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Abstract

Explicitly representing a business model facilitates the understanding, analysis, and innovation of its underlying logic. For representing business models, numerous approaches have been suggested in the literature. They differ greatly in their understanding of the business model concept, the approach for representation, the terminology, and the notational elements they use. This impedes the diffusion of the representational approaches in business practice and the development of a cumulative research tradition. Our contributions are twofold: Based on a comprehensive literature review, we provide (I) a synthesizing framework for classifying approaches for business model representation, and (II) a terminological and conceptual synthesis of the notational elements. Thereby, practitioners are supported in selecting the most suitable representation for a specific purpose. For researchers, our work provides the basis to develop a more cumulative stream of research.

1 Introduction

A *business model* (BM) can be defined as “a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm” [16]. In recent years, interest in the BM concept has surged; the number of academic and journalistic articles

has “virtually exploded” [31]. The BM is seen as a key determinant of a firm’s ability to create value [5] and there is widespread agreement on the BM’s importance to a firm’s success [1].

Explicitly representing BMs improves the understanding, communication [16], and analysis of its underlying logic [9]. Other purposes include to facilitate BM innovation by enabling experimentation [6], [7], and to provide a basis for defining requirements to the underlying information systems [7], [9]. Approaches for representing BMs, or *business model representations* (BMR), can be based on a mixture of textual and graphical elements, or any rather formalized ontology which aims at representing a BM [31]. A number of such approaches can be identified within the literature.

The available BMRs were developed, mostly independently of each other, in domains as diverse as accounting, e-business, information systems, and strategy. They greatly differ in terms of their understanding of the BM concept, their approach for representation, the terminology, and the notational elements they use. Consequently, for practitioners, it is not clear which BMR best lends itself under which circumstances for which purposes. For researchers, this lack of common understanding substantially aggravates identifying future research venues and developing a cumulative research tradition.

Despite the ambiguity of BMRs in the literature, surprisingly few articles can be found which attempt to synthesize the field of BMRs. Of the recent reviews of the BM literature [1], [12], [31], only the well-regarded review of Zott et al. [31] dedicates a section to BMRs. Their treatment briefly characterizes the field and a limited number of approaches. There also exist a number of articles which treat BMRs in-depth, but focus on a very small subset of the available approaches (e.g., [11], [24]). Finally, Gordijn et al. [10] provide a classification framework which focuses on the ontological foundation of BMRs; the framework is applied to two representational approaches. However, no comprehensive overview of the available representational approaches exists. Thus, we provide such an overview and, based on it, the following contributions. First, we provide a synthesizing framework for classifying approaches for BMR which supports practitioners in selecting a suitable BMR. Second, we provide a comprehensive overview and a terminological synthesis of the notational elements used within the literature. This synthesis, together with the classification framework, provides the basis to develop a more cumulative stream of research.

2 Review methodology

No common understanding of the BM concept has emerged so far [1]. This lack of common understanding, naturally, also extends to the approaches to represent BMs. In order to not unnecessarily exclude representational approaches, in the following, we adopt a rather wide understanding of a BMR: Every BMR which (I) allows representing the model of a specific business, and (II) which provides a graphical representation qualifies as a BMR in terms of this paper. We restrict ourselves to BMRs which have been treated in a non-marginal way in a book or peer-reviewed journal article (see also [13]).

To identify available representations in the literature, we followed a structured approach as recommended in [28]: We used recent reviews of the BM literature [1], [12], [31] and, as a first step, included the articles on BMRs mentioned there into our review. This yielded five representations of which four comply with the understanding of a BMR outlined above. Taking the corresponding articles as a starting point, in a second step, we went backwards by reviewing

the sources that are mentioned within those articles. In a third step, we forwardly reviewed the articles which cite the representations identified in the previous steps. In addition, we performed a keyword search using the terms *visualization*, *depiction*, and *representation* together with the term *business model* in various syntactically correct variations. Through the previously identified representations it had already become apparent that our review has to draw upon a very interdisciplinary body of literature. Therefore, we performed the keyword search using the Google Scholar service (which is limited in its functionality to refine search parameters, but – compared to professional databases such as EBSCO – offers a very broad, interdisciplinary coverage).

