internal and external influences leading to the evolution of its components and the system itself." (Schaffer et al., 2019). Compared to a static approach, a dynamic perspective recognizes BMs as correlated and complex systems of various elements. Furthermore, a BM is not only changed purposefully, but it is also exposed to inherent dynamics that occur unintentionally. The analysis of induced changes in a business model is crucial (Groesser and Jovy, 2016). In such complex systems, decision-makers require support to quickly take informed and effective decisions (Jere Jakulin et al., 2020).

One technique to model these dynamics is through simulation. By developing causal loop diagrams, the logical interdependencies in a complex and dynamic BM can be captured (Casadesus-Masanell and Ricart, 2010) and simulation models can be derived. A literature-based review of existing interdependencies between BM components can be found in Schaffer, Drieschner et al. (forthcoming). In the context of BMs, a suitable simulation approach is system dynamics (SD) (Cosenz and Noto, 2018). SD is a computer-aided approach to enhance analysis and decision making in complex systems (Moellers et al., 2019), and according to Täuscher and Chafac (2016) "SD focuses on identifying nonlinear causal relations in a system". As such, it accounts for nonlinearities, delayed cause-and-effect, and feedback relationships (Groesser and Jovy, 2016). However, building effective simulation models is a complex task and requires a deep understanding of simulation approaches. In practice, simulations can be used to evaluate different BM choices (scenarios) toward, for example, the adaptability, profitability, or robustness of a BM. However, to encourage practical implementation, the ease of use needs to be increased, since the typical consumer of the simulation outcomes is middle management, innovation managers, entrepreneurs, and potential investors. These consumers are typically only interested in the simulation results, and often hesitate to apply resources to model BMs required for simulation.

2.2 Extant Software-Based Tools for Business Models

To account for the complexity of BMs, managers use software-based tools to aid the process of modeling and innovating BMs. One well-known example is the e3-Value ontology (Akkermans and Gordijn, 2003). Other examples include Dellermann et al. (2019) who developed a decision support system for BM validation and Peinel et al. (2010) who described a modeling method to support the planning of BMs in the context of eGovernment work. Groesser and Jovy (2016) provide a quantitative approach for BM analysis, based on a SD-simulation, to address dynamic complexity in BMs and interactions of company initiatives, BMs, and their elements. Techniques have been proposed to identify the role of information technology (IT) in other areas, such as BM transformation, evaluation, and management (Augenstein, 2019; Rambow-Hoeschele et al., 2019; Terrenghi et al., 2017). In a series of papers, Athanasopoulo et al. provided a tool for BM development in the context of the Internet-of-Things, implementing prefilled BM templates and utilizing so-called solution-based patterns (Athanasopoulo, de Reuver, Haaker, 2018; Athanasopoulo, de Reuver, Kosman et al., 2018; Athanasopoulou and de Reuver, 2018). However, the majority of the existing software-based tools are restricted to visualizing and designing a BM and do not offer simulation capabilities (Terrenghi et al., 2017). To our knowledge, no tools exist that offer the capability to simulate different BM design choices (i.e., scenarios), or that depict existing interdependencies between components to account for inherent dynamics.

3 Methodology

By definition, the result of applying DSR is "a purposeful IT artifact created to address an important organizational problem" (Hevner et al., 2004). An artifact may be a decision support system, a modeling tool, a governance strategy, an IS evaluation method, or an IS change intervention (Gregor and Hevner, 2013). Since the goal of this research is to create a tool that enables decision support, we adhere to the DSR guidelines for developing such an innovative artifact to an unsolved problem as proposed by Hevner et al. (2004) and Gregor and Hevner (2013). Table provides an overview of our DSR approach according to the process defined by Peffers et al. (2007). This approach entails creating an understanding of the context and the perceived problem, design a solution, interpret, and test the prototype with a real-world use case. Through this process we are aligning with prior DSR approaches on BM tooling, such as Athanasopoulo, Haaker et al. (2018).

