Quantifying the Quality of Business Models

A State of the Practice

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***Abstract* – Companies increasingly show that the choice of the right business model is a crucial success factor. In particular, the software industry is characterized by a high degree of dynamics within their business activities. To stay competitive in a continuously changing business environment, companies must be able to adapt their business models to external or internal influencing factors. Business models are often seen as a mediator between a company's strategy and its business processes. Hence, this paper has a strong focus on the existing dependencies between business models and business processes. To gain insight on how companies currently measure the quality of their business models, several expert interviews have been carried out. To obtain significant results, the expert interviews have been carried out within one specific industry branch, namely, the software industry. The interviews have shown that, in practice, so far, there does not exist a standardized framework to measure relevant key performance indicators (KPIs) from business processes to determine the existing interrelations between business models and business processes.**

Keywords – Business models; business processes, adaptability; performance measurment; software industry

I. INTRODUCTION

The last decade has shown that the concept of business models has proven to be an increasingly important factor in literature, as well as in practice. Especially, companies in fast evolving sectors such as the software industry, demonstrate that business models form the basis for most innovations these days [1]. IBM's Global CEO study has shown that CEO's are increasingly forced to adapt their business models to dynamic factors to stay competitive within the continuously changing business environment [2]. Hence, companies must be flexible enough to adapt their business models to external and internal influencing factors [3]. So far, research on business models has a strong focus on static aspects, not adequately taking into account the huge amount of dynamic factors that continuously affect a company's business model [4][5].

Due to the lack of existing theory in the area of interest, this paper follows a design-oriented approach [6]. Several semi-structured interviews with experts from the software industry and different areas of expertise have been carried out. Based on these results, shortcomings of business model management in practice are identified and collected as requirements for deriving a framework to obtain feedback from business processes with the goal to adapt the current business model. Hence, this paper has a strong focus on the "bottom-up perspective" (feedback loop from business process level back to the business model level), providing practitioners an overview of relevant KPIs that serve as feedback parameters for business model adaptations.

The outline of the document is as follows. First, an overview of business models and business processes and their interrelations is given in Section 2. Section 3 explains the methodology and the results of the interviews carried out to gain insights in the transformative influence of business processes on business models. Section 4 summarizes the main results and gives an outlook on future research.

II. LITERATURE ANALYSIS ON BUSINESS MODELS AND BUSINESS PROCESSES – A STATE OF THE ART

A. Business Models

There is a large number of definitions for the term "business model" found in literature (e.g., [4][7–11]). Al-Debei et al. define a business model as "an abstract representation of an organization, be it conceptual, textual, and / or graphical, of all core interrelated architectural, co-operational, and financial arrangements designed and developed by an organization presently and in the future, as well as all core products and / or services the organization offers, or will offer, based on these arrangements that are needed to achieve its strategic goals and objectives" [12]. Hence, business models serve for understanding a company's business logic by containing a set of concepts and objects which are described by their relationship amongst each other [13][14]. Business models are used as management tool as they support the planning and the design of innovative business concepts to demonstrate a company's future orientations [15]. Furthermore, business models are also used in the field of requirements engineering e.g., for

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choosing needed information and communication technology to implement a company's current business model into practice [16].

The business model concept has already been addressed in literature in 1957 by Bellmann et al. [17] as well as in the 1960s by Jones [18]. Since the internet boom in the late 1990s however, the business model concept gains importance ever since [1].

In this paper, the consideration of dynamic factors plays an important role. For this reason, existing interrelations between a company's business model and its underlying business processes have to be taken into consideration in order to learn from business processes. The following sub-section gives an overview on the basic aspects about business processes.

B. Business Processes and the Software Value Chain

As already shown in the previous sub-section, business models provide a view on aspects about value creation within the enterprise [13]. In contrast to business models, business processes represent a chain of logically related activities that have to be carried out within a certain order [19]. Thereby, the consideration of organizational aspects also plays a significant role [20]. Another definition describes business processes as several activities that provide a company's customers a certain value in form of an output by requiring several input factors [21].