3 Business model representations

Altogether, we identified 13 representational approaches (see table 1).These BMRs originate from a wide range of domains such as accounting, e-business, and strategy. They differ in their main scope in that some focus primarily on a single domain (e.g., e-government), whereas others aim at a more general applicability. The identified BMRs have been referred to by terms as diverse as “business model representation” [5], [31], “business model ontology” [15], methods for “business modeling” [7], [19], and business model “design methods & tools” [18]. In some instances, there is confusion about whether a BMR should only refer to the representation of a specific business or whether BMRs also comprise mere representations of conceptual BM aspects. Following this second notion, for example Zott et al. [31] categorize their visualization of value driver interactions developed in [3] as a BMR – even though that visualization is not capable of representing the model of a specific business. Another source of confusion is the fuzziness of the BM concept itself, for example its partial overlap with the concepts of strategy and value networks. This conceptual fuzziness inhibits the identification of representations which, despite being rooted in other literature streams, may assist in representing a BM. For example, the “activity system map” [20] is an approach to visualize strategies, which is rooted in the strategy literature and does not make explicit reference to BMs. However, it has been noted that activity system maps and BMs are very similar and that “it is not clear how Porter’s conceptualization of strategy differs from what others call business models” [25].

In the following, we develop a framework for classifying BMRs (sec. 3.1) and, subsequently, outline, compare, and synthesize the notational elements employed by the identified BMRs (sec. 3.2). We addressed the issue of coding reliability for the BMRs in the framework and the synthesis of notational elements through the following three-step-process. First, the coding and synthesis were conducted separately by the four authors. Second, the individual results were discussed in the group, and, third, the individual results were jointly consolidated based on the outcome of the discussion.

3.1 Classification framework

A number of criteria influence the usefulness of a BMR in a certain business context. These include (but are not limited to) the *reach*, *perspective*, *notation principle*, and *tool support* of a BMR. In the following, we describe why the chosen criteria are useful, how they can be operationalized, and subsequently apply these criteria to the identified BMRs.

Business model representations	Main characteristics		Classification framework										
			Reach (sec. 3.1.1)			Perspective (sec. 3.1.2)		Notation principle (sec. 3.1.3)		Tool support (sec. 3.1.4)			
	Domain of origin	Main scope	Strategy layer	Business model layer	Process layer	Single view	Multiple views	Map-based	Network-based	Formalization	Design	Financial evaluation
Activity system map* [20]	Strategy	General	X	X		X			X			
Business models for e-government [19]	E-business	E-government	X	X		X			X	X	X	
Business model ontology [15]	E-business	General	X	X		X		X		X	X	
Causal loop diagram [5]	Causality theory	General	X	X		X			X			
e3-value [9]	E-business	General		X		X			X	X	X	X
E-business model schematics [29]	E-business	E-business		X		X			X			
Eriksson-Penker business extensions [7]	Information systems	General	X	X	X		X		X	X	X	
Integrated business model concept [30]	Strategy	General	X	X		X		X				
Resource-event-agent [13], [26]	Accounting	General		X			X		X	X	X	
Strategic business model ontology [23]	E-business	General	X	X			X		X	X	X	
Value map [2], [27]	Value networks	General		X		X			X			
Value net* [17]	Strategy	General		X		X			X			
Value stream map [21]	E-business	ICT	X	X		X			X			

* The contributing author makes no explicit reference to the term “business model”: These approaches had been developed before the business model concept gained prominence. Nonetheless, they are listed because of their conceptual similarity to later approaches which are explicitly intended to represent business models.