Table1: DSR approach applied within this research, adapted from Peffers et al. (2007)

Step	Activities
(1) Identify Problem & Motivation	Identify the problem and highlight importance (Section 1 and 2)
(2) Define Solution Objectives	Select six requirements and derive concrete design principles (Section 4.1)
(3) Design & Develop	Implement the tool to develop and simulate dynamic BMs (Section 4.2)
(4) Demonstration	Apply the artifact to a case study (Section 5)
(5) Evaluation	Evaluate a problem-solution fit and determine requirements and improvements for the next design iteration (Section 6)
(6) Communication	Publish problem and proposed solution to receive feedback from academia

The first step of our DSR cycle is the problem identification and the motivation of the topic as in the first two sections of this paper. Second, we define the objectives and the requirements of our proposed software tool used for BM development and simulation. The third step, following the requirements and design principles, is to design and implement the artifact for decision support. Finally, we demonstrate the artifact using a case study on a digital platform ecosystem for the German tourism industry. In our case, the platform owner uses the tool prototype to assess alternative options for the configuration of the value proposition in a first iteration. This iteration comprises the alpha and beta testing and an initial use case to show that the proposed tool can be used to solve practical problems (Hevner et al., 2004). We evaluate the artifact and derive conclusions regarding its functionality in the fifth step listed in Table 1 (Verschuren and Hartog, 2005). According to Prat et al. (2014), the instantiation and the demonstration of the use of an artifact is a valid evaluation. Particularly, we discuss preliminary results of the artifact and options for improvement in subsequent iterations. Finally, we conclude our first iteration by providing our insights to the community and by making the artifact available for further contributions from the scientific community (Hevner et al., 2004).

4 Artifact Description: Tool Prototype

In this DSR project, we focus on the design of a prototype that is functional for further evaluation, based on the requirements that we identified from the literature. In our first cycle, we created a working prototype of a software-based tool, which can model and simulate BMs and their components. In this section, we present the requirements and applied design principles, followed by the tool prototype.

4.1 Requirements and Design Principles

To define the objectives of the proposed solution, we obtained requirements and design principles for BM tooling based on existing literature (Peffers et al., 2007). We build on our prior work, during which we identified 59 requirements and subsequent design principles for BM tools based on a comprehensive literature review (Schaffer, Weking et al., forthcoming). These are 1) requirements regarding dynamic BMs and 2) general requirements toward BM tooling and decision support systems. Since this prototype represents the first design cycles of the overall research setting, we selected the most relevant requirements to create the first artifact, ensuring the relevance and practicality of the presented artifact. Within the first research cycle, we selected six out of 59 identified requirements (see Schaffer, Weking et al., forthcoming), which are listed in Table 2. Three researchers involved in designing the BM of the use case depicted in Section 5 were asked to prioritize the requirements in a way that reflected their immediate needs. Based on this prioritization, we selected the requirements in Table 2, as they describe the core functionalities necessary for a running prototype and were prioritized by potential users.

Table 2: Requirements identified and selected for the tool prototype in the first iteration

Requirement 1: Build on existing BM representations and use a clear structure (Athanasopoulo, de Reuver, Kosman et al., 2018; Augenstein, 2019; Dellermann et al., 2019; Haaker et al., 2017; Schoormann et al., 2018)
Requirement 2: Users have to be able to customize the underlying BM to best fit a certain context (Giessmann et al., 2013; Szopinski et al., 2019)
Requirement 3: Provide features for specifying BM versions/variants to compare different solution options (Ebel et al., 2016; Schoormann et al., 2018; Voigt et al., 2013)
Requirement 4: Enable modeling of interdependencies between BM elements (Augenstein, 2019; Schaffer et al., 2019; Szopinski et al., 2019)
Requirement 5: Provide functions for simulating and financially evaluating a BM (Szopinski et al., 2019; Voigt et al., 2013)
Requirement 6: Facilitate collaboration across time, location, and organizational boundaries with the architecture of the tool (Dellermann et al., 2019; Ebel et al., 2016; Schoormann et al., 2018; Zec et al., 2014)

For the artifact specification, we selected subsequent design principles for the respective requirements. These also stem from prior work (Schaffer, Weking et al., forthcoming). Our goal was to specify a useable artifact, with design principles that can be easily comprehended and at the same time fulfill the requirements. The following design principles, as presented in Table 3, are used for implementation.

