

# Towards Operationalization of Business Models: Designing Service Compositions for Service-Dominant Business Models

Bambang Suratno

Supervisors: Paul Grefen and Oktay Turetken

School of Industrial Engineering, Technical University of Eindhoven, Eindhoven,  
The Netherlands  
b.suratno@tue.nl

**Abstract.** The new trend of service-dominant business which produces so-called *value-in-use* as a competitive advantage demands rapidly changing business models and collaboration of organizations in a cross-organizational business network. As information technology nowadays largely contributes to the way of delivering business services to the customers, strong alignment between business models and information technology is critical for business continuity and success. This means the rapidly changing business models necessitate quick adaptation of information systems to address the need to continually provide support for these business models. Current solutions and approaches fail to address this need to a large extent. Recent works, on the other hand, have brought key contributions and opened new research directions in designing service-dominant business. Accordingly, business models can be operationalized using service compositions that bring together loosely-coupled business services offered by the organizations collaborating in the business network. However, these works provide tools and techniques to structure the service-dominant business design only at the conceptual level or in a limited way. Therefore, there is a need for a structured, systematic, and repeatable method that will help organizations to implement service-dominant business models into business processes in the form of service compositions at the operational level.

**Keywords:** business model; operationalization; business process; service composition; service-dominant business

## 1 Introduction

The new paradigm of Service-Dominant Business offers great potential in creating new business value that attracts customers. While the conventional paradigm of Good Dominant Logic business focused on goods, the value chain has now shifted towards the service and solution and value network based paradigm, i.e. the Service Dominant Logic paradigm [1]. There are important implications of following this transition [2]. First, customers will expect coherent solutions, not stand-alone solution fragments for their needs. Therefore, integration of multiple service providers with different capa-

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bilities is essential to create the service. Second, customer-driven requirements to solution-oriented services evolve much faster than requirements to the underlying products. Rapid technology developments in the field of information processing and flexible telecommunication will further reinforce this process. Therefore, service providers must be able to follow the complex and rapidly changing needs of the customers. They must be *agile* in managing their business.

While a business model is important as a guidance to manage the business [3], conventional business modeling tools widely used by companies (e.g. Business Model Canvas) cannot cover all domain of business. While these tools have been acknowledged for their usefulness in their particular domain [4], they are not adequate to fulfill the requirements of the Service-Dominant Business (SDB). The SDB requires a network of parties to collaborate for co-creation of a particular business model and therefore necessitates a network-centric approach to business modeling [5].

As business models have short lifecycles, the underlying IT applications supporting the business models should also adapt quickly as a response to these changing business settings [2]. This is a requirement for business agility. Many information systems, mainly those for the Web, are therefore being created as a means of offering services over the Internet, usually involving simple or complex business processes in which several participants are collaborating [6]. The participant activity in the business process represents the business service provided by each of them, which are then composed as a service composition. This way, the service providers can provide complex functionality using a set of simpler functions available in the market [2].

Therefore, methods of operationalizing business models in a service-dominant business setting require a set of key business concepts to be *tightly* integrated and *aligned*. These include, for instance, network-centric business models, business services, service compositions, and process-aware information systems that execute the compositions. There are a plethora of studies in the literature proposing approaches that address these concepts in *isolation* or their alignment in *limited scope* [2, 6–13]. However, there is yet no structured method for operationalizing these concepts and implementing them as process-aware information systems. The IT solutions operationalizing business models still relies on ad-hoc approaches. Moreover, ideal requirements of business services suitable for this type of service compositions have not been investigated sufficiently.

## 2 Research Objective

To address the research problem depicted above, we need a structured, systematic, and repeatable method that will help organizations to implement service-dominant business models at the operational level. This research study will address a part of this need by proposing a method to align two key elements: *business models* and their operationalization in the form of executable *service compositions*. By extending and adopting approaches and tools in the Business Process Management (BPM) domain, the method will help in establishing a concrete and clear relation between business models and their operationalization, which will contribute to business organizations agility. Accordingly, this study will address the following main research question:

*“How to develop a structured method that will help a network of organizations to operationalize service-dominant business models into business processes in the form of service compositions given a set of predefined business services?”*

The efforts on discovering the right approach for operationalizing business models can go through the different route of investigation. However, we assume a general case where business models are transformed into business service compositions that previously have been predefined and then represented as conceptual business process models in the business viewpoint, which are then subsequently transformed into executable designs that can run as process-aware information systems potentially on business process management system (BPMS) platforms. Accordingly, our work can be identified through these four sub-questions:

*RQ1: How to transform a service-dominant business model into service compositions?*

A service composition composes a particular set of business services, which together provide the functionality to realize the *value-in-use* in a business model. A service composition at the business level is an abstract business process, which shows the elements (and their ordering) that collectively generates the value-in-use in the business model. Currently, there is no standard approach or notation that can be used to represent the underlying scenario of business models as abstract business processes. The research on this question will focus on formulating the transformation process of service-dominant business models into service compositions by applying these approaches, and discover what needs to be adjusted to the existing approaches to address the research problem.