Table 1: Identified BMRs, main characteristics, and classification framework ([13], extended)

3.1.1 Reach

The BM concept can be seen as an intermediate layer between the layers of business strategy and business processes. As such, it translates the highly aggregated contents of the strategy layer into a more specific model of a company’s business logic. This business logic, in turn, serves as the basis for defining the required operational processes [1], [15]. In a given business situation, only those BMRs are applicable that are able to cover all the layers that are sought to be modeled. Thus, applying the classification criterion *reach* narrows down the set of potentially suitable BMRs.

There is already some consensus regarding the delineation between the BM layer and the business process layer [1]. The process layer provides a very detailed view on the activities to be performed and focuses on the sequence of these activities. In other words, it does not seek to answer the question of *which* (high-level) activities are performed in general, but rather *in which order* certain (low-level) activities are performed [8]. Therefore, the prerequisite for a BMR to be categorized as reaching into the process layer is that it (next to the representation of the BM layer) also seeks to provide a detailed, low-level view on activities and on the order in which these activities are performed.

A BM is said to be a conceptual framework that helps to link the firm's strategy to the executing activities [22] or a "reflection" of a firm's realized strategy [5]. Whereas some researchers see the terms as interchangeable, others argue that they are indeed very different. "The debate on the difference between the BM and business *strategy* has not yet been resolved" [1] – hence, there is no obvious or widely-accepted criterion which can be used for categorizing a BMR as reaching into the strategy layer. Therefore, we operationalize the categorization as follows. A BMR is categorized to be reaching also into the strategy level if (I) it is explicitly intended to represent strategic aspects (e.g., through notational elements such as "strategic goals" [23] or "strategic themes" [20]), or (II) if it provides notational elements which, depending on the chosen level of abstraction, can be related to both the strategy and the BM layer (e.g., "choices" in [5], which depending on their level of abstraction can also have a strategic character).

Naturally, all representations can represent aspects of the BM layer. Nearly half of the representations merely represent a network of actors, and thereby focus on the BM layer only. The remaining representations also reach into the strategy layer. Of these approaches, some [20], [23] explicitly intend to address strategic aspects and provide respective notational elements. Most of the others are assigned to the strategy layer, because they provide notational elements which can be related to both the strategy and the BM layer. There is only one BMR, namely the Eriksson-Penker business extensions [7], which covers all three layers. Also, this representation is the only one which covers the process layer at all. We attribute this to the fact that except for this BMR, which is rooted in the information systems domain, none has its origin in a domain with a strong relation to process modeling.

3.1.2 Perspective

A *view* can be defined as "an abstraction from a specific viewpoint, omitting details that are irrelevant to that viewpoint" [7]. Views are orthogonal to layers in that they focus on specific aspects of a BM (e.g., the involved actors' goals), either within or across layers. A view has been seen to comprise a set of diagrams which describe related aspects of a BM [7]. In contrast, we adopt the notion used in [4], and see every diagram which has a focus on a specific aspect of a BM to be equivalent with one view. Adopting the latter notion means defining the lower of the two possible levels of abstraction (i.e., a view being either a single diagram or a set of diagrams) as the level of analysis. This is a prerequisite for a vertical extension of the framework in future research, which could allow for classifying views more thoroughly, for instance according to their thematic focus.

The more views a BMR provides for representing a certain BM, the more elaborate the resulting BM conceptualization can be. Employing the criterion *perspective* and selecting representations that either feature a *single view* or *multiple views*, thus, narrows down the set of potentially suitable BMRs depending on the aim of the modeling process: to yield either a rather detailed or a rather abstract view of the business.