To be able to measure the quality of a company's business model based on its underlying business processes and value chains, relevant KPIs have to be derived first. To define industry-specific KPIs, we have a strong focus on one distinct industry branch, named software industry. Figure 1 depicts the value chain of the software industry which has been derived by several empirical and literature studies [22].

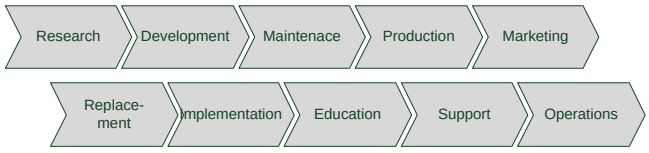

Figure 1. Value Chain of the Software Industry [23]

Software value chain activities serve for the identification of changes within the business processes of a software producing company that are caused by modifications on the underlying business model. A certain number of business processes is assigned to each activity in the value chain activity diagram. This means several related business processes are merged within one single value chain activity. If certain business processes are modified by external or internal influencing factors, these changes have a significant influence on the corresponding value chain activity. In the following, the above mentioned value chain activities will be described:

- Research: The conceptualization of a first vision of a product, fundamental research and first feasibility studies [24].
- Development: The core activities of a software producing company (e.g., requirement analysis, software design, software development, technical documentation, verification and validation). It refers to the process of software development.
- Maintenance: The continuous supervision of all required production facilities. Thus, "Maintenance" is responsible for the quality of the manufactured software products.
- Production: Encompasses product composition, production and packaging. This activity is mainly characterized by a physical reference.
- Marketing: This software value chain activity 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 [25]."
- Replacement: This activity includes the decision whether an existing system will be replaced by an alternative system [26].
- Implementation: Encompasses the installation, configuration and adaptation of a specific software product [24]
- Education: 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 [24][26].
- Operations: Comprise the monitoring within the accomplishment of specific software product by an information system [24][27]. To avoid damages caused by data loss, backups have to be carried out and releases have to be continuously actualized.

The following section gives an overview about the existing relationships and dependencies between business model layer and the level of business processes, encompassing the presented value chain.

C. Interdependencies between business models and business processes

Business Models are often described as a mediator between a company's strategy and its business processes [28]. These interrelations are depicted in Figure 2 and form the basis for the conduction of the expert interviews that are presented in the following section:

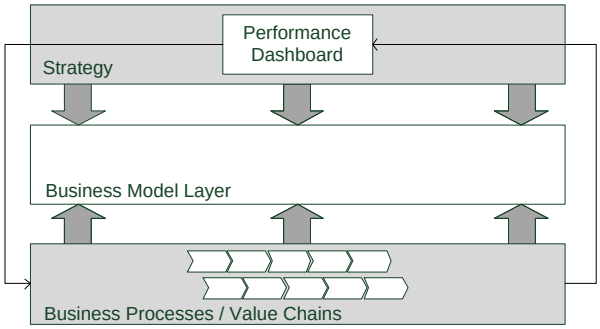

Figure 2. Intedependencies between strategy, business models and business processes [3]

Especially the connection between a company's strategy and its business processes shows that business model analysis should not only be conducted top-down but also bottom-up, beginning from business process level. The main focus of this paper is in analyzing the interrelations between business models and the layer of business processes. Therefore, relevant KPIs for each value chain activity are needed, which serve as feedback parameter for the underlying business model. This means, a continuous feedback loop arises which is essential for business model adaptability. Hence, business models gain flexibility which is needed for the adaptation to influencing factors (e.g., market developments or changing prices).

III. CONDUCTION OF THE INTERVIEWS

In this section, the conduction of the interviews with experts from the software industry is described. First, the scientific goal of the expert interviews is described, followed by an explanation of the results and implications for business model research.

