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A Domain-Specific Modeling Method for Supporting the Generation of Business Plans

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Abstract: For the formation of new companies it is indispensable to provide well-defined and comprehensive business models in order to attract investments and earn trust of relevant stakeholders. In the past, several methods have been proposed to support this complex undertaking and successfully arrive at viable business models. In this paper we propose a domain-specific modeling method for operationalizing the concepts contained in the Business Model Canvas as one of the most prominent methods in this field. The modeling method has been implemented on the ADOxx meta modeling platform and permits to generate business model templates in the form of a business plan as text documents. The usage of the approach is illustrated through an example from the business model of the telecommunications application Skype. Finally the benefits and limitations of the prototype are discussed using a strengths, weaknesses, opportunities, and threats analysis.

Keywords: Domain-specific Modeling; Business Model; Business Model Canvas; Business Plan; Modelling Tool.

1 Introduction

The market success of a company is influenced by the ability to create value for the customer [SH13]. This competence forms the basis for strategic goals as well as the underlying business processes and the definition of technological opportunities [BS96]. Digitalization as a driver of disruptive innovations or servitization increases the pressure on companies in terms of optimizing their business routines and reducing costs [Ma06, Ha91]. On the other hand, customers need to be provided with continuously enhanced products and services as part of the business model [Mv03]. Business model innovations represent the modification of an existing business model or the building of a new business model to meet customer needs in a better way [Ve17]. Thereby, methods and tools to identify business model innovations are required for example by start-ups or in incubators of already established firms to support this continuous innovation process.

When designing such methods and tools, the challenge is not to over-simplify the complexity of the way a company operates [OP10]. However, it is important that systematic assumptions are made about the contents of a business model and that an efficient and effective conception

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of ideas is enabled. For this purpose, we decided to focus on established approaches for creating and analyzing business models in the sense of an integrated business model management [OP10]. Although such methods and tools already exist in principle, we found that a tool that supports both the visual representation of business models as well as automatically translating them into textual documents does not exist so far. That latter aspect of textual documents is however important for startups and incubators that want to convince investors and document all aspects of their future business in form of a detailed *Business Plan*. Therefore we decided to design a domain-specific conceptual modeling method that is capable of both visually representing business models in the established notation of the so-called *Business Model Canvas* [OP10] as well as generating textual documents from these representations.

The remainder of the paper is structured as follows: In section 2 we will briefly describe work related to our approach. Section 3 will present the details of the modeling method and in section 4 we will show a small use case for demonstrating the working of the method. The paper will conclude with a discussion of the approach in section 5 and an outlook to future work in section 6.

2 Related Work

In this section, we provide an overview of methods and techniques for conceptualizing business models. In addition, we briefly characterize the components of modeling methods as we will use them later for describing our method.

2.1 Methods and Tools for Business Model Conceptualization

One well-known method for planning business strategies is the SWOT (Strength, Weaknesses, Opportunities and Threats) analysis for assessing market and environmental conditions [BAD93]. However, this approach is particularly suitable for a retrospective assessment of existing companies. Other approaches describe companies on the basis of their business model. Following the definition of Osterwalder and Pigneur a *Business Model* "describes the rationale of how an organization creates, delivers and captures value" [OP10, p.14]. Based on our literature research, we identified several approaches, each taking a different perspective. For example, the e-business model approach by Timmers takes the perspective of the market, with the focus on specific elements such as e-shop or e-procurement [Ti98]. Stähler defines a business model through the three main components: "User promise", "Architecture of value creation" and "Earnings model"and focuses on the value creation [St01]. Akkermans also describes an approach for electronic businesses where he uses an underlying value model supported by a conceptual modeling approach [AG03]. Maurya describes a problem-focused approach, the so-called "Lean Canvas" [Ma12]. The integrated business model management approach proposed by Osterwalder and Pigneur requires to review the business model from

different aspects. Their Business Model Canvas (BMC) creates the link between strategic management and business model management and is grounded on a concrete building block structure and also links to the implementation guide in form of a *Business Plan* [OP10, p.268].

