MEASURING BUSINESS MODEL TRANSFORMATION

Christina Di Valentin, German Research Center for Artificial Intelligence, GER
Christina.Di_Valentin@dfki.de

Tobias Weiblen, SAP Research Center, Business Research Group, CH
Tobias.Weiblen@sap.com

Anton Pussep, Technische Universität Darmstadt, Chair of Information Systems, GER
Pussep@is.tu-darmstadt.de

Markus Schief, SAP Research, Darmstadt, GER
Markus.Schief@sap.com

Andreas Emrich, German Research Center for Artificial Intelligence, GER
Andreas.Emrich@dfki.de

Dirk Werth, German Research Center for Artificial Intelligence, GER
Dirk.Werth@dfki.de

Peter Loos, German Research Center for Artificial Intelligence, GER
Peter.Loos@dfki.de

Abstract

Pressure amongst competitors combined with a rapidly changing economy drive enterprises to continuously adapt their current business models to prevail over competitors. Business models nowadays must be flexible enough to cope with external or internal changes and therefore should be managed and controlled dynamically. Hence, enterprises must be aware of the interconnections between the strategic level and the operational level of business processes for being able to adjust their current business models to external or internal influencing factors. However, for enterprises it is not enough to solely adapt their business models. Enterprises must also be able to measure the quality of their adapted business model as they continuously need feedback about the quality of their current business models. Therefore the transformation mechanism from business models into business processes has to be evaluated. This paper presents an approach for measuring business model adaptation. With regard to the software industry an approach is presented to measure the degree and the quality of business model adaptation by evaluating a company's business processes that result from business model adaptations.

Keywords: Adaptive Business Models, Dynamic Enterprise, Business Processes

1 INTRODUCTION

For staying competitive within the continuously changing business environment enterprises are increasingly forced to adapt their current business models to dynamic external and internal factors (IBM 2010). A business model is commonly viewed as a mediator between strategy and business processes, which reflects in different granularity levels of the concepts (operational vs. tactical vs. strategic) (Morris et al. 2005). Thereby it explains the way a company performs by representing an abstract view on aspects such as resources or supply chains of certain products within the company (Scheer 2001). During the internet boom the concept of business models has established itself and gains importance ever since (Magretta 2002). Meanwhile business models are not only popular in the area of e-business, but also in the research fields of strategic management and information systems (Osterwalder & Pigneur 2010). Especially in terms of diffusions of innovation from information

technology into business, the concept of business models has proven to be increasingly important (Magretta 2002).

This paper follows a paradigm-oriented methodology (Wilde & Hess 2007). Based on the conduction of several expert interviews this paper builds on prior work dealing with the derivation of a framework for adaptive business models (Di Valentin et al. 2012) and the transformation methodology from business models into business processes (Burkhart et al. 2012). Hence, an integration of performance measurement into business model adaptation is aspired. The results of the expert interviews serve for describing the quality of business model transformation into business processes and vice versa by using relevant key performance indicators (KPIs). As enterprises have to continuously measure the success of their current business model, the transformation mechanism from business models into business processes must be perpetually evaluated. Thus, enterprises must be aware of the constituent elements of their business model to gain a detailed overview of the core aspects of their business.

The rest of the document is structured as follows. The section "Related Work" deals with the derivation of business model components and is based on a systematic literature review. These components form the basis for the process of business model transformation into business processes. The conceptual framework for adaptive business models by Di Valentin et al. (Di Valentin, Emrich, Werth, Loos 2012), which contains the constituent parts of a business model, is also introduced within this section. It serves as a basis for the measurement of business model adaptation presented in chapter 3. The framework takes into account the relevant dependencies between a business model (broken down into its constituent elements) and all enterprise levels, reaching from strategic level to the level of business processes. Demonstrated for the software industry, the derivation of relevant KPIs is shown that serve as feedback parameters for the quality of the current business model. "Conclusions and Outlook" summarizes the paper and gives an outlook on future research dealing with flexible business models and their performance measurement.