The vast majority of the BMRs feature a single view. Within their respective views, they focus either on the BM layer, or reach into the strategy layer as well through the incorporation of strategic aspects. There are only three representations, namely the Eriksson-Penker business extensions, REA, and SBMO, which provide multiple views. The number of views they provide differs, and it is acknowledged that additional views may be defined [7]. The relation between the views described in the articles differs in that it can either be hierarchical or non-hierarchical. For example, the "strategy" and "operational" views in [23] are clearly hierarchical in that goals from

the operational view are aggregated to more strategic goals in the strategy view. In contrast, the "key concepts" defined in the "conceptual model" of the Eriksson-Penker business extensions are at the same conceptual level, i.e., non-hierarchical compared to the "core processes" in the process diagram of the same BMR [7]. In addition, the thematic focus of the views defined in the BMRs differs. Whereas, for example, Eriksson and Penker [7] as well as Samavi et al. [23] both define a view for modeling actors' goals, [7] also define a view for resources, which has no match in [23].

3.1.3 Notation principle

BMRs, according to the underlying *notation principle*, can be categorized into two categories: *map-based* approaches and *network-based* approaches (see figure 1). Both approaches likewise define a set of concepts to represent a BM. The way they visualize these concepts, however, greatly differs. Also, the richness of information which can be conveyed through the notation principles differs. Thus, the notation principle may serve as a selection criterion to identify representations aiming at a rather detailed or a rather abstract view of the business.

Map-based approaches lay out the concepts one by one, thereby providing a template which spatially structures a specific BM's key characteristics. For each concept (e.g., actor, activity), the elements belonging to the concept (e.g., actor 1, actor 2) are listed at the respective spatial position.

Network-based approaches assign a different graphical notation to each of the concepts. They explicitly visualize every single element of a given concept (e.g., every actor) and the relations among these elements, i.e., they use a network of elements to represent a BM. Both notation principles can form the basis either for a single view representation or a multi view representation (see figure 1). For multi view representations, also a mix of map-based and network-based visualization is possible by combining views of both notation principles.

The vast majority of representations employ the network-based notation principle. In doing so, they use a limited number of concepts in a single or in multiple views. As every concept has its own notation, the representation becomes more complex if more concepts are sought to be represented within one view. Therefore, the network-based approach is rather suited for representing complex networks of the elements of a limited number of concepts. The map-based approach (only used by Osterwalder [15] and Wirtz [30]), in contrast, is rather suited for describing a larger number of different concepts, being less suited, however, for representing the interrelations among their elements.

In figure 1, the relation between the criteria *perspective* and *notation principle* is illustrated. With a single view, approaches are available according to the map-based and the network-based notation principle. With multiple views, BMRs could only be identified according to the network-based approach. None of the current BMRs uses a map-based approach with multiple views, even though such a BMR could be advantageous in that different levels of abstraction potentially improve comprehension as well as provide a means to substantiate a BM. Also, it would be possible to combine views of the map-based and the network-based approach. As no currently available representation falls into this category, for purposes of clarity, we omitted this hybrid approach in the below figure.