Table 3: Design principles employed to fulfill identified requirements for the tool prototype

Req.	Design principle	Description
R1	Use of existing framework by Krumeich et al. (2012)	Providing a clear structure by using an existing framework consisting of 20 components
R2	Individual creation, editing, and linking of components (Giessmann et al., 2013; Schoormann et al., 2018; Szopinski et al., 2019)	Allow customization by various editing and adjustment functionalities
R3	Creating different models and versions of them (Voigt et al., 2013)	Model management section to create and compare various models and versions of them
R4	Modeling of interdependencies between components and effects on existing interdependencies (Augenstein, 2019; Szopinski et al., 2019)	Function to create visual links as well as to create dependencies within the underlying functions used for simulation
R5	Definition of quantitative information within elements and interdependencies used for simulation (Szopinski et al., 2019; Voigt et al., 2013)	For each element, specific parameters, and mathematical functions can be defined and used by the simulation
R6	Containerized software as a web application (Zec et al., 2014)	The architecture as web application allows collaboration without regional or time boundaries

4.2 Tool prototype

The prototype of our tool is depicted in Figure. The bar on the left presents the hierarchical logic of our tool. After logging in, users can create a new project, for example, based on their use case, represented in the "projects" view. Within a project, a variety of BMs can be generated and simulated. The "models" section in the center of Figure is the modeling environment. This environment is based on SD (Forrester, 2009). To translate the concepts of SD into BMs, we used stocks from SD as BM components, while flows from SD were used to describe interrelations between the components. Stocks in SD describe entities that can accumulate or be depleted, such as resources. Flows are entities that lead to an increase or decrease in a stock, for example an adoption rate influencing the total number of customers. As such, one stock represents a maximum of one BM component; however, more than one stock can be used to model a component, e.g. different types of resources within the component resource model.

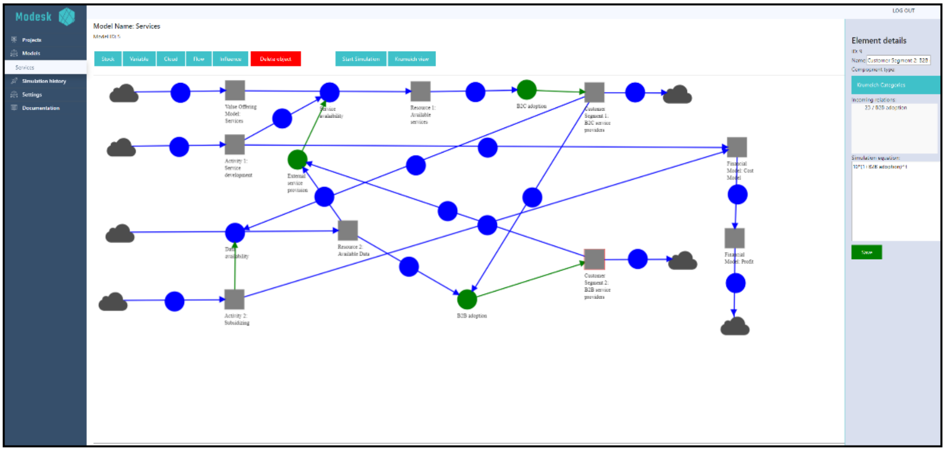

Figure 1: Tool prototype. Left: Navigation bar. Middle: Modeling environment depicting a case from a research project (see Section 5 of this research). Right: Editing section

Components can be grouped for better comprehension. We use the *Business Model Component Framework* of Krumeich et al. (2012) to describe each of the components, as it is a detailed framework consisting of 20 components, allowing us to capture the complexity of a BM and prepare it for simulation. In Figure 1, on the right, the editing section of an individual element is shown. Each element in the modeling environment can be described (element type, e.g., BM component; metrics, and equations for simulations) and edited individually. In the model depicted in Figure 1, the editing of the BM component Customer and Market Segment is shown. Users can choose the relevant BM component currently modeled from a dropdown list (turquoise button on the right), describe and edit the component, and define its metrics. The same is possible for additional variables and stimuli to create comprehensive models that are suitable for simulation. Once a model is created, users can run simulations directly in the modeling environment. If equations or metrics are missing, error warnings are shown for the respective components. Depending on the variables that have been defined, it is for example possible to simulate cash-flows for different scenarios. The simulations can be performed directly within the "models" section and be saved in the "simulation history" screen.