For supporting the definition and analysis of business models, a range of tools have been developed in the past, especially for the BMC. As Schoormann et al. describe in a review of these tools, they are mostly oriented towards pure visual representations and lack typical features of modeling tools such as the support for a modeling procedure [SBK16]. Also, the linkages between elements and the transformation of visual representations into textual documents that are suitable for investors do not seem to have been covered so far. A first conception that takes up these deficiencies by showing linkages explicitly has been presented by Augenstein and Fleig [AF18], however the tool has not been fully implemented.

2.2 Components of Modeling Methods

In the approach described by us, we will revert to the concept of a domain-specific conceptual modeling method, which targets a specific field of application and that can be realized as an IT-based prototype [JF17, KMM16]. These methods are composed of a modeling language, a modeling procedure, and Mechanisms and Algorithms [KK02] (MA). The syntax of the modeling language defines a grammar, and an according semantics specifies the meaning of its elements. The modelling procedure describes how the modeling language and the MA are to be used. Different forms of MA enable the computer-aided and automated processing of model contents. To ensure efficient processing of information in relation to calculation and storage, the interdependence between MA, the modeling procedure and the modeling language must be taken into account in the development of modeling methods [FRK13]. Software platforms such as Eclipse, MetaEdit+ or ADOxx facilitate the implementation of such modeling methods, cf. [TK09, FK13].

3 A Domain-Specific Modeling Method for Generating Business Plans

Based on the previous elaborations we can now advance in this section by describing our modeling method. The conceptualization of the modeling method is founded on the core elements of the BMC. We thus describe this conceptualization in the form of the derivation of the modeling procedure and the different model types. After that we describe the design of our modeling language based on a meta model and outline the implementation aspects for our prototype.

3.1 Research method

The research procedure follows the process described by Johannsen and Fill, without the formalization step in FDMM [JF17] - see Figure 1. Therefore, we start with the elaboration of a concept for generating Business Plans based on the BMC. This is followed by the development of the domain-specific modeling method (DSMM) with the according model types in semi-formal notation, which are then implemented as a modeling tool.

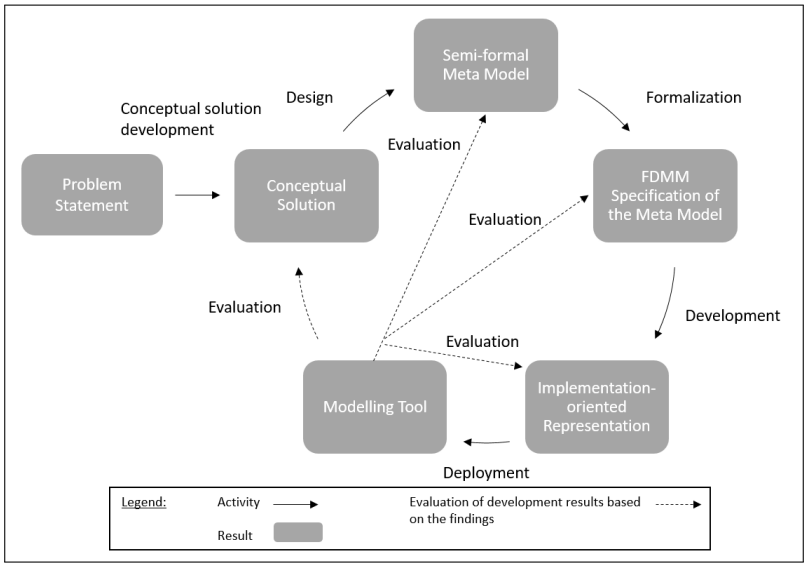

Fig. 1: Design-oriented Research Cycle for Modeling Methods [JF17, p.257]

In the activity *"Conceptual Solution development"*, the goal is to create a concept for systematic creation of *business plans* as an investor-oriented representation based on the design of a business model. The *"Design"* step contains the development of meta models to support techniques of the design process for generating business models. These model types are used to codify business concepts within a DSMM. For the semi-formal description, UML class diagrams described in natural language are used. At this stage of development, it is not guaranteed that all required information for a technical implementation is yet available. *"Formalization"* would mean that the previously created semi-formal meta models are specified in an exact notation. For example, attributes, classes, and possible restrictions would be exactly described here [FRK13]. In addition, the graphical representation of the elements is specified using the meta model [BF14]. The *"Development"* step stands for the implementation of the modeling language and the MA for generating the business plan documents using a software platform. In the *"Deployment"* phase, the tool is further advanced from the development environment to a standalone tool including installation procedures. Finally, the *"Evaluation"* phase contains the assessment of the modelling tool,

where experience gained over the entire development period is gathered. In this paper we not provide a detailed evaluation, the modeling concept is only demonstrated using a practical example, which allows to assess the accuracy and consistency with the semi-formal and formal specifications of the method, called ”Demonstration”.