2 RELATED WORK

The major objective of this section is the presentation of the constituent parts of a business model derived from several comprehensive literature reviews. Thereby relevant approaches dealing with dynamic business model research as well as existing interdependencies between these elements have been considered and analysed. A framework for adaptive business models which forms the basis for further research on dynamic business models is presented in section 2.2.

2.1 Constituent Elements of a Business Model

Each business model is composed of several core elements. For making statements about certain adaptation factors within a company's business model these core elements have to be defined. Business model elements do not represent an entire business model but describe its constituent parts. Hence, an analysis of each single business model element helps to determine the entire combination and composition of a business model. By breaking down a business model into its constituent parts, dynamic factors can be better considered. Thus, an exact analysis about the interdependencies of business model components among each other can be carried out (Demil & Lecocq 2010). For deriving the constituent elements of a business model, several articles dealing with business model elements have been taken into account (Afuah & Tucci 2004; Amit & Zott 2001; Betz 2002; Chesbrough, Henry & Rosenbloom, Richard 2002; Hamel 2002; Linder & Cantrell 2000; Mahadevan 2000; Petrovic et al. 2001; Osterwalder & Pigneur 2001; Schief & Buxmann 2011; Stähler 2001; Timmers 1998). Furthermore several literature reviews concerning business model elements have been also taken into consideration (Morris et al. 2005; Richardson 2008; Di Valentin et al. 2012; Burkhart et al. 2011).

The review has shown that in literature there is a large agreement that a business model is composed of the following components: Revenue Model, Resources, Value Proposition and Architecture of Value Creation (see figure 1).

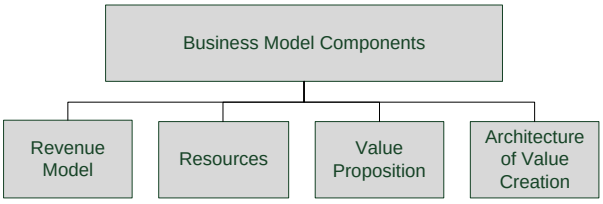

Figure 1. Constituent Elements of a Business Model

The Revenue Model refers to the different ways in which revenues are being generated (Hitt, Michael et al. 2002). Resources relate to a company's performance potential by describing the required basis to gain competitive advantages. The Value Proposition describes the perceived value that is promised to a company's customers taking into account the fulfillment of customer needs (Kotler & Armstrong 2012), whereas the Architecture of Value Creation contains information about several channels of information flow and also about the products and activities required to translate a specific business model into practice. The majority of authors concerned with business models agree about these four constituent elements of a business model.

It should be noted that these derived business model components are interconnected to each other and therefore cannot be considered in isolation. The literature analysis has also shown that so far, business models are not flexible enough to cover an automated analysis and controlling of service level agreements and key measures. However, these are important aspects for a rapid adaptation of business models as well as for the provision of up-to-date information to strategic management.

2.2 Framework for Adaptive Business Models

The framework for adaptive business models proposed by Di Valentin et al. (2012) forms the basis for further research presented in this paper. The following figure shows the business model in its mediating role between a company's business model and its strategy. This framework demonstrates the importance of business model analysis not only being conducted top-down but also bottom-up beginning from business process level.