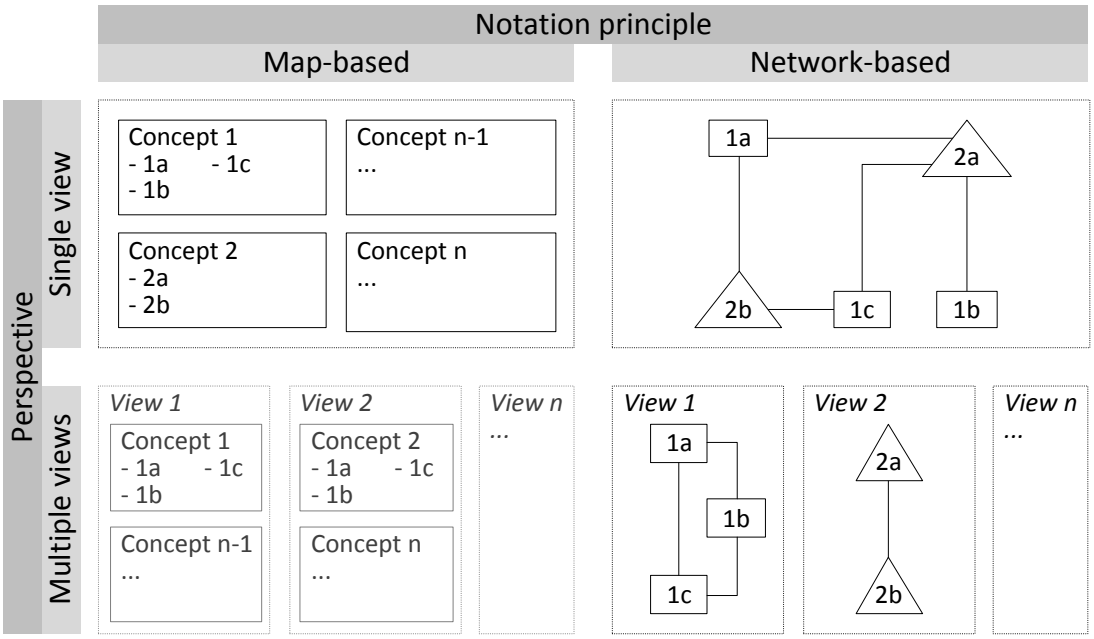

Figure 1: Illustration of the criteria notation principle and perspective

3.1.4 Tool support

Whether a BMR is supported by a tool determines to a great extent how easily a given representation can be changed, analyzed, shared etc. The more complex a BM gets and the more elaborate the analysis is sought to be, the more important is it that a BMR is supported by a software tool. Thus, we employ *tool support* as a fourth classification criterion.

More than half of the representational approaches are conceptual tools. They define a number of main concepts and provide a corresponding graphical notation. Others (e.g., [7], [9], [19]) also provide a formal model of their concepts and the corresponding relations, which is documented as entity-relationship or class diagram. Except for [26], no approach outside the e-business or IS domains attempts such a formal representation. As formalization is a prerequisite for tool support, consequently, (except for [26]) no representations from outside these two domains are provided with a supporting tool. The available software tools all support the design and change of a BM. e3-value [9], however, is the only BMR that provides a software tool, which integrates the design *and* the financial analysis of a BM using capital budgeting techniques.

3.2 Notational elements

As already mentioned, the identified BMRs use a variety of different notational elements and terminologies. In some cases, concepts with the same name convey different semantics, in other cases, concepts with different names actually convey the same semantics. Often, it is not obvious whether a notational element in a given notation has a direct counterpart in another BMR. To establish a basis for a cumulative tradition it is, therefore, necessary to develop a terminological as well as conceptual synthesis of the *notational elements* which are employed to represent BMs. For a first step towards such a synthesis, we (I) extracted the notational elements utilized in the approaches identified in the literature, and (II) interrelated concepts with similar or same semantics. Thereby, we derived eleven notational key concepts (see table 2), which are described in the following.

		Business model representation										
Notational concept		Activity sysetem map [20]	Business model for e-government [19]	Causal loop diagram [5]	e3-value [9]	E-business model schematics [29]	Eriksson-Penker business extensions [7]	Resource-event-agent [14][13], [26]	Strategic business model ontology [23]	Value Map [2], [27]	Value Net [17]	Value stream map [21]
Actor		-	Partner	-	Actor Market segment	Firm of interest Supplier Customer Ally	-	Inside agent Outside agent	Agent	Member	Actor	Actor
Role		-	Role	-	-	-	-	Inside agent Outside agent	Role	-	-	-
Goal		-	-	-	-	-	Quantitative goal Qualitative goal	-	Goal Soft goal	-	-	-
Guiding principle		Strategic theme	Policy	-	-	-	Qualitative goal	-	Soft goal	-	-	-
Activity		Activity	Service	-	Activity	-	Core process	Business process	Task	-	Management of external transactions Support Realization	-
Connection	Flow	-	Object exchange	-	Value object	Money Product Information	Resource	Resource	-	Good, service, revenue Knowledge Intangible benefits	Financial Good Information Influence relation Reciprocal influence relation	Service Free service Product Free product Information
	Relation				Value exchange & Value port & Value interface	Electronic rel. Primary rel.	Dependency	Economic resource flow				
Key Resource		-	-	-	-	-	Resource	-	-	-	-	Resource
Advantage/ Disadvantage		-	Advantage/ Disadvantage	-	-	-	-	-	-	-	-	-
Choice and consequence		-	-	Choice Flexible conseq. Rigid conseq.	-	-	-	-	-	-	-	-
Domain-specific key concepts		-	-	-	-	-	Concepts	-	-	-	-	-
Other relations		-	-	-	-	-	Aggregation Association Dependency Generalization	-	Dependency Means-ends Contribution Decomposition	-	-	-