The prototype is designed as a containerized application, to allow easy deployment in different environments. To address the presented requirements and develop the prototype, we implemented the following technology stack:

- Docker for Containerization,
- Spring Boot, Angular, and Bootstrap for the application,
- MySQL for the database,
- Swagger for the API, and
- The simulation engine is self-developed and implemented in Java, following the rules of SD (Forrester, 2009).

5 Artifact Demonstration: Use Case of a Research Project Conceptualizing a Digital Platform Ecosystem

The use case to demonstrate our tool and its subsequent evaluation is a research project that aims to conceptualize a digital platform ecosystem for the German tourism industry. One relevant use case of the platform is connecting two customer segments: Business-to-business (B2B) service providers (component Customer Segment 2 in the modeling environment in Figure 1) and business-to-consumer (B2C) service providers (Customer Segment 1). Different key values are offered for both customer segments to get them on board (Engert et al., 2019). To provide value-added services, B2B service providers require a large amount of data to be exchanged through the platform. The B2C service providers are interested in the available services on the platform, which they can use and offer to their respective customers.

The success of this platform BM depends on the willingness of the B2C service providers to share their data within the ecosystem. If they provide sufficient data, B2B service providers are more eager to provide value-added services. The B2B service providers, on the other hand, are willing to create a service in exchange for data, as data monetization has become an important strategic option for many firms (Baecker et al., 2020). The platform BM has two options available:

- **Option 1:** Increase the BM component *Product and Service Offering* by increasing the number of available services (Resource 1) by, for example, creating services for the platform by the operator;
- **Option 2:** Increase the BM component *Resource Model* by increasing the amount of available data (Resource 2) on the platform by, for example, the operator paying B2C service providers to share their data.

Choosing either one of these options will have significant implications on the respective adoption rates, and thus on the growth of the platform and its BM. The complexity of the decision lies in the tradeoff between multiple future scenarios regarding the platform ecosystem. The proposed tool is capable of simulating this early stage, helping to evaluate the available options and resource investment decisions. In Option 1, creating own services, increasing the *Product and Service Offering* requires additional resources (Ressource 1), additional activities (Activity 1), and increased costs (Financial Model: Cost Model). Option 2, paying for the provision of data, requires additional activities (Activity 2), increased costs (Financial Model: Cost Model), and influences the customer relationship, the value proposition, and the profit (Financial Model: Profit). In Figure 1, only the relevant components of this setting are shown. Based on this model as depicted in Figure 1 and described above, both scenarios can be simulated.

The tool models these interdependencies and helps to understand occurring dynamics. Based on a set of assumptions and real-world data, it can be shown that Option 1, even though having higher initial cost (Financial Model: Cost Model), increases the overall adoption of the BM (the adoption rates of both customer segments increase stronger in this option than with Option 2) as well as the long-term profitability (Financial Model: Profit). Option 2 is more costly (Financial Model: Cost Model), and the costs increase even more with an increasing adoption rate by the B2C service providers (B2C adoption), while the adoption rate of B2B service providers is weaker.

6 Discussion and Conclusion

In this paper, we designed and evaluated a software tool to model BMs and their inherent dynamics. The proposed artifact is novel since existing tools hardly support the modeling of interdependencies between BM components and do not simulate dynamics or evaluate varied design choices.

Through our artifact, we contribute to research on BM tooling and dynamic BMs. For the two BM scenarios within the demonstrated use case, we successfully show the practical application of the tool and its' simulation functionality. We, therefore, contribute to the body of knowledge by showing that simulations and software tools, for complex BM decisions in practical settings, enhance decision support (Massa et al., 2017) in the context of BMI (Augenstein, 2019; Cosenz and Noto, 2018). Furthermore, we enhance literature on BM tooling by providing a tool allowing to evaluate different BM design choices and depicting interdependencies between components, thus accounting for dynamics (Osterwalder and Pigneur, 2013; Szopinski et al., 2019). At the same time, the tool is a step towards purposeful user-involvement in BM design and BMI.