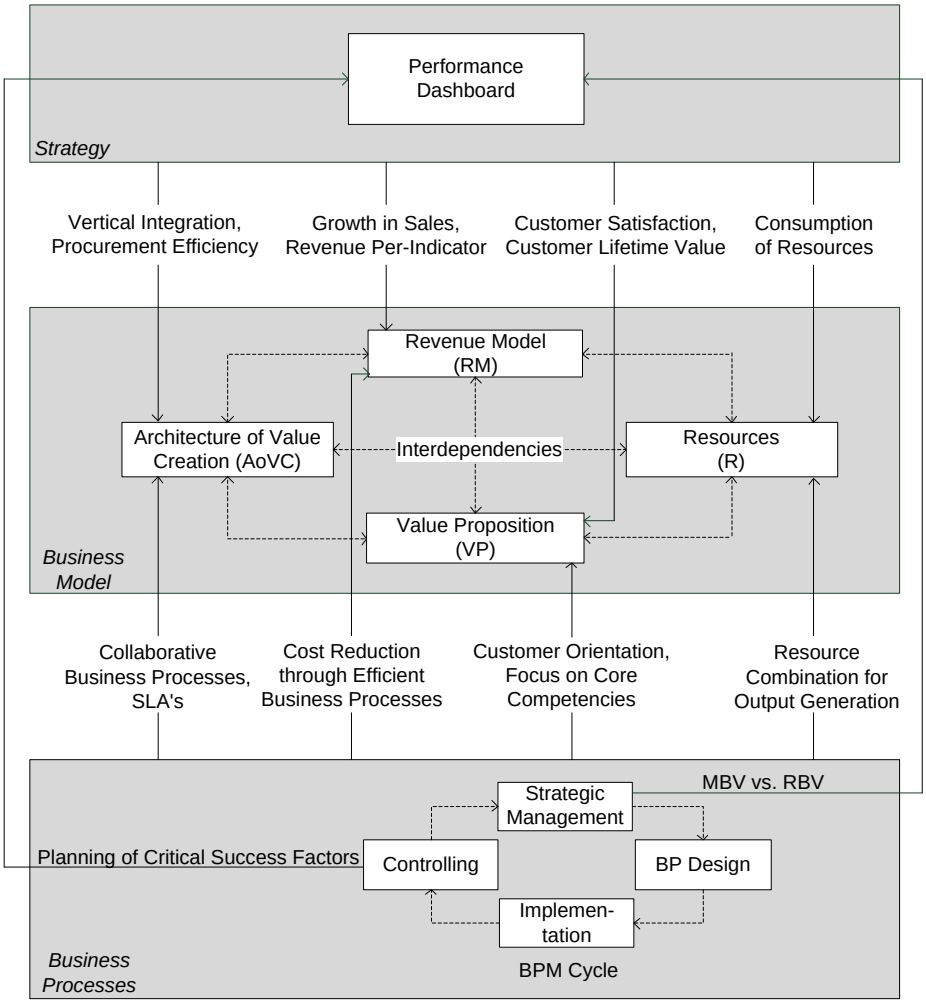

Figure 2. Framework for Adaptive Business Models (Di Valentin et al. 2012)

This paper is focused on the interaction between business models and business processes, especially on the impact business processes have on their underlying business model. The business process level is characterized by an implementation of a concrete use case into practicable business processes through producing an output by using several resources and input factors (Osterwalder & Pigneur 2005). In contrast to business processes, the business model represents an overview on the value creation within an enterprise (Osterwalder & Pigneur 2005). As changes within the business model influence a company's business processes the determination of business processes should begin with the constitution of a company's strategic goals and its business model for gaining a comprehensive understanding about the issues to be modelled. The interconnections between business models and business processes are characterized by a continuous alignment and permanent optimization of both layers.

The business process management (BPM) lifecycle embedded in the layer of business processes represents the connection between the business process level and a company's strategy. In this cycle, Controlling plays the most significant part as it comprises the development and coordination of strategic objectives and KPIs for control purposes. On strategic level the collected and analyzed key measures can be evaluated and displayed by performance measurement systems such as Balanced Scorecard (BSC) to support several evaluation mechanisms. Strategic Management ensures an embedment of business process management into strategy which can be either market based (Market based View, MBV) or resource based (Resource based View, RBV). Thereby, the market based view is characterized by taking into account a certain industry branch whereas the resource based view is characterized by the generation of specific resources to achieve competitive advantages. Business

Process (BP) design encompasses the identification of all business processes that are relevant for specific business model adaptations as well as the definition of corresponding key measures. Finally, Implementation focuses on an enterprise wide realization of planned business processes including the required information systems which are needed for carrying out these processes.