3.2 Characterization of the Business Model Canvas

The aim of the BMC is to provide a simple, relevant and intuitively understandable model that captures the core business logic of all companies and does not disregard the complexity of corporate functions [OP10]. It provides a uniform approach for describing and adapting business models in the context of strategic action fields, resulting from nine building blocks which are specified in a standardized order. The BMC serves as a tool for analysis, to improve understanding, as a basis for discussion and to increase creativity. Figure 2 shows a BMC template and the building blocks according to [OP10]. These will be described in the following according to the definitions by Osterwalder and Pigneur [OP10].

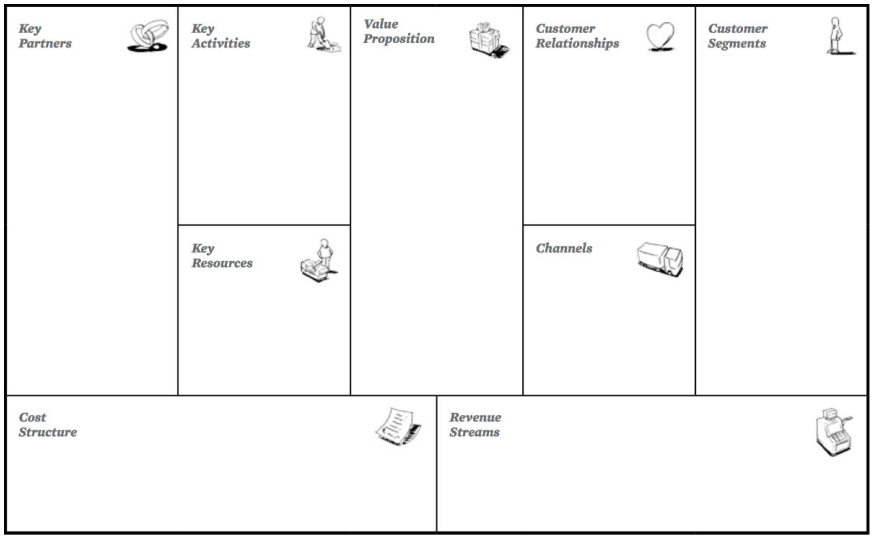

Fig. 2: The Business Model Canvas [OP10, p.44]

Key Partnerships represent a network of suppliers and partners which are necessary for a business model. *Key Activities* specify the essential activities of a company’s business model. *Key Resources* are required to operate the business model, they are needed by any company to operate a business model, deliver or create value, reach markets, maintain customer relationships and generate revenue. The *Value Proposition* building block describes a collection of products or services that provide value to a specific customer segment. The

Customer Relationship block outlines the different types of relationships between companies and a customer segment. The *Channels* building block describes how to interact with a customer segment to deliver a value proposition. *Customer Segments* represent the various customers and other groups that the company intends to address. The block *Cost Structure* describes all of the operating costs incurred within a business model. *Revenue Streams* represent cash flows from each customer segment.

Osterwalder and Pigneur describe two approaches for creating a BMC. Either, a large poster is needed where the nine building blocks are shown together with a lot of post-it notes. The core factors are then noted on the post-its in the form of keywords and assigned to the respective block. The second option is that the factors are described using software where a BMC template has to be filled with textual descriptions [OP10, p.266]. As shown by the study conducted in [SBK16], such tools often just imitate the use of post-it notes in an electronic format. Thus, they do not harness the possibilities of modeling methods for inter-linking elements and applying MA to them.

3.3 Conceptualization of the IT-based Modeling Method

Based on the previous elaborations, the next step in the research method is the actual conceptualization of an IT-based modeling method which supports the creation of business models and business plans. For this purpose we derived ten requirements that have been derived from the literature [OP10], that shall be satisfied by the modeling method. These are shown in Table 3.3 and will be explained in detail in the following.