This research is subject to certain limitations. Only a limited number of requirements have been realized, as we focused on the fundamental functionalities of our tool. The creation of simulation models is still complicated, not entirely accomplishing the goal of reducing the effort to conduct complex simulations. Furthermore, the evaluation of the tool prototype is demonstrated through the use of the artifact within a research project, with the BM being in a conceptual stage. Even though this is a valid evaluation method (Prat et al., 2014), additional iterations and more user feedback are required. For simulation, the tool uses SD-models, which are incomplete and can be extended and further validated (Täuscher & Chafac, 2016).

Based on this prototype and feedback received, we will expand the tool through case studies on the BMs of companies while continuing to evaluate the existing tool. The tool will be advanced by a new user interface and providing templates of generic patterns, building blocks, and where practical, entire models. More BM representations, such as the Business Model Canvas, will be implemented to allow selection of the desired framework by users. Further, we plan to implement a recommender system for modeling, which will reduce the complexity of modeling and simulation. Automatic identification and notification of users of crucial dependencies between components is another option for advancing the proposed artifact. User involvement in BMI will be encouraged with a collaborative editor. In the tool's current form, for different scenarios, a model needs to be cloned and adjusted. However, for the updated design, we plan to implement the development and the evaluation of different scenarios within one model. Finally, a repository of models that have been developed with our tool could be provided anonymously and used as best practice guidelines for various practitioners.

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References

Akkermans, J. M. and Gordijn, J. (2003) 'Value-based requirements engineering: exploring innovative e-commerce ideas', Requirements Engineering, vol. 8, no. 2, pp. 114–134.

Amit, R. H. and Zott, C. (2010) Business Model Innovation: Creating Value in Times of Change, Working Paper WP-870.

Arreola González, A., Pfaff, M. and Krcmar, H. (2019) 'Business Model Representations and Ecosystem Analysis: An Overview', in Themistocleous, M. and Rupino da Cunha, P. (eds) Information Systems, Cham, Springer International Publishing, pp. 464–472.

Athanasopoulo, A., de Reuver, M. and Haaker, T. (2018) 'Designing digital tooling for business model exploration for the Internet of Things', in Designing for a digital and globalized world: 13th international conference, DESRIST 2018, Cham, Springer.

Athanasopoulo, A., de Reuver, M., Kosman, R. and Roelfsema, M. (2018) 'Understanding business model innovation: Recommendations for future business model tooling by an action research.', in R&D Management Conference Proceedings, Milano, Italy.

Athanasopoulo, A., Haaker, T. and de Reuver, M. (2018) 'Tooling for Internet-of-Things Business Model Exploration: A Design Science Research Approach', Twenty-Sixth European Conference on Information Systems (ECIS2018).

Athanasopoulou, A. and de Reuver, M. (2018) 'Designing business model tooling for business model exploration: An experimental design for evaluation', BLED 2018 Proceedings, 2018, University of Maribor Press, pp. 477–489.

Augenstein, D. (2019) Design Principles for Business Model Analytics Tools: Dissertation, Karlsruhe.

Augenstein, D., Fleig, C. and Maedche, A. (2018) 'Development of a Data-Driven Business Model Transformation Tool', in Designing for a Digital and Globalized World, Cham, Springer International Publishing, pp. 205–217.

Baecker, J., Engert, M., Pfaff, M. and Krcmar, H. (2020) 'Business Strategies for Data Monetization: Deriving Insights from Practice', in Gronau, N., Heine, M., Poustcchi, K. and Krasnova, H. (eds) WI2020 Zentrale Tracks, GITO Verlag, pp. 972–987.

Becker, W., Ulrich, P., Botzkowski, T. and Eurich, S. (2017) 'Digitalisierung von Geschäftsmodellen', in Schallmo, D., Rusnjak, A., Anzengruber, J., Werani, T. and Jünger, M. (eds) Digitale Transformation von Geschäftsmodellen, Wiesbaden, Springer Fachmedien, pp. 283–309.

Casadesus-Masanell, R. and Ricart, J. E. (2010) 'From Strategy to Business Models and onto Tactics', Long Range Planning, vol. 43, 2-3, pp. 195–215.