The connections between business processes, strategy and the constituent components of the business model show that both changes within a company's strategy as well as changes within its relevant business processes have an effect on the underlying business model. Inversely, dynamics within the business model also influence business processes and strategy. Thereby implications caused by external or internal changes cannot just be considered in a generic fashion. Enterprises must be able to estimate the implications of these changes for each element of the business model to meet countermeasures (e.g. adapting current offerings or pricing to current market developments). Moreover, enterprises must be able to measure the quality of their (adapted) business models. Therefore, key measures for each business model element have to be constituted. By this means a new kind of business model adaptability can be reached through an automatic propagation of change events across model layers. Hence, an evolutionary dynamics support can be realized by defining rule sets to define adaptations measures or to provide the relevant data basis for subsequent recommendations and analysis (Di Valentin et al. 2012).

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Based on the literature review and the presented framework for adaptive business models, this chapter shows how relevant key measures can be derived as feedback parameters to measure the quality of business models. For this purpose, it is helpful to focus on a specific industry branch for being able to describe in detail existing interconnections of the business model in its mediating role between strategy and business processes. First the software industry value chain which forms the basis for deriving KPIs from business processes is presented in chapter 3.1. Section 3.2 presents the results of expert interviews which are based on the software industry value chain to gain insight in performance measurement in the software industry.

3.1 Business Processes and the Software Value Chain

For evaluating and measuring adaptations within a company's business model, first underlying business processes and value chains have to be specified because they serve as a basis for the collection of key measures. In general, a value chain "disaggregates a firm into its strategically relevant activities in order to understand the behavior of costs and the existing and potential sources of differentiation (Porter 1985)" whereas a business process represents a chain of logically related activities which have to be carried out in a certain order (Oesterle & Winter 2003). The software industry value chain presented in this paper has been analyzed and specified by several literature and empirical studies. It consists of the following elements: Research, Development, Maintenance, Production, Marketing, Replacement, Implementation, Education, Support and Operations (Pussep et al. 2011). Figure 3 shows the elements of the software industry value chain in its logical order.

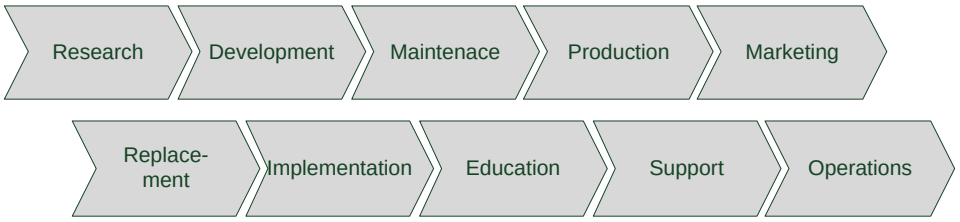

Figure 3. Software Value Chain (Pussep et al. 2011)

These activities of the software value chain serve for the identification of changes within the business processes of a software company that are caused by modifications on the underlying business model. We assume that a specific number of business processes is assigned to each activity in the value chain

