# Defining Key Performance Indicators for Business Models: Design Principles for a Method and Tool Support

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# DEFINING KEY PERFORMANCE INDICATORS FOR BUSINESS MODELS: DESIGN PRINCIPLES FOR A METHOD AND TOOL SUPPORT

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# DEFINING KEY PERFORMANCE INDICATORS FOR BUSINESS MODELS: DESIGN PRINCIPLES FOR A METHOD AND TOOL SUPPORT

*Research in Progress*

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## Abstract

*Key Performance Indicators (KPIs) play an important role in guiding the management of business models throughout their lifecycle. However, existing research lacks practical methods to guide the definition of KPIs for business models. Without proper guidance, there may be a mismatch between the intended business model design and its implementation, resulting in many promising business model ideas failing to reach the market. To address this problem, we adopt a design science research approach to design and evaluate a method and supporting IT tool for defining business model KPIs. In this research-in-progress paper, we present a set of meta-requirements and design principles for developing the method and tool support. We instantiate the requirements and principles in a tool prototype and evaluate their validity in semi-structured interviews with five industry experts. Our study contributes to research on KPIs for business models and the development of methods and tools for business model management.*

*Keywords: Business Model, Key Performance Indicator, Design Science Research, Design Principle.*

## 1 Introduction

Business models have become an essential concept in today's management practice as conceptual representations of an organization's business logic and as cognitive schemas to facilitate stakeholder communication (Massa et al., 2017). A business model describes how an organization creates, delivers, and captures value (Teece, 2010). It functions as a useful concept to represent, innovate, and evaluate an organization's business logic (Osterwalder et al., 2005; Veit et al., 2014). The innovation and adaptation of business models is viewed as a continuous cycle, referred to as the business model management lifecycle (Wirtz, 2020). The business model management lifecycle comprises five phases: design, implementation, operation, adaptation and modification, and control (Wirtz, 2020).

To support and facilitate business model management activities, several models, methods, and IT tools are available (Bouwman et al., 2012; Schwarz and Legner, 2020). Models are used as conceptual templates to represent, visualize and discuss an organization's business model (Baden-Fuller and Morgan, 2010). Prominent examples include the Business Model Canvas (Osterwalder and Pigneur, 2010) and e3-value ontology (Gordijn and Akkermans, 2003). Methods provide systematic guidance for specific tasks in the business model management lifecycle, such (re-)designing business processes (Lara Machado et al., 2023) and creating road maps (de Reuver et al., 2013). Lastly, IT tools support the digital representation of models (e.g., Augenstein and Fleig, 2018) or facilitate the digitization of methods, such as exploring business models in a virtual environment (e.g., Athanasopoulou et al., 2018).

Key Performance Indicators (KPIs) play an important role in guiding the management of business models across all phases of the business model management lifecycle (Gilsing et al., 2022). KPIs are measurable constructs that enable organizations to evaluate how well they are performing in relation to their objectives (Domínguez et al., 2019). In the context of business models, KPIs are used to specify measurable objectives in the design phase (e.g., Gilsing et al., 2021a; Heikkilä et al., 2016), monitor the performance of a business model during implementation and operation (e.g., Augenstein et al., 2018; di Valentin et al., 2013) and benchmarking against competitors (e.g., Afuah and Tucci, 2003).

Several theoretical contributions to support the definition of KPIs for business models have been reported in the literature (Van de Ven et al., 2022). The available knowledge base consists primarily of models, such as KPI catalogs (e.g., Dubosson-Torbay et al., 2002; Heikkilä et al., 2016) and KPI frameworks (e.g., Lüdeke-Freund et al., 2017; Morioka et al., 2016). In contrast, only a few methods and IT tools are available to guide the definition of business model KPIs (Van de Ven et al., 2022). Existing methods (e.g., Heikkilä et al., 2014; Montemari et al., 2019) provide limited support for systematically identifying KPIs and tailoring them to a specific business model. In practice, decision-makers desire systematic guidance and IT support to capture the critical parameters of business models (Terrenghi et al., 2017). Without the right guidance, there could be a gap between the planned business model design and its implementation, preventing many good business model ideas from succeeding in the market (Frankenberger et al., 2013; Geissdoerfer et al., 2018).