Chesbrough, H. (2007) 'Business model innovation: it's not just about technology anymore', Strategy & Leadership, vol. 35, no. 6, pp. 12–17.

Cosenz, F. and Noto, G. (2018) 'A dynamic business modelling approach to design and experiment new business venture strategies', Long Range Planning, vol. 51, no. 1, pp. 127–140.

Dellermann, D., Lipusch, N., Ebel, P. and Leimeister, J. M. (2019) 'Design principles for a hybrid intelligence decision support system for business model validation', Electronic Markets, vol. 29, no. 3, pp. 423–441.

Ebel, P. A., Bretschneider, U. and Leimeister, J. M. (2016) 'Leveraging virtual business model innovation: a framework for designing business model development tools', Information Systems Journal, vol. 26, no. 5, pp. 519–550.

Engert, M., Pfaff, M. and Krcmar, H. (2019) 'Adoption of Software Platforms: Reviewing Influencing Factors and Outlining Future Research', Twenty-Second Pacific Asia Conference on Information Systems (PACIS 2019).

Forrester, J. W. (2009) Some Basic Concepts in System Dynamics, Boston, Sloan School of Management, Massachusetts Institute of Technology.

Giessmann, A., Fritz, A., Caton, S. and Legner, C. (2013) 'A Method For Simulating Cloud Business Models: A Case Study On Platform As A Service', in Twenty-First European Conference on Information Systems (ECIS 2013).

Gregor, S. and Hevner, A. R. (2013) 'Positioning and Presenting Design Science Research for Maximum Impact', MIS Quarterly, vol. 37, no. 2, pp. 337–355.

Groesser, S. N. and Jovy, N. (2016) 'Business model analysis using computational modeling: a strategy tool for exploration and decision-making', Journal of Management Control, vol. 27, no. 1, pp. 61–88.

Haaker, T., Bouwman, H., Janssen, W. and de Reuver, M. (2017) 'Business model stress testing: A practical approach to test the robustness of a business model', Futures, vol. 89, pp. 14–25.

Hevner, A. R., March, S. T., Park, J. and Ram, S. (2004) 'Design Science in Information Systems Research', MIS Quarterly, vol. 28, no. 1, pp. 75–105.

Jere Jakulin, T., Rozman, Č., Pažek, K., Kljajić Borštnar, M., Škraba, A., Kofjač, D. and Jakulin, V. (2020) Systems Approach Concepts in Contemporary Society: Systems Thinking, Modelling and Simulation in Science and Practice, Hamburg, Kovac, Dr. Verlag.

Krumeich, J., Burkhart, T., Werth, D. and Loos, P. (2012) 'Towards a Component-based Description of Business Models: A State-of-the-Art Analysis', Eighteenth Americas Conference on Information Systems (AMCIS 2012).

Marolt, M., Lenart, G., Kljajić Borštnar, M., Vidmar, D. and Pucihar, A. (2018) 'SMEs Perspective on Business Model Innovation', BLED 2018 Proceedings, 2018, University of Maribor Press, pp. 577–591.

Marolt, M., Maletič, D., Borštnar, M. K., Lenart, G. and Pucihar, A. (2016) 'Comparative Analysis of Business Model Ontologies', in 35th International Conference on Organizational Science Development: Sustainable Organization, Portoroz, Slovenia.

Massa, L., Tucci, C. and Afuah, A. (2017) 'A critical assessment of business model research', Academy of Management Annals, vol. 11, no. 1, pp. 73–104.

Moellers, T., Burg, L. von der, Bansemir, B., Pretzl, M. and Gassmann, O. (2019) 'System dynamics for corporate business model innovation', Electronic Markets, vol. 29, no. 1, p. 74.

Osterwalder, A. and Pigneur, Y. (2013) 'Designing business models and similar strategic objects: The contribution of IS', Journal of the Association of Information Systems, vol. 14, no. 5, pp. 237–244.

Pang, C., Wang, Q., Li, Y. and Duan, G. (2019) 'Integrative capability, business model innovation and performance', European Journal of Innovation Management, vol. 34, no. 2, p. 161.