A. Methodology

As already shown in the previous sections, existing interdependencies between business models and business processes are a so far an understudied area of high practical relevance [3]. The bottom-up perspective has not been analyzed in literature and practice so far. Hence, to gain insights in how companies shape and implement this feedback mechanism in practice, an empirical study within the software industry has been conducted. We employ an explorative study design that follows the ideas of grounded theory [29]. This inductive approach "means to start with individual cases, incidents or experiences and develop progressively more abstract conceptual categories to synthesize, to explain and to understand [the] data and to identify patterned relationships within it." [30]

The data for the study was collected in semi-open interviews with experts from different software companies and areas of expertise. In total, 13 interviews of 30 to 90 minutes length each have been conducted. Interviewees were selected based on two guiding principles. First, the overall composition of companies in the sample should be as broad as possible – both in terms of company size and field of business. This principle aimed at ensuring generalizability of the results for the entire software industry. Second, the experts contacted should have deep insights into the area of interest in order to be able to structure the concrete field of action logically and precisely. Consequently, we identified interviewees whose daily business is located between management and reporting, at the border between operations and strategy. Following the second principle also entailed a specialization of knowledge: most interviewees surveyed for the empirical study were experts covering a small part of the value chain only.

B. KPI Usage in Software Enterprises

The most diverse perceptions about the constitutional definition and evaluation of software specific KPIs are present in the companies surveyed. Even within bigger enterprises, there is a discrepancy in KPI usage depending on the respective value chain activity.

Many interviewees have significant problems in connecting their collected KPIs to their business models. Another noticeable aspect is that many software firms are not able to assign relevant KPIs to each activity in the software value chain because they 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, if KPIs are measured, this is predominantly done on a regular basis.

In the analysis of the interviews, two paths / characteristics to classify the usage of process KPIs in enterprises emerged. On one hand, there is the maturity and elaboration of performance measurement systems as a basis for the definition, measurement, monitoring and tracking of KPIs. Several companies already set up such a measurement system, some are about to conceptualize such a system, but others are not covered by any data collection mechanism concerning process KPIs. Based on the experts' descriptions, the maturity of their performance measurement systems can be broken down to a number of criteria. They include:

- the existence of a KPI measurement system,
- whether the system is completely set up and KPIs are defined,
- if the defined KPIs are automatically measurable and
- how distinctive the institutionalization of the measurement is

Some companies establish particular units for setting up a performance measurement system that interacts with all sub-activities of the generic software value chain.

On the other hand, there were many different perceptions concerning the importance of process KPIs for strategic decisions and the strategic orientation on those performance measurement systems. This characteristic can also be broken into three criteria to classify the companies' positions:

- first, there is the general awareness of the connection between process KPIs, and the business model,
- second, the perceived importance of such a performance measurement system for strategic decisions,
- as a third criterion, companies were asked to give examples for past strategic adjustments in their business model caused by certain developments of process KPIs

The evaluation of the experts' interviews highlights the very diverse KPI usage in software enterprises. These differences can be the result of the different company sizes, the products' nature or the respective business models, besides the general attitude towards the usage of process KPIs for strategic decisions.

C. Exemplarily KPIs

During the interviews, it was difficult for the experts to ad hoc establish a link between KPIs monitoring the processes of their respective value chain activity and the related business model elements. In order to lead them to the

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actual research question, they were at first asked to list as many process KPIs as possible. Favored by the classification of the experts into the software value chain's activities, it is logical to also subsume the key measurements presented by them in this manner. As already mentioned in the previous section, most KPIs were presented within the activities holding high user and customer contact, such as marketing and support. In contrast, activities such as research, production and implementation are not represented by many key measures. This tendency however can also be due to the few questioned enterprises.

The collected KPIs can be found in Table 1. Most of the KPIs are hard KPIs, as they can be easily described in numbers (e.g., number of bugs, business contacts, fixes, and open/closed tickets are hard KPIs). In contrast, soft KPIs (e.g., customer satisfaction), do not occur as countable units, but can also be translated into numbers to make them comparable. Other categorizations can be time, differentiating into non time-related and time-related KPIs, such as implementation time and time for user training, or permanently and irregularly monitored KPIs.