Tab. 1: Requirements for a Domain-specific Modeling Method for Business Plan Generation

Categorization	Requirements (Rq)
Business Plan Generation	Rq1: Business plan structure support Rq2: Tool supported generation of business plan templates as a textfile
Business Model Generation	Rq3: Support the Business Model Canvas structure Rq4: BMC Design support Rq5: BMC Strategy support Rq6: Support of BMC Process Stages
Properties of techniques	Rq7: High understandability and learnability Rq8: Flexible handling
Interdependencies between techniques	Rq9: Sequential ordering of techniques Rq10: Complementary interdependencies

The category *"Business Plan Generation"* contains two requirements and describes all the requirements which must be met in relation to business plans. The solution shall serve as a structured input interface for mapping the structural design of business plans as described in the literature, for example to attract investors [CYK09] (Rq1). As a result of the data input

using the input mask, it should be possible to generate a business plan template as a text document (Rq2). The text file created in this way serves as a business plan template for further processing, which can be complemented as needed. After the document has been completed, the final business plan will be saved as text document.

The category *"Business Model Generation"* describes the requirements for the business model generation, where the BMC principles serve as a basis and the focus is on the aspect of graphical modeling. The presentation of the basic structure of a BMC on the basis of building blocks represents an important requirement [OP10] (Rq3). In the business model design, it should be possible to simply create new ideas for business model concepts, therefore a modeling approach should be used to support techniques such as Ideation or Visual Thinking by using a guided design process [OP10, p.131] (Rq4). Business models should be stored over time and it must be possible to adapt these models due to changing environmental conditions as it is also required to manage several business models at the same time (Rq5). The implemented modelling tool should also support each of the five design process phases defined by Osterwalder and Pigneur [OP10, p.249] (Rq6). In the category *"Properties of Techniques"*, implicit requirements for the properties of the different techniques must be met. Due to the complexity of business models and business plans themselves, it must be ensured that each designed model type is intuitively understandable (Rq7). It must be ensured that the techniques are flexible so that they can be used for different types of business plans (Rq8). For example, it shall be possible that the ideation process can be started from any building block and that one can freely choose suitable relations to other building blocks.

The category *"Interdependencies between the techniques"* specifies interrelationships between techniques. It should be possible to specify a distinct sequence of the techniques for achieving particular results (Rq9). The different techniques should also be mutually supportive in order to allow synergy effects that improve the end result through the combined use of each technique (Rq10), e.g the outcomes of a technique are recorded and further processed by a subsequent technique.

3.4 Derivation of Modeling Procedure and Model Types

For deriving the model types (diagram types) of our modeling method, we defined first a procedure for generating business plans in a structured way according to the requirements Rq1 and Rq2. Subsequently, the elements of the BMC for generating business models were considered (Rq3-Rq4). Finally, the additional requirements Rq7-Rq10 were taken into account. This resulted in the derivation of a 4-step procedure as shown in Figure 3.

At the beginning of the business model design process it is started by creating first ideas for business models. This is supported by the model type "Business Transaction Model" (BTM) that supports techniques such as Visual Thinking and is already based on the building blocks of the BMC.

After the modelling of the first ideas in the Business Transactions models, a first snapshot of a BMC is created. This is accomplished through a second model type, the ”Business Model Canvas Model” (BMCM). This model type provides mechanisms for an automatic synchronization of the business concepts of the BTM into the typical structure of a BMC. Thus, these first two model types fulfill the strategic requirements of an integrated management solution, where it is possible to adapt several business models to environmental changes(Rq5). In addition, the process stages of the BMC basic design process are supported (Rq6).

The third step consists of setting references to the BTM and BMCM and the addition of relevant data for a business plan document. This step is supported by the model type ”Business Plan Document Model”. Once this is completed, it is possible to extract the data as an editable text document called *Business Plan*. Sometimes, optimizations of a business model are required at certain intervals in order to adapt to changing market conditions, cf.[Mu13]. This is highlighted by the dotted arrow that points back to the first step. Finally, it is possible to edit and complete the exported Business Plan template and convert it to a non-editable text document.