To address this problem, we aim to develop a method and supporting IT tool that guide the definition of business model KPIs. In this research-in-progress paper, we aim to derive design knowledge for developing the method and supporting IT tool. Therefore, we formulate the following research question:

*What are relevant meta-requirements and design principles for a method and supporting IT tool that guide business model KPI definition, and how can they be instantiated?*

We follow a Design Science Research (DSR) approach to answer this question. In the context of our research, the proposed artifact is an IT-enabled method that guides identifying, operationalizing, and selecting KPIs for business models. In this research-in-progress paper, we report our findings of the first design cycle of our DSR project, which focuses on the definition of meta-requirements and design principles for the development of the method. To demonstrate the applicability of the design principles, we instantiate them into an initial prototype and evaluate them in expert interviews.

With our research, we respond to the calls to investigate the definition of KPIs for business models (Burkhart et al., 2011; Nielsen et al., 2018; Van de Ven et al., 2022). In addition, our study advances the knowledge on the development of practical methods and IT support for managing and innovating business models (Bouwman et al., 2020; Szopinski et al., 2020; Veit et al., 2014). We aim to contribute to both research and practice by providing design knowledge and a prototype instantiation to inform the design of new methods and IT tools for managing business models and the extension of existing ones.

The remainder of this paper is as follows. We describe the theoretical background of our research in Section 2. In Section 3, we describe the research design that we followed. In Section 4, we report on the results of our first design cycle, in which we derived requirements and principles for developing our proposed method. Section 5 presents an instantiation of the principles in a preliminary method description and IT tool prototype. In Section 6, we report our findings from the expert interviews we conducted to evaluate the validity of the requirements and principles. Finally, we conclude this paper by discussing our expected contributions and future research steps in Section 7.

## 2 Theoretical Background

Over the past two decades, business models have gained increasing interest in academic research (Budler et al., 2021; Wirtz et al., 2016). In Information Systems (IS) research, the business model is viewed as an intermediate layer between an organization's strategy and its business processes, including its Information Technology (IT) systems (Al-Debei and Avison, 2010; Veit et al., 2014). A good business model articulates who the target customer is, what value is offered to the customer, how this offering is created and delivered, and what costs and benefits are associated with this (Gassmann et al., 2014; Turetken et al., 2019). One approach to describing business models is through the use of business model patterns, which refer to reoccurring design solutions that have proven to be successful in the past in different industries or contexts (Weking et al., 2020). Business model patterns provide an abstract description of a particular instance or dimension of a business model, such as *Freemium*, *No Frills,* or *Razor and Blade* (Remane et al., 2017). Furthermore, to fulfill the different needs of different customers, many organizations may adopt more than one business model (Schwarz et al., 2017). For example, Hilti decided to expand its power tool business, aimed at selling high-quality construction tools, with an additional business model focused on providing fleet management services (Johnson et al., 2008).

Key Performance Indicators (KPIs) represent a set of indicators that focus on the most critical aspects of performance for the current and future success of the organization (Parmenter, 2020). They enable organizations to operationalize their strategic objectives and evaluate the extent to which they are being fulfilled (Kaplan and Norton, 1996). While the term *KPI* is often used interchangeably with other terms (e.g., performance indicator, measure, or metric) (Lebas and Euske, 2007), in this paper, we adopt the term KPI because business professionals most commonly use it to refer to a deliberate selection of performance indicators (Hope, 2007). KPI management has been studied in different contexts and fields, leading to a variety of frameworks and tools (Domínguez et al., 2019). However, traditional KPI management frameworks, such as the Balanced Scorecard, may not fully capture the unique aspects of today's digital business models (e.g., SaaS, e-commerce) (Nielsen et al., 2017). Moreover, many organizations track their performance using business intelligence tools (Peters et al., 2016). Yet, these tools typically focus on operational or process-level performance, making them less suitable for tracking business model performance (Augenstein et al., 2018). As a result, scholarly interest in developing systematic guidance for defining business model KPIs has been increasing (Van de Ven et al., 2022).