Table 2: Terminological and conceptual synthesis of notational elements for business model representations

The economic parties, or *participants*, involved in a BM can be represented via the concepts actor and role. *Actors* represent concrete economic entities, for example, a specific electricity provider. *Roles* are abstract actors in that they comprise a set of characteristics which can potentially be shared by more than one actor (e.g., the general characteristics of electricity providers). An actor can possess one or several roles, for example, be an electricity *and* a gas provider. Most of the identified approaches employ the actor concept only; others [19], [23], [26] define a separate notation for actors and for roles.

The concept *goal* represents a desired condition or state of affairs that can actually be achieved. Goals can be distinguished according to the nature of the underlying criterion for achievement which, for example, can be qualitative or quantitative [7]. *Guiding principles*, in contrast, shape the general criteria on which decisions are taken and provide a broad direction for the participants without setting precise objectives.

Activities represent sets of processes, or core processes, which are performed by one actor or assigned to a role. Within some approaches [7], [23], they are related to the goals they are contributing to.

The concept *connection* addresses the linkages between actors, or between activities. A connection shows (I) that some kind of link, or *relation*, exists between two given actors/ activities, which (II) enables the transfer of an object of interest, or *flow* between them. These two aspects can either be represented by a combined notational element (e.g., [2], [19]), or by separate notational elements for relation and flow (e.g., [7], [9], [26], [29]).

Key resources represent resources that – in line with the resource-based view of competitive advantage – are of critical importance for an actor [21].

Advantages/Disadvantages denote the positive or negative impacts that the participation of actors in a BM has on their guiding principles. For example, having to cooperate with a company known to be not very serious about environmental regulation may negatively impact the policy of “being an ecological company”. According to [19] *(dis)advantages* can also affect policies of other actors. The authors, however, do not describe under which circumstances such an interdependency could occur.

Deliberate decisions on specific aspects of a BM are represented by a *choice*. The outcome associated to such a choice is represented by *consequences***.** A choice may, for example, represent the decision of a low-cost airline not to offer meals on their flights. A corresponding consequence is that variable costs are reduced. Consequences can be further distinguished according to their sensitivity to the choice they result from [5].

Through *domain-specific key concepts* a reference terminology is established for the most important concepts in the modeling domain (types of products, customers etc.) [7].

There is also a number of relations which connect elements other than activities and actors (goals, key concepts etc.). These connections are highly specific to the corresponding BMR and therefore are summarized under *other relations*.

4 Discussion & conclusion

A great variety of approaches exist for representing BMs. They greatly differ in terms of their understanding of the BM concept, their approach for representation, the terminology, and the

notational elements they use. This calls for a synthesis of the field to enable further cumulative research. Addressing this issue, our contributions are (I) a classification framework for BMRs, and (II) a conceptual as well as terminological synthesis of the notational elements used in the literature.

There is merit in the question why – given the lack of a widely-accepted definition of the BM concept – efforts for representing this "vague" concept [1] should be undertaken before such a definition is available. One reason is the need to apply the BM concept, which is evident, for example, through the surge of interest in practitioner-oriented journals [31]. To satisfy this "pull", approaches are needed which operationalize at least the current definitions of a BM. Furthermore, modeling is a useful activity to achieve a better understanding of the subject to be modeled. Therefore, research on explicating the understanding of the BM concept through representational approaches may contribute to the efforts to further refine the common understanding of the BM concept. Analyzing more thoroughly the understanding of the BM concept underlying the various BMRs denotes a topic for further research.