*RQ2: What are the essential properties of the business services required in service compositions?*

When the long-term vision strategy realized into concrete medium-term vision business model, we always need to consider the condition of business services. Therefore, it is necessary to determine the ideal properties of the business services that will be used in the design of service composition. In answering this research question, we will discover the essential properties that lead to the suitable design of service compositions which can support business agility.

*RQ3: How to formulate the executable service compositions?*

In order to operationalize the model, several IT related details should be added to make the business process *executable*. This carries the model from the business pyramid to the operations pyramid. Therefore, the executable processes are specified in such a way that the cross-organisational setting can be accommodated. The research on this question will then focus on the formulation of executable business service compositions of service-dominant business in a cross-organizational setting.

*RQ4: How to evaluate the developed approach?*

The developed method in this research aims to align and ease the connection between business concepts and its implementation. The relevance of research results to the application in business has become a key distinguishing feature of design science research [14]. The method should be applicable and usable in practice. Therefore, it should be implemented in real-life business settings. In order to evaluate the method that we will propose by answering the first three research questions, we also need to involve the components of the platform level, which provides the technical infrastructure for the operationalization.

### **3 Related Work**

In this section, we summarize the related works concerning business model operationalization. Arsanjani et al. [7] present a method to provide a service-oriented solu-

tion (namely, SOMA), in which the transformation of business model is mentioned in their conceptual development steps. Di Valentin et al. [8] define a method for transforming business models into process models through the use of a component-based business model which is subsequently transformed using four view process template. Traganos and Grefen [2] propose a method for business model operationalization using network-centric business models embedded in their BASE/X framework, in which service composition is used to transform the complex network-centric value creation into business process by composing a set of simpler value offering services. However, these transformations do not continue to technical level and stay in the business (process) level.

Fayoumi and Laucopoulos [9] present conceptual modeling steps, which transform a high-level business goal model into process model in nine steps. The major contribution of this approach is that it brings simulation, design rationale and enterprise modeling together in one framework. Weigand et al [10] shows that the services at the business level and software-services are interrelated. They propose a service design method that starts from a value model. This method can help to identify core and enhancing services, and possible web services available for service compositions. However, while the previous approach considered to achieve business agility, it does not take the network-centric business setting into consideration. The latter approach also did not specifically address this matter.

Ulmer et al. [11] introduce a metamodel-centric methodology for BPM integrating concepts from Model Driven Engineering (MDE), particularly from Model Driven Architecture (MDA) [15], by evolving MDA-approach to a BPM-approach, in which consist of Business Process Analyst (BPA) and Business Process Implementation (BPI) model. This methodology allows business analysts to develop conceptual models, generally graphical ones, in accordance with a formalised metamodel. It also guarantees to IT specialist the conversion of a conceptual model to a block-structured one (technical model) in order to ease its implementation on an execution platform. We consider this structure comparable with the BASE/X framework (Fig. 1). This approach has the advantage of establishing a loose coupling between process analysis and process integration, however, it does not define how a high-level business model can be transformed into a process model.

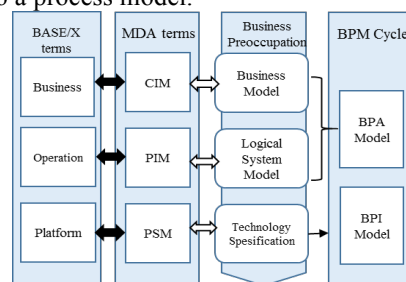


Fig. 1. BASE/X, MDA, and BPM, adapted from [12]

A Service-Oriented Development Method (SOD-M) is a transformation method for business model following the MDA approach (from CIM to PIM oriented service) developed by Castro et al. [6]. Authors represent CIM level by using Business Process Modelling Notation (BPMN) [16] for modeling business process, and by using e3-value model [12] for identifying services from the beginning in the business perspec-

tive. This approach has the advantage of identifying services and business process at CIM level in order to guide a semi-automatic transformation to PIM level. However, the business model aspect is addressed in a limited way, where the requirements of the service-dominant business are clearly addressed.