KPIs for business models help decision-makers monitor an organization's critical dimensions of performance (McGrath, 2010) and provide insights into how competitiveness can be increased (Montemari and Gatti, 2022). Once a business model is understood and described, it facilitates the identification of KPIs for evaluating business model performance (Montemari et al., 2019). Business model KPIs can be both quantitative (e.g., customer retention, delivery time) and qualitative (e.g., customer satisfaction, brand image) (Heikkilä et al., 2016). Business model performance measurement differs from other types of performance measurement, such as organizational, product, or process performance (Van de Ven, 2021). For instance, in the case of Hilti, sales revenue can be measured as an overall financial KPI to assess the organization's strategy as a whole (Kaplan and Norton, 1996). However, since Hilti has adopted both a product-based and service-based business model, the organization would want to measure financial performance separately for each model. In addition, the value proposition Hilti offers in its product-based business model differs from that of its service-based model, as well as the value chain needed to create it (Bereznoi, 2015; Johnson et al., 2008). Therefore, Hilti would want to adopt different KPIs to measure the performance of each business model. We build on the existing body of knowledge on business models and KPI management to construct our method.

## 3 Research Design

To develop the method for defining business model KPIs, our research follows the Design Science Research (DSR) paradigm (Gregor and Hevner, 2013). DSR aims to build and evaluate artifacts to address identified business problems (Hevner et al., 2004). To contribute to the existing knowledge, DSR often involves multiple iterative design cycles (Hevner, 2007; Sonnenberg and vom Brocke, 2012).

Our DSR project is planned in two design cycles (Figure 1). In this paper, we report the results of the first cycle, which focuses on the design and evaluation of meta-requirements and design principles to guide the development of the method and a supporting IT tool. Design principles codify design knowledge to enable its reuse (Chandra Kruse et al., 2016) and support designers in developing instances of artifacts that can be applied to similar problems (Sein et al., 2011). We derive the design principles from meta-requirements, which are requirements that address a class of artifacts (Walls et al., 1992). Meta-requirements are formulated in an abstract and general way, making them valid for more than one artifact instance (Möller et al., 2020). In the second design cycle, we aim to improve the method, build the IT tool, and apply it in a real-life business environment to evaluate its use (Venable et al., 2012).

We structure our research according to the DSR methodology and followed the process proposed by Peffers et al. (2007). This approach is commonly used to develop artifacts in business model research (e.g., Gilsing et al., 2021b; Schoormann et al., 2021). Accordingly, our research process involves identifying and motivating the problem, defining the objectives of a solution artifact, designing and developing the artifact, and demonstrating it in a suitable context to evaluate its validity and utility.