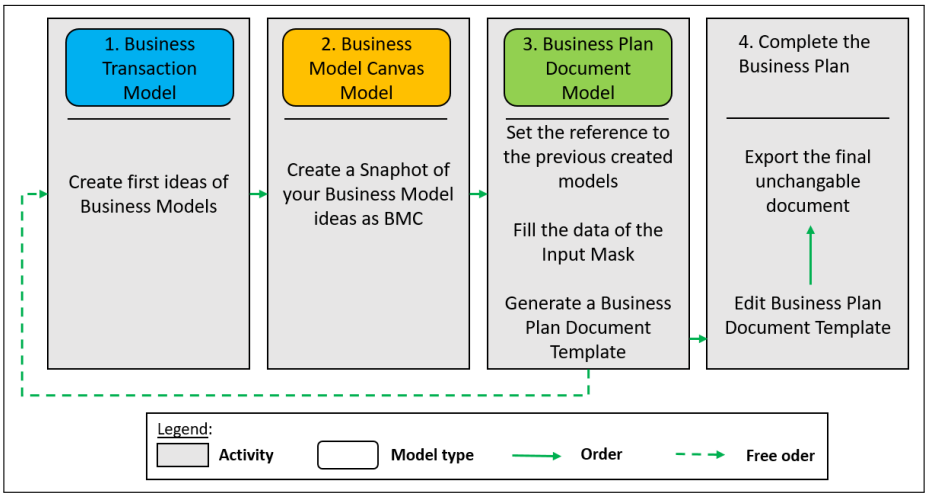

Fig. 3: Business Plan Document Design Process

3.5 Design of the Modeling Language

The techniques that support the modeling procedure were carefully examined in order to identify the core principles of each technique and to meet the previously derived requirements. This has resulted in three main model types. The model types are shown in Figure 4, their inter-linkages are depicted by ”Reference” relations, the graphical notation for the classes is

shown besides them. For some classes, multiple options for the graphical representation are available, e.g. for 'Value Proposition' to distinguish between general value propositions, products, and services. Due to limitations of space, attributes are omitted in the figure.

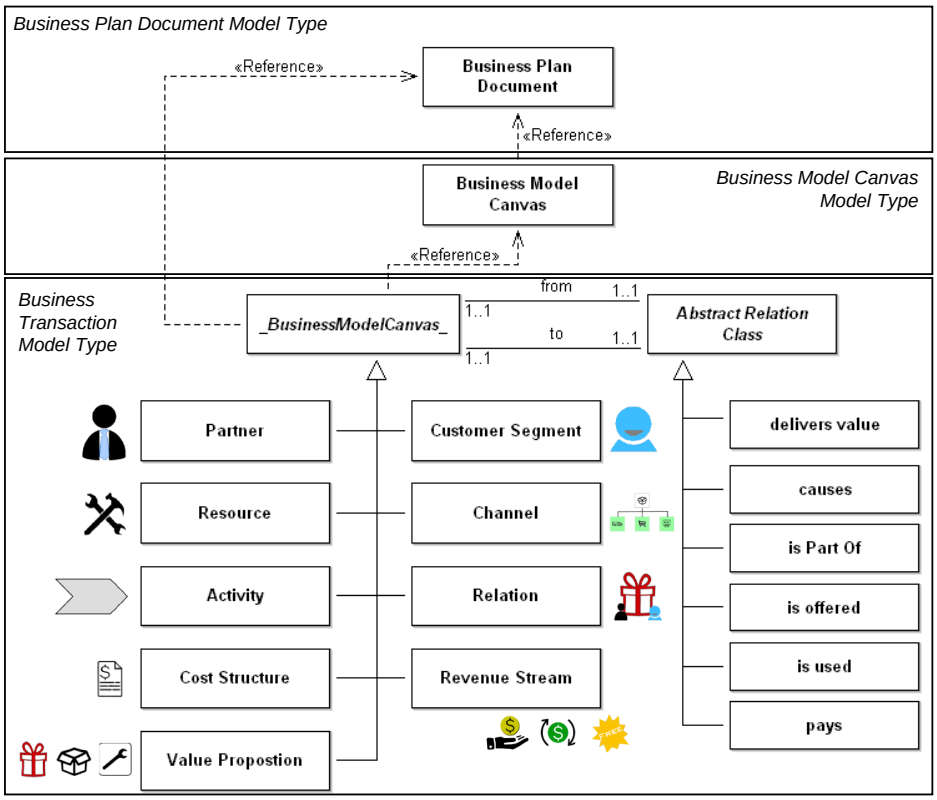

Fig. 4: Meta model of the Modeling Language and including Model Types

The *"Business Transaction Model"* type was developed with the design focus on creating ideas for business models. The model type serves as the starting point in our Business Plan creation process. Thereby, the building block elements described in section 3.2 serve as the basis for the language elements and the modeling behaviour, e.g. to support the story telling technique. Therefore each building block is represented by a class, e.g. "Channel". An essential aspect is that the instances of the classes can be linked to each other. To enable this, the relation classes "delivers value", "causes", "is Part Of", "is offered", "is used", "pays" are available.