Rhazali et al. [13] propose a CIM to PIM transformation method with clear transformation rules using graphic presentation. Based on the MDA, this approach provides a solution to the problem of transforming business models represented in CIM level to analysis and design models, modeled in PIM level. However, while the IT aspects are highly emphasized, the use of the business practitioners-friendly high-level business model is not adequately addressed.

We can categorize the works on business model operationalization as follows:

- We refer to approaches [2, 8, 9] that attempt to use a high-level business model as the starting point of the transformation. However, these approaches do not proceed to the implementation of the solution. In [9] the authors propose an interesting approach concerning the transformation of business models to process models, however, the authors only provide the conceptual model and do not address the necessity of network-centric business settings.
- Other works, such as [13] focus more on the technical aspects, i.e. on the transformation of the process models, but do not particularly necessitate business models as the starting point.
- Another category of works considers a loose-coupling arrangement that leads to business agility in process model transformation [11].
- There are also studies, such as [10, 17–19], that introduce relevant concepts but only partially address the key elements and challenges in operationalizing service-dominant business models.
- Finally, there are approaches, such as [6], which propose precise transformation methods but address business model aspects in a limited way.

## 4 Research Methodology

This research project follows the design-science research paradigm for information system discipline [20]. It will contribute mainly to the service-dominant business field that can be considered to have a low application domain maturity. We will adopt and extend existing solutions (e.g. BPMN) to this domain, while also use the recently developed BASE/X framework as the basis for a solution. Given this problem context, the steps in the research procedure [14] can be listed as follows (Fig. 2):

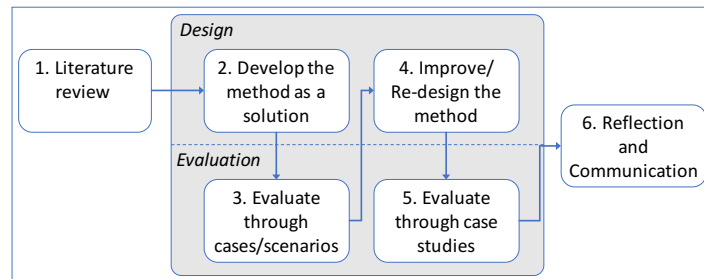


Fig. 2. The DSR Methodology applied to our research (adapted from [14])

#### **4.1 Step 1. Literature review**

Prior work relevant to the study (including existing tools and methods that have already been developed to solve similar problems) is currently being reviewed using systematic literature review [21] to get a better understanding of the state-of-the-art contributions and research gaps in this relatively new domain of service-dominant business.

#### **4.2 Step 2. Develop the method as a solution**

This task will form a critical component of the research work in which the proposed method - as a design artefact- will be developed based on the findings from the systematic literature review, critical analysis of existing methods, tools and solutions, prototype implementations and evaluations, as well as the (domain) knowledge we gathered in a number of industry and research projects (including EU supported H2020 projects) that we are involved in. The execution of this task will lead to an *initial (alpha) version* of the proposed method and will address the *first three research questions*. To this end, we will first develop the overall requirements for the proposed method. Next, we will develop a set of structured steps for transforming a service-dominant business model into conceptual service compositions (RQ1). In doing so, we will also identify the essential properties of business services required in service compositions (RQ2). Finally, we will develop guidelines as- a part of the method- that will help in transforming conceptual service compositions into concrete executable ones (RQ3), which will provide a key input for the implementation of process-aware IS and their deployment on related IT platforms, eventually realizing the business models. This step will be accompanied by the development of prototype implementations of sample realistic business models for explorations and testing of alternative solution fragments and tools.

#### **4.3 Step 3. Evaluate the method through business cases/scenarios simulation**

The utility, quality, or efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods [14]. This research will use an iterative approach that includes intermediate testing and evaluation in the development process. The *alpha* version of the proposed method will be evaluated using business cases and realistic scenarios (gathered in previous industry projects) to test its validity and applicability and to gather immediate feedback for further improvement of the method. The objective is to investigate the alpha version of the proposed method and relevant techniques/tools for their effectiveness in operationalizing business models, starting with business model blueprints and ending with a process-aware information system that supports its execution. This will also address partially the fourth research question (RQ4).

#### **4.4 Step 4. Improve/re-design the method**

The first round of evaluation will provide feedback for the improvement (or, if necessary, redesign) of the proposed solution. The proposed method will be updated and finalized accordingly. This step will lead to a final (beta) version of the method, which will be expected to address the first three research questions. The proposed method will then be ready to go through a final round of evaluations using new real-life cases.