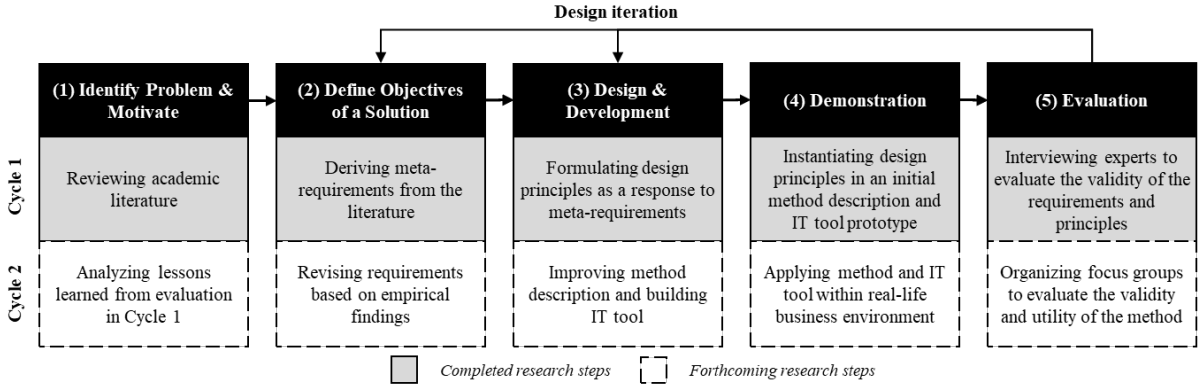


*Figure 1. Iterative development of the method.*

In design cycle 1, we follow the guidelines of Möller et al. (2020) to derive supportive meta-requirements and design principles from the literature for guiding the design of the method (Peffers et al., 2007). To *identify and motivate the problem*, we first reviewed the existing academic literature on models, methods, and IT tools for defining business model KPIs and for KPI definition in general. Based on our analysis, we explicated the problem that our study aims to address (see Section 1): *the lack of methods to guide the definition of KPIs for business models and the absence of design knowledge to develop such methods*. To address this problem, we aim to develop design knowledge in the form of meta-requirements and design principles to assist designers in developing methods for business model KPI definition. To *define the objectives of a solution*, we built on the existing knowledge from related studies resulting from the literature review to derive meta-requirements. Subsequently, we formulated design principles in response to the derived meta-requirements based on the theoretical insights from the identified literature. The *design and development* of the method is guided by the derived meta-requirements and design principles. To *demonstrate and evaluate* the requirements and principles, we instantiated them into an initial method description and IT tool prototype. In addition, we performed semi-structured interviews (Myers and Newman, 2007) with five experts from the industry in which we focused on the validity of the requirements and principles (Wiegers and Beatty, 2013). Consistent with the current stage of the DSR study, prototype instantiation and expert interviews are appropriate means to evaluate the validity of our proposed artifact (Sonnenberg and vom Brocke, 2012).

# 4 Meta-Requirements and Design Principles

In this section, we report the meta-requirements and design principles for developing the artifact, i.e., a method that guides the definition of KPIs for business models. In the following, we describe the four identified meta-requirements.

The focus of the artifact is on the definition of KPIs for business models. Therefore, a business model design of an organization serves as the basis for the further identification, operationalization, and selection of business model KPIs. Users may define KPIs for a current business model of an organization (Montemari and Gatti, 2022; Wirtz, 2020) or for a future business model design that it aims to implement (Batocchio et al., 2017; Heikkilä et al., 2016). Accordingly, the first meta-requirement is:

*MR1: The artifact should take the design of a business model as the basis for the definition of KPIs.*

The second meta-requirement relates to identifying KPIs for the considered business model. KPIs can be identified in many ways, such as by brainstorming with responsible managers (e.g., Heikkilä et al., 2014), deriving them from literature (e.g., van Looy and Shafagatova, 2016), or by picking them from an existing KPI catalog (e.g., Lüdeke-Freund et al., 2017). To ensure that the identified KPIs are relevant, they must be aligned with the business model under consideration (Heikkilä et al., 2014; Montemari et al., 2019). Therefore, we formulate the following requirement:

*MR2: The artifact should support the identification of KPIs relevant to the considered business model.*

The operationalization of KPIs is an essential aspect of KPI definition because it enables the reuse of KPIs and the alignment of knowledge within the organization (Popova and Sharpanskykh, 2010). In the context of KPIs, operationalization refers to the specification of characteristics for each KPI (Popova and Sharpanskykh, 2010). Such characteristics may include calculation formulas, data sources, target values, and relations to other KPIs (del-Río-Ortega et al., 2014; Strecker et al., 2012). Accordingly:

*MR3: The artifact should support the operationalization of the identified KPIs.*

When an initial set of KPIs is identified for a business model, it is often a rather large pool. Thus, the organization needs to determine which KPIs in the pool are the "key" indicators of performance in order to end up with a manageable set (Podgórski, 2015; Shahin and Mahbod, 2007). The suitability of a KPI for a specific business model may depend on several criteria, including the interdependency of a KPI with other KPIs and the availability of KPI data (Mourtzis et al., 2018). Accordingly:

*MR4: The artifact should support the selection of KPIs to determine which KPIs should be adopted by the organization.*

Next, we present design principles (DPs) that address the meta-requirements. The DPs serve as prescriptive guidelines for the design and development of the artifact. We follow the framework by Chandra et al. (2015) to formulate our design principles in a structured way:

*"Provide the system with [material property—in terms of form and function] in order for users to [activity of user/group of users—in terms of action], given that [boundary conditions—user group's characteristics or implementation settings]."*

The *boundary conditions* of the DPs are determined by the implementation setting of the *system*, i.e., the development of an IT-enabled method for defining business model KPIs. For all principles, the *implementers* can be method engineers, software developers, or researchers that aim to develop a method and IT support for defining KPIs for business models. Potential *users* of the to-be-designed method are business professionals responsible for developing organizations' business models. Examples of users include senior executives, innovation experts, and management consultants. We recommend involving various stakeholders from different departments (e.g., sales, finance, and IT) to brainstorm about the definition of KPIs for business models. In line with Gregor et al. (2020), we describe the rationale behind each DP. In the following, we present the five identified DPs.