diagram. Hence, a value chain activity merges several related business processes. By this means, changes within the value chain can be traced back to changes within its underlying business processes. The value chain activity Research encompasses the conceptualization with the result of a first vision of a certain product as well as fundamental research and first feasibility studies (Messerschmitt & Szyperski 2003). The element Development represents the core activity of a software producing company (requirement analysis, software design, software development, technical documentation, verification and validation). It refers to the actual process of software development and encompasses in large parts the stages of the waterfall model. Maintenance includes a continuously supervising of all needed production facilities. For this reason, this activity is responsible for the quality of the manufactured software products. Production encompasses the distinct activities of product composition, production and packaging which are mainly characterized by a physical reference whereas Marketing is „associated with providing a means by which buyers can purchase the product and inducing them to do so, such as advertising, promotion, sales force, quoting, channel selection, channel relations, and pricing" (Porter 1985). The value chain component Replacement has been identified by Crnkovic et al. (Crnkovic et al. 2005). This activity includes the decision whether an existing system will be replaced by an alternative system. Within Implementation the installation, configuration and adaptation of the software product is accomplished (Messerschmitt & Szyperski 2003) whereas Education encompasses the user's instruction and explanation of the developed product. Within Support error corrections and improvements of the software product as part of the waterfall model are carried out (Crnkovic et al. 2005; Messerschmitt & Szyperski 2003). Finally, Operations comprise monitoring within the accomplishment of the software product by an information system (Messerschmitt & Szyperski 2003; Royce 1970). To avoid damages caused by data loss, backups have to be carried out and releases have to be continuously upgraded. The following section shows, how for each value chain element key measures can be collected in dependence to a company's business model elements.

3.2 Defining relevant Feedback Parameters

The prototype developed so far covers aspects about business model compilation by enabling enterprises to compose their individual business model by predefined building blocks for the software industry. Thereby enterprises are supported in changing single elements of their business model by receiving recommendations about the next steps to be carried out within the adaptation of their business models. After completion, a comprehensive standardized overview is displayed.

The next goal is to gain relevant feedback parameters for the quality of the current state of a business model. Enterprises must be able to receive for each step within the process of business model adaptation relevant feedback about the current state of their business model. Thus we want to define for each value chain activity of the software industry relevant key measures which are related to the constituent elements of a business model. Before being able to define relevant KPIs, first an analysis of the current state-of-the-art on performance measurement in the software industry has to be carried out.

To reach this goal, several expert interviews have been conducted with CEOs and / or experts for performance measurement and controlling purposes in the software industry. In total 15 interviews, thereof 13 SME's and 2 large companies have been carried out. For establishing a connection between business model level and business process level, interviewees had to classify the business models of their companies to the constituent elements of a business model introduced in chapter 2.1. In doing so companies adjusted their value chain to those shown in figure 3. For each of the 10 activities in the software value chain the same set of questions was asked. In addition we wanted to know from the interviewees examples about how their KPIs measured on business process level affect their business model.

Results from the first phase of the interviews show that especially in the software industry there is still a quite fragmented perception about the constitutional definition and evaluation of software specific KPIs. Many interviewees have significant problems in connecting their collected KPIs to the specific elements of their business models. Another noticeable aspect is that many software firms were not able to assign relevant KPIs to each activity in the software value chain because many of the interviewed

software firms are still in the process of defining relevant key measures for their business processes. Most of the companies surveyed do not have a superior performance measurement system and do not carry out internal or external benchmarking. However, KPIs are predominantly measured on a continuous basis.

Table 1 shows the classification of concrete KPIs to the activities of the software value chain based on the results of phase 1 of the expert interviews. Because of the fact that not every interviewed software company was able to assign key measures to each activity in the software value chain, we show those value chain activities for which most of the interviewed software firms could assign relevant KPIs.