Pateli et al. criticized in an earlier review paper that "when illustrating business models, only parts of the conceptual model, mainly the value flows and the business players, are usually depicted. The remaining information is usually implied or even totally ignored." [18]. The first results of our work provide evidence that this criticism can be countered. Since then, lots of approaches have been developed which stray out of the narrow focus solely on actors and their relations (e.g., [5], [23]), and thereby cover formerly neglected aspects of the BM concept. Additionally, it is striking that the level of sophistication devoted to describing the notational elements varies greatly among the identified approaches. On the one hand, there are approaches which define formal meta-models of the utilized notational elements, define the concepts textually, and also provide sample applications of their notation (e.g., [7], [9]). On the other hand, there are approaches which provide rather simple textual definitions, and convey a major part of the semantics through a number of examples ([5], [20]). The latter case poses a considerable challenge for researchers to build their cumulative research on such approaches, because a large part of the semantics is left implicit.

Although broader aspects of the BM concept have been covered with the increasing number of articles, it can be criticized that the various BMR approaches rarely build on each other. Thus, our work shall provide a starting point to develop a more cumulative stream of research. For researchers, our synthesis of notational elements provides a set of generic notational elements for representing BMs, which can serve as a basis for developing reference models for BMR and for the extension of existing BMRs with additional notational elements. Classifying the existing BMRs through our framework highlights numerous gaps in the existing approaches, which can be addressed by future research. For example, there are only representations which employ either the map-based or the network-based notation principle (and not a combination of both). The classification also reveals that there are no map-based representations that employ multiple views. Another insight is that only one representation provides a tool which explicitly supports the financial evaluation of a BM. The classification framework may also serve as a starting point for the extension of existing BMRs and the development of new ones which, for example, may be tailored to specific domains.

For practitioners, the synthesis of notational elements allows to better understand the similarities and differences between BMs modeled with different representational approaches. The developed classification framework assists practitioners in narrowing down the set of potentially

suitable BMRs depending on the purpose of the visualization. Thereby, the framework may save effort in deciding upon a suitable BMR for a given business context, and may help to prevent undertaking business development endeavors with an ill-suited BMR. The next steps in our work include a thorough evaluation, for example, through applying the framework in real-life cases.

5 References

[1] Al-Debei, MM; Avison, D (2010): Developing a unified framework of the business model concept. European Journal of Information Systems 19(2):359-376.

[2] Allee, V (2000): Reconfiguring the value network. Journal of Business Strategy 21(4):36-39.

[3] Amit, R; Zott, C (2002): Value drivers of e-commerce business models. In: Hitt, MA; Amit, R; Lucier, CE; Nixon, RD (eds.), *Creating value: Winners in the new business environment*, Blackwell Publishers, Oxford.

[4] Becker, J; Breuker, D; Rauer, HP (2011): On Guidelines for Representing Business Models - A Design Science Approach. In: *Proceedings of the 12th Americas Conference on Information Systems*. Detroit.

[5] Casadesus-Masanell, R; Ricart, JE (2010): From strategy to business models and onto tactics. Long Range Planning 43(2-3):195-215.

[6] Chesbrough, H (2010): Business model innovation: Opportunities and barriers. Long Range Planning 43(2-3):354-363.

[7] Eriksson, HE; Penker, M (2000): Business modeling with UML. Wiley, New York.

[8] Gordijn, J; Akkermans, H; van Vliet, H (2000): Business modelling is not process modelling. In: Liddle, S; Mayr, H.; Thalheim, B. (eds.), *Proceedings of ER 2000 Workshops on Conceptual Modeling Approaches for E-Business and the World Wide Web and Conceptual Modeling*. Salt Lake City.