Peffers, K., Tuunanen, T., Rothenberger, M. A. and Chatterjee, S. (2007) 'A Design Science Research Methodology for Information Systems Research', Journal of Management Information Systems, vol. 24, no. 3, pp. 45–77.

Peinel, G., Jarke, M. and Rose, T. (2010) 'Business models for eGovernment services', EG (Electronic Government), vol. 7, no. 4, pp. 380–401.

Prat, N., Comyn-Wattiau, I. and Jacky, A. (2014) 'Artifact Evaluation in Information Systems Design Science Research: A Holistic View', Nineteenth Pacific-Asian Conference on Information Systems (PACIS 2014).

Rambow-Hoeschele, K., Rambow, N. G., Hampel, M. M., Harrison, D. K. and Wood, B. M. (2019) 'Creating a Digital Twin: Simulation of a Business Model Design Tool', Advances in Science, Technology and Engineering Systems Journal, vol. 4, no. 6, pp. 53–60.

Schaffer, N., Drieschner, C. and Krcmar, H. (forthcoming) 'An Analysis of Business Model Component Interrelations', Twenty-Third Pacific Asia Conference on Information Systems (PACIS 2020).

Schaffer, N., Pfaff, M. and Krcmar, H. (2019) 'Dynamic Business Models: A Comprehensive Classification of Literature', in Thirteenth Mediterranean Conference on Information Systems (MCIS 2019).

Schaffer, N., Weking, J. and Stähler, O. (forthcoming) 'Requirements and Design Principles for Business Model Tools', Twenty-Sixth Americas Conference on Information Systems (AMCIS 2020).

Schneider, S. and Spieth, P. (2013) 'Business Model Innovation: towards an integrated future research agenda', International Journal of Innovation Management, vol. 17, no. 01, pp. 1340001-1 - 1340001-34.

Schoormann, T., Behrens, D. and Knackstedt, R. (2018) 'Design Principles for Leveraging Sustainability in Business Modelling Tools', in Twenty-Sixth European Conference on Information Systems (ECIS 2018).

Still, K., Seppanen, M., Korhonen, H., Valkokari, K., Suominen, A. and Kumpulainen, M. (2017) 'Business Model Innovation of Startups Developing Multisided Digital Platforms', 2017 IEEE 19th Conference on Business Informatics (CBI). Thessaloniki, Greece, IEEE, pp. 70–75.

Szopinski, D., Schoormann, T., John, T., Knackstedt, R. and Kundisch, D. (2019) 'Software tools for business model innovation: current state and future challenges', Electronic Markets, vol. 60, no. 11.

Täuscher, K. and Chafac, M. (2016) 'Supporting business model decisions: a scenario-based simulation approach', International Journal of Markets and Business Systems, vol. 2, no. 1, p. 45.

Teece, D. (2010) 'Business Models, Business Strategy and Innovation', Long Range Planning, vol. 43, 2-3, pp. 172–194.

Terrenghi, N., Schwarz, J., Legner, C. and Eisert, U. (2017) 'Business Model Management: Current Practices, Required Activities and IT Support', 13. Internationale Tagung Wirtschaftsinformatik (WI 2017). St. Gallen, Switzerland.

Veit, D., Clemons, A., Benlian, A., Buxmann, P., Hess, T., Kundisch, D., Leimeister, J. M., Loos, P. and Spann, M. (2014) 'Business Models – An Information Systems Research Agenda', Business & Information Systems Engineering, vol. 6, no. 1, pp. 45–53.

Verschuren, P. and Hartog, R. (2005) 'Evaluation in Design-Oriented Research', Quality & Quantity, vol. 39, no. 6, pp. 733–762.

Voigt, M., Plattfaut, R., Ortbach, K., Malsbender, A., Niehaves, B. and Becker, J. (2013) 'Evaluating Business Modeling Tools from a Creativity Support System Perspective: Results from a Focus Group in the Software Development Industry', Seventeenth Pacific Asia Conference on Information Systems (PACIS 2013).

Zec, M., Dürr, Peter, Schneider, Alexander W. and Matthes, F. (2014) 'Improving Computer-Support for Collaborative Business Model Design and Exploration', Proceedings of the Fourth International Symposium on Business Modeling and Software Design (BMSD 2014), pp. 29–37.