It can be challenging to identify appropriate KPIs based on a detailed definition of a business model (Heikkilä et al., 2016). Therefore, a more structured and generalizable approach is needed. Enabling users to choose from proven business model patterns (e.g., Gassmann et al., 2014; Taran et al., 2016) can help them to describe the considered business model. Each pattern affects or relates to one or more business model dimensions (e.g., target customer, value chain) and corresponding business model elements. For instance, the business model elements key partners, key activities, and key resources of the Business Model Canvas (Osterwalder and Pigneur, 2010) relate to the value chain dimension of a business model (Bartels, 2021; Taran et al., 2016). In turn, KPIs can be related to the business model dimensions and elements (Montemari et al., 2019; Thomsen, 2019). Accordingly:

*DP1 (Addresses MR1): Provide features for matching a business model with business model patterns in order for users to describe the considered business model for which KPIs should be defined.*

It is important to identify the KPIs most relevant to the considered model. Using an existing KPI catalog, users can draw KPIs from a pool of tested and acknowledged examples (Heikkilä et al., 2016; Taran et al., 2021). The KPIs in these catalogs have been applied and evaluated, often in multiple settings, and can be modified or replaced to best match the unique business model at hand. An existing KPI catalog dedicated to a specific type of business model can be used, such as e-business (e.g., Dubosson-Torbay et al., 2002) or a KPI catalog focused on a specific performance aspect of a business model, such as environmental, social, and governance (ESG) performance (e.g., GRI, 2013). Accordingly:

*DP2 (Addresses MR2): Provide features for identifying KPIs from an existing KPI catalog in order for users to identify KPIs relevant to the considered business model.*

Enabling users to specify the relations between KPIs improves the alignment of KPIs with the business model (Minatogawa et al., 2019; Schaffer et al., 2020). In addition, enabling users to specify the relations between KPIs (e.g., positive causation, negative causation, aggregation) can help them understand the dependencies among them (Popova and Sharpanskykh, 2010). In other words, it can reveal which KPIs are the leading or lagging indicators of performance (Kaplan and Norton, 1996). Accordingly:

*DP3 (Addresses MR2 and MR3): Provide features for mapping the relations between KPIs and business model elements in order for users to identify relevant KPIs and to operationalize the KPIs.*

The artifact should enable users to operationalize the KPIs by specifying characteristics for the identified KPIs (e.g., KPI name, calculation formula or qualitative question, data source). Standardizing the specification of KPI characteristics promotes reuse (Popova and Sharpanskykh, 2010) and ensures knowledge alignment between stakeholders (Gilsing et al., 2021a). In addition, specifying KPIs in a standardized way can reduce ambiguity (del-Río-Ortega et al., 2014; Strecker et al., 2012). Accordingly:

*DP4 (Addresses MR3): Provide features for specifying the characteristics of each KPI in order for users to operationalize the identified KPIs.*

Finally, users should be able to determine which KPIs in the pool of potential KPIs should be adopted by the organization. To determine the most favorable set of KPIs, users should be able to specify the importance of each KPI using pre-determined KPI selection criteria. By specifying the preferred weight for each criterium, a calculation can be made to create a prioritization of KPIs, based on which the most favorable set of KPIs can be determined (Mourtzis et al., 2018). Compared to manual KPI selection, specifying quantitative criteria for KPIs can reduce subjectivity in assessing their relative importance (Podgórski, 2015; Shahin and Mahbod, 2007). By converting the criteria values to a normalized scale (e.g., Likert scale), the importance of each KPI can be calculated for the considered business model (Mourtzis et al., 2018). Accordingly:

*DP5 (Addresses MR4): Provide features for determining the importance of each KPI based on selection criteria in order for users to select the KPIs that the organization should adopt.*

# 5 Method Description and Tool Prototype

In this section, we describe the main steps of our proposed method for defining business model KPIs and present an initial prototype of the supporting IT tool. The method consists of four main steps and corresponding sub-steps (Figure 2).