The basis of the BMCM is a previously created instance of a BTM type. This model type serves as an overview in the known BMC layout to ensure the familiar understanding of the business models within the BMC design. The BMCM type is only used as a view in this

case, so it will not be possible to edit it. It is automatically generated from the information in a BTM. To create the BMCM, the reference to the source model from which the BMCM has to be created must be selected.

In the *"Business Plan Document Model"* the additional data necessary for business plans is specified. This is done via a range of attributes that are part of the class "Business Plan Document". These are organized along the categories "Description", "Cover Page and Table of Contents", "Executive Summary", "The Team", "The Business Model", "Financial Analysis", "External Environment", "Implementation Plan", "Risk Analyis"and the "Conclusion" and represent the business plan structure [OP10, p.269]. Due to the large number of these attributes they are not shown in Figure 4.

3.6 Implementation of the Modeling Method

The modeling method has been implemented using the ADOxx meta modeling platform [FK13]. This included the implementation of the model types including their classes, relation classes and attributes as well as corresponding graphical representations. The graphical icons were partly taken from *"Openclipart.org"*, and adapted to the specific needs of the modeling method.

In the *Business Transaction Model* we integrated a guided design process which indicates the progress within the modeling procedure, thus embedding the method in work practices of users [Sa18]. As part of the *Business Model Canvas Model* we implemented a BMC design template which automatically references elements of the assigned BTM type using an automatic update mechanism of ADOxx in the form of so-called *expression attributes*. The *Business Plan Document Model* is able to integrate the referenced BTM and BMC instances. An algorithm for the creation of business plans has been implemented in ADOscript. The algorithm collects data in the Business Plan document, which is based on the entered data on the graphical user interface. Finally, the prototype was deployed as a stand-alone modeling tool with its own setup routine for installation on Microsoft Windows 10.

4 Application of the Modeling Method in a Use Case

For the demonstration of the method we demonstrate the implementation of the various models to support business plan development and their practical usefulness. The IT-based modeling method, targets users in the practical environment who have to develop business plans or business model concepts and create or adapt them in digital change. Our method enables documentation and communication and further processing of the results (e.g. business model concept) within the framework of conceptual models. For the purpose of the demonstration we refer to a small use case to illustrate how the method works.

4.1 Use Case

To demonstrate the applicability of the Business plan creation and of our implementation which supports the generation process, the business model of Skype as case study of Osterwalder and Pigneur's basic literature was used [OP10, p.98]. The core aspect of the business model is to offer video and phone calls via internet based on peer-to-peer technology. Due to the scope of a business plan, the applicability for the creation of a business is only to be shown briefly. The focus is on the creation process and the modelling capability of business model innovation using ideation technology and the presentation as BMC. Figure 5 illustrates the steps for creating a business plan based on our prototype.