TABLE 1. RESULTS OF THE EXPERT INTERVIEWS

Value Chain Activity	**Named KPIs by the interviewees**
Research	• Rated Feature Requests • Elaboration Time
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 • Number of rescheduled milestones • Log in time • Number of accesses to shop • Social contacts (number of sent Mails, interactions between friends)
Maintenance	• Number of Customer Complaints • Number of Bugs • Implementation Time • Number of Implementation Inquiries • Time Units for Definition and Test • Product Quality • Developers per Software Project
Production	• Completion time
Marketing	• Sales Growth • Brand Awareness Level • Number of Business Contacts • Effort per Marketing Activity • Revenue per Marketing Activity • Conversion Rate • Number of contacts/potential customers (after marketing campaigns, presentations, monthly) • Participants/Customers per contact • Customer Acquisition Rate (Sign up numbers: number of users per time periods) • Log in numbers (concurrent user capacity, general log in frequency, time spent playing the online game, identified peaks of use) • Customer Churn Rate (Funnel for tracking user losses: taken burdens at payment procedure) • Payment behaviour (amount spent, time intervals)
Replacement	• Number of carried out Software Updates • Implementation time for the replacement of legacy systems
Implementation	• Time for implementation
Education	• Number of certified consultants • Time for user training • Number of trained people • Training portfolio
Support	• Number of fixes • Number of support calls (absolute/average/per employee/per customer/per transaction/per active installation) • Number of open/closed tickets (distribution per employee/time period) • Costs per solved ticket • Error rate (distribution of found bugs) • Customer satisfaction index (initial reaction time, response quality, accessibility, friendliness, competence, time to solution, technical comprehensibility) • Number of forwarded support calls (to development, maintenance) • Average Support carried out per employee • Escalation rate • Average Processing Time • Effort for Rework
Operations	• Number of Participants • Transactions per Time Unit • Data Volume per Time Unit • Employee Satisfaction Index • Number of developers per project • Response time

Table 1 shows that most interviewees were able to assign most KPIs to the value chain activities Development, Maintenance, Marketing, Support and Operations. The majority of the interviewees share the opinion that measuring KPIs according to the underlying value chain and business model can be an indicator for successfully adapting a company's business model. There is also a large consensus amongst the interviewees that research on business model adaptations based on KPIs is a highly relevant topic in future research. The results also show that, in practice, there is still no holistic and systematic approach of performance measurement within the software industry. This, however, represents a lack in research, as only a systematic evaluation of current events affecting a company' s business model gives decision makers adequate motivation for changing specific elements of their business model. The measurement of the aforementioned KPIs can be carried out by several performance measurement systems which enable to measure the quality of business processes and sending the collected information to a company's strategy. By this means, the

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collected KPIs can be used on strategic level to be matched to the building blocks of the underlying business model [31].

IV. CONCLUSIONS AND OUTLOOK

This paper contributes to the understanding of the existing interconnections between the business model and the layers of strategy and business processes. The state of the art analysis and the expert interviews have shown that, so far, there is no standardized framework in literature and practice that efficiently supports measuring KPIs from business processes on business models and vice versa. This aspect, however, is essential for enterprises to be able to analyze, define and adapt their current business model to internal or external environmental factors. In a next step, further analysis will be carried out to determine how these derived KPIs will influence decisions on business model adaptations.

The study revealed that there is a lack of practical tools and conceptual work that addresses a systematic link between business processes and business models. Thus, future work should have a strong focus on these interrelations. First research work addressing a formalized description of business models have already been addressed by deriving a business model framework which has also been formalized in an ontology [32].

This paper depicted relevant KPIs and value chains in the software industry. Future research should also focus on different industry branches. By this means, a conceptual framework for different industry branches can be derived, containing the most significant KPIs for business model adaptations. Another research question addresses on agile enterprise software which is capable to support the described feedback loop between business processes and business models.

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