Vale Chain Activity	**KPIs**	**Effects on Business Model Elements**
Development	• Implementation Time • Number of Implementation Inquiries • Time Units for Definition and Test • Number of Customer Complaints • Product Quality • Number of Bugs • Developers per Software Project • Profit Margins	The faster the software development the higher is the chance for being innovative and successfully sell the software product. These aspects have a positive effect on the **Revenue Model** The quality of the developed software product influences the perceived **Value Proposition**
Operations	• Number of Participants • Transactions per Time Unit • Data Volume per Time Unit • Employee Satisfaction	The number of carried out transactions and participants of value chain activities have an effect on a company's **Architecture of Value Creation** and the **Revenue Model**
Marketing	• Sales Growth • Degree of Brand Awareness • Number of Business Contacts • Effort per Marketing Activity • Revenue per Marketing Activity • Number of Customers that know the Software Product	The number of fulfilled customer requests has a positive impact on the customers' **Value Proposition.** Sales Growth and Revenue per Marketing Activity directly influence the **Revenue Model** whereas the Number of Business Contacts is related to a company's **Architecture of Value Creation**
Support	• Amount of Support • Average Support carried out per Employee • Effort per Support • Average Processing Time • Effort of Rework	Amount of Support, Average Support carried out per Employee, Effort per Support and Effort of Rework have a strong influence on a company's **Revenue Model** and **Resources**. The Average Processing Time is positively correlated to the perceived **Value Proposition** of customers
Maintenance	• Number of Complaints • Number of Bugs	Key measures within Maintenance are related to the **Value Proposition** as they indicate the satisfaction of a company's customers
Replacement	• Number of carried out Software Updates	The Number of carried out Software Updates have an impact on the **Value Proposition**

Table 1 Results of the Expert Interviews

The opinion that internal and external events are decisive for the success of their business model is widespread among the interviewees. Interviewees share the opinion that changing KPIs can be an indicator for business model adaptations. Most of the surveyed companies estimate that research about business model adaptations is highly relevant as key measures are often neglected in practice and there is still no systematic and holistic approach of performance measurement within the software industry. This opinion is additionally enforced by the fact that only an evaluation of current events gives decision-makers a reasonable motivation for changing specific aspects of their business model.

4 CONCLUSION AND OUTLOOK

This paper has derived a requirements analysis for KPIs in business models with the goal to collect feedback for an efficient constitution and adaptation of business models in the software industry. Hence, key measures can be reflected in an integrated information system architecture for adaptive business models. Phase 1 of the conducted expert interviews has shown that in literature and practice there is still no standardized framework which supports software companies in efficiently measuring their KPIs. However, an integrated performance measurement system is essential for enterprises to sufficiently analyze, define and further develop their current business models. Interviewees confirmed that key measures especially with regard to a specific industry branch or particular aspects of a business model are very often neglected by enterprises. Phase 2 of the expert interviews will further analyze on how the derived KPIs from phase 1 effect business model decisions.

In future work derived KPIs from the conducted expert interviews are going to be integrated in the prototype to serve as feedback parameters for the quality of the current state of business models in the software industry. In reference to the first results of the study a conceptual KPI framework for the software industry should be developed which serves software companies as reference model for the determination of key measures.

Future research should focus on this approach with regard to several industry branches. Enterprises must be able to exactly measure the quality of their business model adaptations to internal and external factors. Therefore, value chains from several industry branches should be analyzed and integrated into the framework for adaptive business models. In addition aspects like compliance of service level agreements and business rules should be also considered within an adaptive business model. Beyond that, an analysis and verification of relevant software tools and modeling languages which support a continuous evaluation of business model transformation into business processes should be carried out.

References

Afuah, A. & Tucci, C., 2004. *Internet Business Models and Strategies: Text and Cases* 2nd ed., New York: McGraw Hill.

Amit, R. & Zott, C., 2001. 'Value Creation in e-business'. *Strategic Management Journal*, 22(6): 493-520.

Betz, F., 2002. 'Strategic Business Models'. *Engineering Management Journal*, 14(1): 21-28.

Burkhart, T. et al., 2011. 'Analyzing the Business Model Concept: A Comprehensive Classification of Literature'. In *International Conference on Information Systems (ICIS-11)*. Shanghai.

Burkhart, T. et al., 2012. 'Transformation of Business Models into Business Processes'. To appear in *American Conference on Information Systems (AMCIS-12), 18th Americas Conference on Information Systems*. Seattle.

Chesbrough, Henry, W. & Rosenbloom, Richard, S., 2002. 'The Role of the Business Model in capturing Value from Innovation: Evidence from Xerox Corporation's technology spin-off companies'. *Industrial and Corporate Change*, 11(3): 529-555.