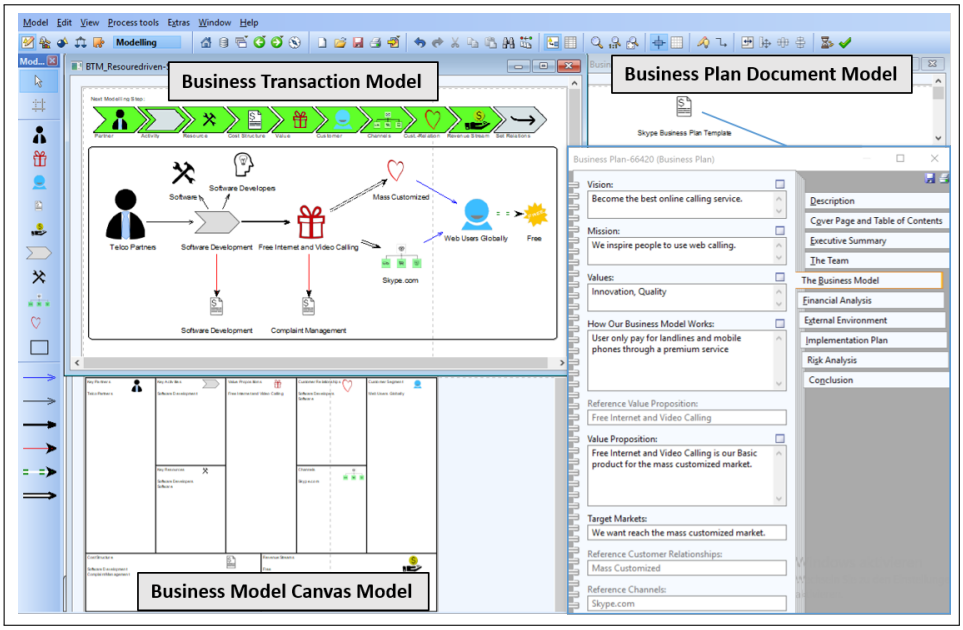

Fig. 5: Screenshot of the Prototype Showing Instances of the Model Types "Business Transaction Model", "Business Model Canvas Model", and "Business Plan Document Model" based on the Business Model of Skype

In a first step, the *"Business Transaction Model"* is used to model business transactions based on their specific relationships by using the elements of the domain-specific modeling language as described in section 3.5. For brevity, we consider only the resource-driven epicenter of a business model innovation in the business model design process[OP10, p.138]. On top of the modeling area, the modeling progress is displayed according to a recommended modeling order - see Figure 6 for the details.

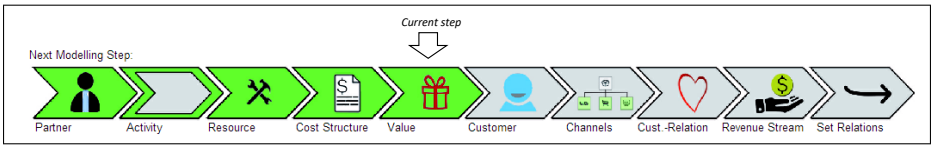

Fig. 6: Progress Bar Indicating the Completed and Next Modeling Steps

For better understanding, the graphical language elements as applied in the use case will be explained based on the modeling flow, i.e. each building block element is followed by the corresponding relation. We begin to place the ”Partner” object on the modeling area and name it ”Telco Partner”, which represents a telecommunication partner. The business partner of Skype ”delivers value” by providing a specific ”Activity”, i.e. in the example of Skype ”Software Development”. Sub elements of an activity like ”Software” and ”Software developers” are related to the activity by the relation ”is part of”, whereby cost factors are represented by the element ”Costs”, e.g. for ”Software development”. These are attached using the relation ”causes”. Following the example of Skype, the value proposition is represented as the service ”Free Internet and Video Calling” and consists mainly of the software development activity. This can be identified by the relation ”is part of”. Additionally, it is possible to identify object-related earnings or costs, for example ”Complaint management” for the offered service. The ”is offered” relation shows the used ”Channel” to provide the service and also identifies the specific ”Relation”, i.e. in our example the ”Mass Customization”. For a customer segment, e.g. ”Web Users Globally”, the object ”Customer Segment” is used. For the assignment of the ”Channel” and ”Relation” elements to a specific ”Customer Segment”, the ”is used” relation is applied. To determine the value of a customer group, e.g. ”Web Users Globally”, it is quantified with the relation ’pays’ together with a ”Revenuestream” element. As soon as all transaction-relevant objects have been modeled, the model instance is stored and it is continued with the BMCM type.

The initial task for creating a *”Business Model Canvas model”* is to place a special aggregation object named *"Business Model Canvas"*. This element has the design of a BMC template, which is a fixed representation that can not be changed by the user. To automatically complete the template, the user has to choose from which *"Business Transaction Model"* the information should be inserted. Technically, we use the references in the meta model for this purpose. After adding a reference, all data are automatically inserted in the Business Model Canvas element. To assign the respective elements, we applied expression attributes, e.g. ”Reference Contain Partner”, which automatically collects the name of each modeled partner object in one variable of a reference model.