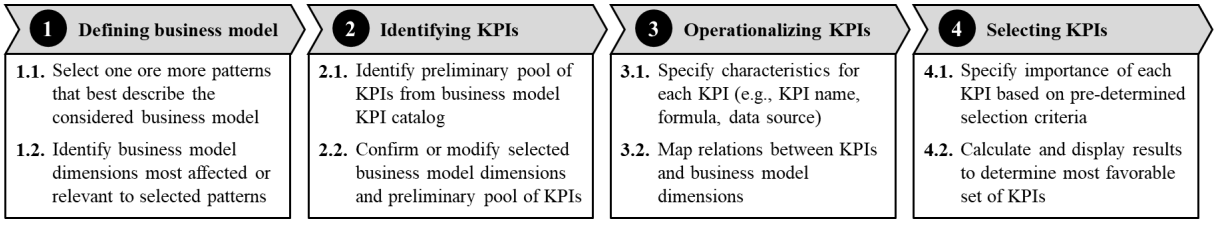


*Figure 2. Overview of the method's steps and corresponding sub-steps.*

The four main steps of the method are: (1) Defining the business model, (2) Identifying KPIs, (3) Operationalizing KPIs, and (4) Selecting KPIs. Each step is supported by the IT tool and reflects the requirements and principles presented in Section 4. The steps of the method are iterative, implying that organizations may directly start with identifying KPIs for a business model and then proceed with operationalizing them. This ensures the adaptability of the method to an organization's specific needs.

We created an initial prototype to illustrate the functionalities of the IT tool. Figure 3 provides a screenshot of the interface to execute the third step of the method, the operationalization of KPIs. All user interfaces of the prototype can be accessed via https://sites.google.com/view/definingbmkpis/. In the following, we describe the main steps of the method and how the IT tool supports them.

*First*, the business model for which the organization aims to identify KPIs needs to be defined. To enable users to describe the business model of interest, we integrate the business model patterns by Gassmann et al. (2014) in the IT tool, as these patterns include an elaborate description and related examples of real-world organizations (DP1). Correspondingly, for each business model pattern, the IT tool automatically indicates which business model dimensions (e.g., value chain, revenue model) are most affected or applicable. *Second*, based on the selected pattern and relevant business model dimensions, the IT tool assembles and displays a pool of potential KPIs that are drawn from a digitized catalog of business model KPIs that was synthesized from the literature (e.g., Heikkilä et al., 2016; Johnson et al., 2008). The user can confirm or modify the preliminary KPI pool by adding new or existing KPIs. *Third*, the KPIs need to be operationalized. As Figure 3 depicts, the IT tool suggests a mapping of KPIs on the nine elements of the Business Model Canvas (Osterwalder and Pigneur, 2010) (DP3). Users can also specify the relations between KPIs (i.e., positive, negative, or aggregative). To further operationalize the KPIs, the tool enables users to specify the characteristics of each KPI in the pool of potential KPIs, such as a KPI name, frequency of measurement, and responsible employee (DP4). *Fourth*, a selection of KPIs is made, for which the five KPI selection criteria proposed by Mourtzis et al. (2018) are used. Users can specify and adjust the weights of each criterium (DP5), based on which the IT tool calculates and displays the most favorable set of KPIs.

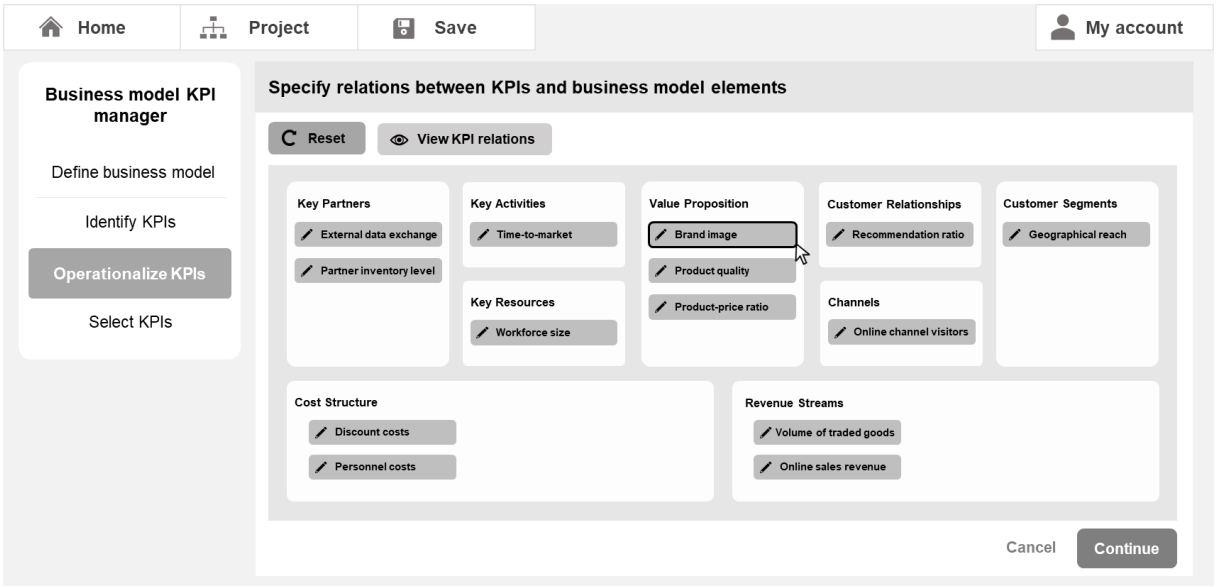


*Figure 3. Screenshot of the IT tool interface to execute the third step of the method (Operationalizing KPIs).*