[9] Gordijn, J; Akkermans, HM (2003): Value-based requirements engineering: Exploring innovative e-commerce ideas. Requirements Engineering 8(2):114-134.

[10] Gordijn, J; Osterwalder, A; Pigneur, Y (2005): Comparing two business model ontologies for designing e-business models and value constellations. In: Vogel, DR; Walden, P; Gricar, J; Lenart, G (eds.), *Proceedings of the 18th BLED eConference*. Bled.

[11] Gordijn, J; Yu, E; van der Raadt, B (2006): e-service design using i* and e3-value modeling. IEEE software 23(3):26-33.

[12] Klang, DJH; Wallnöfer, M; Hacklin, F (2010): The anatomy of the business model: A syntactical review and research agenda. In: *Proceedings of the DRUID summer conference.* London.

[13] Kundisch, D; John, T (2012): Business Model Representation Incorporating Real Options: an Extension of e3-value. In: *Proceedings of the 45th Hawaii International Conference on System Sciences*, Maui.

[14] McCarthy, WE (1982): The REA accounting model: A generalized framework for accounting systems in a shared data environment. Accounting Review 57(3):554-578.

[15] Osterwalder, A (2004): The business model ontology: A proposition in a design science approach. PhD Thesis, University of Lausanne.

[16] Osterwalder, A; Pigneur, Y; Tucci, CL (2005): Clarifying business models: Origins, present, and future of the concept. Communications of the AIS 15:2-40.

[17] Parolini, C (1999): The value net: A tool for competitive strategy. Wiley, New York.

[18] Pateli, AG; Giaglis, GM (2004): A research framework for analysing eBusiness models. European Journal of Information Systems 13(4):302-314.

[19] Peinel, G; Jarke, M; Rose, T (2010): Business models for eGovernment services. Electronic Government, an International Journal 7(4):380-401.

[20] Porter, ME (1996): What is strategy? Harvard Business Review 74(6):61-78.

[21] Pynnönen, M; Hallikas, J; Savolainen, P (2008): Mapping business: Value stream-based analysis of business models and resources in information and communications technology service business. International Journal of Business and Systems Research 2(3):305-323.

[22] Richardson, J (2008): The business model: an integrative framework for strategy execution. Strategic Change 17(5-6):133-144.

[23] Samavi, R; Yu, E; Topaloglou, T (2009): Strategic reasoning about business models: A conceptual modeling approach. Information Systems and E-Business Management 7(2):171-198.

[24] Schuster, R; Motal, T (2009): From e3-value to REA: Modeling multi-party e-business collaborations. In: *Proceedings of the 11th IEEE Conference on Commerce and Enterprise Computing*. Vienna.

[25] Seddon, PB; Lewis, GP; Freeman, P; Shanks, G (2004): The case for viewing business models as abstractions of strategy. Communications of the AIS 13:427-442.

[26] Sonnenberg, C; Huemer, C; Hofreiter, B; Mayrhofer, D; Braccini, A (2011): The REA-DSL: A domain specific modeling language for business models. In: *Proceedings of the 23rd International Conference on Advanced Information Systems Engineering*. London.

[27] Tapscott, D; Lowy, A; Ticoll, D (2000): Digital capital: Harnessing the power of business webs. Harvard Business School Press, Boston.

[28] Webster, J; Watson, RT (2002): Analyzing the past to prepare for the future: Writing a literature review. MIS Quarterly 26(2):XIII-XXIII.

[29] Weill, P; Vitale, MR (2001): Place to space: Migrating to ebusiness models. Harvard Business School Press, Boston.

[30] Wirtz, B (2011): Business Model Management: Design - Instruments - Success Factors. Gabler Verlag, Wiesbaden.

[31] Zott, C; Amit, R; Massa, L (2011): The business model: Recent developments and future research. Journal of Management 37(4):1019-1042.