The next step is to create the *”Business Plan Document Model”* instance and add the BTM and BMCM references. Figure 5 illustrates this step where attributes like ”Reference Value Propositon”, ”Reference Customer Relationships” or ”Reference Channel” are automatically completed with the previously modeled information from the BTM. Thereby, the object names represent only a short description, e.g. ”Free Internet and Video Calling”, which

serves as a template for the Business Plan Document model. For example ”Value Propositon”, requires a full description with all details of the service in a business plan on the basis of the listed ”Reference Value Propositon” objects.

Thus, in the next step, the user has to add additional data via the graphical interface, which represents the structure of a business plan. All attributes that require text input are part of the final business plan document. Therefore, a complete textual description is required as shown by the attributes ”Vision”, ”Mission”, ”Values”, ”How Our Business Model Works” and ”Target Markets”. After all textual descriptions have been entered in this way, the business plan document can be created with the button "Create business plan". This triggers an algorithm that collects all data and integrates them in a textual document in .docx format. In addition, screenshots of the referenced BTM and BMCM instances are added as graphics at pre-defined positions in the document. This business plan document now serves as a template and can be further completed by other users and then converted into the PDF format as a final business plan.

5 Discussion

The domain-specific modeling method was developed to create business plans based on idea generation techniques. The BTM and the BMCM types were developed for this purpose. Next, a SWOT analysis will be used to identify and discuss strengths and weaknesses based on the requirements of the method [KMM16]. In addition, we mention current limitations.

Strengths of the modeling method and the developed tool are: The method is hybrid, integrated and combines established structured and complex business plan document creation based on the BMC approach (Rq1,Rq3). The modeling method enables fast and intuitive business model concept development and adaption by supporting business model design techniques, e.g. Ideation or visual thinking (Rq4). The business model strategy is supported as the evolution of a business model over time can be documented using the modeling tool. Different business model creation process phases are supported by providing the described techniques for each phase. The DSMM in the BTM serves as a common language basis for initiating business model innovations. The prototype supports techniques of each related BMC design stage, with the focus on the design phase (Rq6). We assume that the graphical implementation of the DSMM within the prototype makes them intuitive to use and therefore easy to learn (Rq7). The structured modeling process simplifies the usage and improves the results by ensuring the completeness of the required information (Rq9). The models created serve as a basis for subsequent models and thus optimise the overall result of the business plan which needs to be created (Rq10).

Weaknesses of our method are, that as soon as the number of objects within the BTM increases, also the complexity of modeling increases and the comprehensibility decreases. A possible solution would be to focus on only one part of a business model in one transaction model, i.e. split the information across different model instances. Furthermore, in the current

version there is no error handling for incorrect relation types. This means, the user has to know which relation is adequate in which context. This may cause problems in using the modeling language consistently. A possible remedy would be to design mechanisms for inspecting the inherent semantics of elements and display hints for better guiding a user [Fi18, Fi17].

Opportunities are, that the business plan document model structure serves as a good starting point for further development. As an example, a financial plan, market- or risk analysis and also the a reimport functionality of the created docx file could be developed. Also constraints for the different relations in a BTM may be useful for a better user guidance. It could be further envisaged that the modeling approach is embedded in application workflows of investment agencies to support start-ups and business incubators in defining their business plans.

Threats may be already established and used procedures, processes and applications for the creation of business plans and the design of business models which prevent the use of the method. The introduction of new approaches is always accompanied by change and this always depends on user acceptance. In the UTAUT model of Venkatesh, these specific influencing factors are described in more detail [VMD03]. A potential solution is to show how the method aligns with established existing approaches, i.e. the BMC.

Limitations are that we finally, have to acknowledge that the prototype has so far only been tested with the mentioned use case. In order to meet the requirements of the target group, the prototype should be tested in a real environment in multidisciplinary teams. These results can be used to adapt the method more specifically to further requirements [KMM16].

6 Conclusion and Outlook

In this paper we described a modeling method for generating business plans using established concepts for business model management. The modeling method was implemented as a first prototype. The practical relevance was demonstrated through a use case, by which we identified that our prototype can serve as a good starting point for generating business plans. However, during the prototype design, we identified a lot of future development potential. A next step for further development could be the integration of a questionnaire for semi-automatically creating the models and thus further guiding the user. Other features may be the integration of a financial business plan for conducting calculations, like a break-even analysis or the combination with approaches for processing the semantic contents of business models, e.g. to further enhance user guidance.

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