#### 4.5 Step 5. Evaluate the method through case studies

In the last round of evaluation, the final (beta) version of the proposed method will be applied in one or two real-life business cases to assess its validity and utility, i.e., to test if the method works, if it achieves its goals successfully, and if the results can be generalizable/achievable also in other business settings. These cases will originate from one of our projects in the mobility domain or from one of our industry projects in the logistics & transportation, or traffic management domains. Unlike the first evaluation, in this step, the method will be applied in a larger scope and will accommodate the involvement of experts and practitioners. The evaluation will involve not only the assessment of the end-result (operationalized business model) but also the elicitation of the views of the people (experts and practitioners participated in the case) on how successful and effective they perceive the method was. This process will be the second iteration step in addressing RQ4.

#### 4.6 Step 6. Reflection and Communication

Step two to five is an iterative process in designing and evaluating the proposed method. By doing that, we can reflect on the limitations and other adjustments that are necessary for the implementation of the method, which complements the research design.

### 5 Proposed Method and Work Progress

A Service-Dominant Business Model Radar (SDBM/R) [22] is a tool - used for the high-level design of business models, integrated into the BASE/X (Business Agility through Cross-Organizational Service Engineering) framework [23]. BASE/X is a business engineering framework that is tuned to the basics of service-oriented business [24] and built on the existing works on business design and engineering [25–28]. BASE/X framework conceptually covers the entire spectrum from high-level business strategy definition to business information system architecture design, including elements like business model design, business service specification, and their composition into business processes. The framework incorporates three pyramids, namely business, operations, and platform. Each pyramid consists of 4 layers: Strategy (S), Business Model (BM), Service Composition (SC), and Business Service (BS) (Fig. 3).

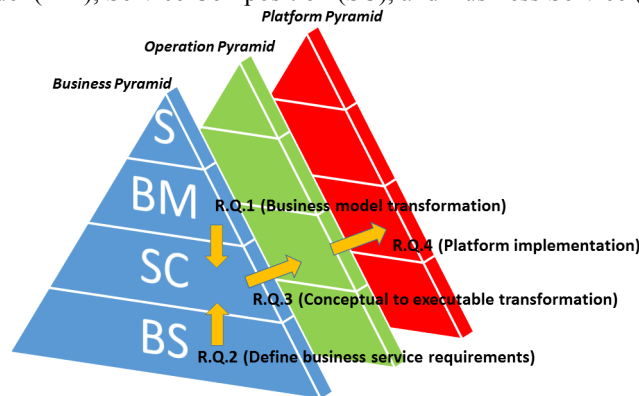


Fig. 3. Interrelation of research sub-questions with respect to the BASE/X

BASE/X proposed a conceptual alignment between all layers and pyramids of the framework, offering a high-level guidance to traverse from different levels of the pyramids. However, this alignment should be further delineated into concrete and structured methods in order for the framework to be effectively applied in practice. With respect to the BASE/X framework, our aim is to address our research questions by following a certain trajectory as depicted in Fig. 3.

Different trajectories across these pyramids can be followed to fulfill the objectives of this research. The trajectory that we chose – as depicted in Fig. 3, follows the line of thinking adapted in the existing works related to the operationalization of business models (e.g. [6][9]). In this trajectory, the service compositions are defined at all pyramids (business, operation, and platform) and at different granularity and abstraction levels. Consequently, the research may rely on separate (but to be integrated) composition approaches at each level.

On-going research corresponds to the first and second step of the research design (as given in Fig. 2), which are: (1) review of the existing literature; and (2) design of the proposed method. For the first objective, based on the research questions, a systematic literature review has been conducted. The initial strategy employed in the review was to find as many as possible relevant scientific publications and then narrow down the results by predefined acceptable criteria. Simultaneously, the proposed method is being developed by iteratively improving the initial concept using a reference from literature study and testing it in BPMN based business process management systems.

## 6 Conclusion and Perceived Contributions

This research aims to create a bridge between the business model of an organization and its operationalization to the level of information system implementation to cover a wide spectrum of service-dominant business design. This will be achieved by utilizing process-aware information systems. Therefore, it will contribute knowledge to the Business Process Management field. After organization formulates their business strategy into business models and business services that can be composed into business processes at the conceptual business level, the next step in this context is to *realize* this set of conceptual models at the operational level, by using BPMN to develop the process-aware information systems. Therefore, developing an approach to address this problem will lead to a more effectively implemented Service-Dominant Business concept, which will contribute to Service Science research domain.

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