# 6 Evaluation

We conducted semi-structured interviews (Myers and Newman, 2007) with five industry experts to evaluate our proposed meta-requirements and design principles. We presented the requirements and

principles at the start of each interview, along with the initial method description and screenshots of the prototype. All interviewed experts have 5 to 20 years of experience and are involved in business model innovation projects. They differ in terms of their current position (e.g., digital transformation consultant, business and IT architect), industry (e.g., automotive, IT consulting), and company size (medium to large-sized enterprises). Each interview lasted one hour and was attended by two authors.

To evaluate the validity of the requirements and principles, we asked the industry experts for their judgment about their correctness, feasibility, unambiguousness, and completeness (Wiegers and Beatty, 2013). All experts confirmed the relevance of our research as, based on their experience, many organizations struggle with defining the right KPIs for their business models. The experts acknowledged the *correctness* of the requirements and principles and the mapping of relations between them. Moreover, all experts confirmed that the requirements and principles are technically *feasible* and reasonable to implement, both as a paper-based method and as a web-based IT tool. However, they highlighted that organizations might want to perform the steps iteratively to cater to their specific needs. Therefore, we added a recommendation that the method can be applied iteratively and that users may start at different method steps in Section 5. As for *unambiguousness*, all experts acknowledged that designers could derive the same understanding from the requirements and principles. Three experts emphasized that a good understanding of the organization's business model is required to implement the requirements and principles and that it would be relevant to include stakeholders from different departments when applying the method. Consequently, we added recommendations for potential implementers of the requirements and principles and the users of the method in Section 4. Finally, in terms of *completeness*, the experts confirmed that the requirements and principles are complete and include all the required information for designers to implement them.

# 7 Conclusion and Future Research

In this research-in-progress paper, we report the findings of the first cycle of our DSR project, in which we develop and evaluate meta-requirements and design principles for the design of an IT-enabled method that guides the definition of KPIs for business models. We instantiated the principles in a preliminary method and tool prototype and performed an initial evaluation through expert interviews.

The initial results of our DSR study provide contributions to research and practice. From a research perspective, our main contribution consists of design knowledge in the form of design principles (Gregor and Hevner, 2013). Researchers can use the principles to develop methods that guide business model KPI definition or design artifacts in similar problem contexts (Chandra Kruse et al., 2016). Using our proposed requirements and principles for extending existing business model IT tools (e.g., Augenstein et al., 2018; Schoormann et al., 2021) with features for KPI definition can also be investigated. With these contributions, we respond to the calls for research on KPI definition for business models (Burkhart et al., 2011; Nielsen et al., 2018; Van de Ven et al., 2022) as well as the development of practical methods and IT support for business model management and innovation (Bouwman et al., 2020; Szopinski et al., 2020; Veit et al., 2014). From a practical perspective, our proposed requirements and principles can assist method engineers and software developers in designing IT-enabled methods that support business professionals in defining business model KPIs. By providing systematic guidance for business model KPI definition, we aim to contribute to closing the business model "design-implementation gap" that many organizations face (Geissdoerfer et al., 2018).

As for the next steps in our DSR project, we aim to further develop the proposed method in a second design cycle. We plan to refine the description of the method steps and develop the prototype into an operational IT tool. Subsequently, we will demonstrate and evaluate the IT-enabled method in a real-life business environment. In particular, we aim to apply the method in a global automotive company (AutoCo). As business models in the automotive industry are rapidly changing due to digital innovations (Athanasopoulou et al., 2019), it is an appropriate context to evaluate our artifact. We plan to set up focus groups and conduct interviews with AutoCo employees involved in business model development, as they are the potential users of the method and supporting IT tool. The interaction with professionals will enable us to enhance the practical relevance of the artifact (Nunamaker et al., 2015).

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