Crnkovic, I., Chaudron, M. & Larsson, S., 2005. 'Component-based Development Process and Component Lifecycle'. *Journal of Computing and Information Technology*, 13: 321-327.

Demil, B. & Lecocq, X., 2010. 'Business Model Evolution: In Search of Dynamic Consistency.' *Long Range Planning*, 43(2): 227-246.

Di Valentin, C., Emrich, A., Werth, D., Loos, P., 2012. 'A Framework for Adaptive Business Models'. To appear in *Proceedings of the International Conference on Information Resources Management (Conf-IRM-12)*. Vienna: IGI Global.

Hamel, G., 2002. *Leading the Revolution*, Boston: Harvard Business Press.

Hitt, Michael, A. et al., 2002. *Creating Value: Winners in the New Economy* 1st ed., Malden: Blackwell Publishers.

IBM, 2010. IBM - Global CEO Study.

Kotler, P. & Armstrong, G., 2012. *Principles of Marketing* 14th ed., Upper Saddle River: Prentice Hall.

Linder, J. & Cantrell, S., 2000. 'Changing Business Models: Surveying the Landscape.' , pp.1-15.

Magretta, J., 2002. 'Why Business Models matter'. *Harvard Business Review*, 80(5): 86-92.

Mahadevan, B., 2000. 'Business Models for Internet-based E-Commerce: An Anatomy'. *California Management Review*, 42(4): 55-69.

Messerschmitt, D. & Szyperski, C., 2003. *Software Ecosystem*, Cambridge: MIT Press.

Morris, M., Schindehutte, M. & Allen, J., 2005. 'The Entrepreneur's Business Model: Towards a unified Perspective'. *Journal of Business Research*, 58(6): 726-735.

Oesterle, H. & Winter, R., 2003. *Business Engingeering – Auf dem Weg zum Unternehmen des Informationszeitalters* 2nd ed., Berlin: Springer.

Osterwalder, A. & Pigneur, Y., 2001. 'An e-business model ontology for modeling e-business'. In *Proceedings of the 15th Bled Electronic Commerce Conference*. Bled, 1-12.

Osterwalder, A. & Pigneur, Y., 2010. *Business Model Generation* 1st ed., Hoboken: Wiley.

Osterwalder, A. & Pigneur, Y., 2005. 'Clarifying Business Models: Origins, Present, and Future of the Concept'. In *Communications of AIS*.

Petrovic, O., Kittl, C. & Teksten, R.D., 2001. 'Developing Business Models for eBusiness'. In *Proceedings of the International Conference on Electronic Commerce*. Vienna.

Porter, M., 1985. *Competitive Advantage*, London: Free Press.

Pussep, A. et al., 2011. 'The Software Value Chain as an Analytical Framework for the Software Industry and Its Exemplary Application for Vertical Integration Measurement'. In *American Conference on Information Systems (AMCIS-11), 17th Americas Conference on Information Systems*. Detroit.

Richardson, J., 2008. 'The Business Model: An Integrative Framework for Strategy Execution'. *Strategic Change*, 17(5): 133-140.

Royce, W., 1970. 'Managing the development of large software systems'. In *Proceedings of IEEE*. Wescon.

Scheer, A.-W., 2001. *ARIS – Modellierungsmethoden, Metamodelle, Anwendungen* 4th ed., Berlin: Springer.

Schief, M. & Buxmann, P., 2011. 'Business Models in the Software Industry'. In *International Conference on System Sciences (HICSS-11)*. Maui.

Stähler, P., 2001. *Merkmale von Geschäftsmodellen in der digitalen Ökonomie*, St. Gallen: EUL.

Timmers, P., 1998. 'Business Models for Electronic Markets'. *Journal on Electronic Markets*, 8(2): 3-8.

Wilde, T. & Hess, T., 2007. 'Forschungsmethoden der Wirtschaftsinformatik - Eine empirische Untersuchung'. *Wirtschaftsinformatik*, 49(4): 280-287.