

# Transformative Influence of Business Processes on the Business Model: Classifying the State of the Practice in the Software Industry

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## Abstract

*Fast changing business environments often force companies to rethink and renew their established business model. Often though, decisions to make changes to the current business model are made too late, when the current business is already struggling. One way to overcome this challenge is to continuously monitor business processes in operations and to adjust the business model according to changes in business processes. This paper clarifies the influence of business processes on the business model. Based on a literature review, expert interviews and inductive reasoning, we derive a classification framework for receiving new insights into the maturity of current KPI-systems and their strategic importance with regards to business model changes. While some companies consider the connection as so important that they set up sophisticated performance measurement systems, others rely much less on process KPIs to initiate business model changes. Investigating these differences marks a promising starting point for future research.*

## 1. Introduction

A rapidly changing economy drives enterprises to continuously reconsider and adjust their business model (BM). More than other industries, the software sector is facing a fast changing and highly dynamic business environment induced by continuously evolving technologies and rapidly changing customer needs [1]. Often though, decisions to modify the current BM are made way too late, when the current business is already struggling [2]. One way to overcome this challenge is to consider dynamic factors by continuously monitoring business processes (BPs) in operations and to adjust the BM

according to changes in BPs [3]. We take the bottom-up perspective from BPs to the BM and attempt to identify and track relevant feedback parameters in order to clarify the connection.

This paper takes two steps towards the clarification of the influence of BPs on BMs based on interviews with 13 practitioners. First, we derive a classification framework for the analysis of BP influences on BMs within firms. The framework depicts a firm's performance measurement system maturity and the system's strategic importance for BM adjustments. Second, we apply the proposed framework to the interviewees' firms. The results indicate that not all firms see their BPs as a valuable source of influences on their BMs, while others exploit this source actively. Researchers will find the framework useful as a tool for BP/BM analysis. Practitioners are urged to gain awareness of possible influences from BPs on their BMs. For them, we further provide some advice on how to exploit their BPs for BM improvement.

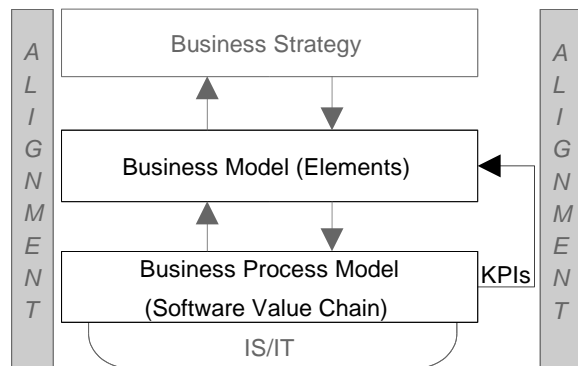
The influence of BPs on BMs under study relates to the research field of enterprise architecture (EA), which aims at modeling a firm's most important artifacts and their mutual interdependencies. In 2008, Aier, et al. [4] provided a systematic state of the art review covering related literature and findings from entrepreneurial praxis. Although a lot of research has been done in this area, they show that publications follow diverse perspectives. To differentiate and classify the various approaches, Winter and Fischer [5] propose an analysis framework. It disaggregates the EA into five layers: Strategy, Organization, Integration, Software/Data, and IT-Infrastructure. Surprisingly, Aier et al. [4] conclude that elements on the strategy layer are only addressed by few researchers [6], [7]. The influence of BPs on BMs and strategy has been strongly neglected so far.

The structure of this paper is as follows. Section 2 sets the frame of this paper by providing a background on the interdependencies of BMs and BPs. Also the concepts of the BM (2.1.) and the software value chain

(2.2) will be presented, which serve as an orientation for the conducted exploratory study. The last subchapter of section 2 presents a short introduction to performance measurement in the software industry (2.3.). In section 3, we present the empirical study including its explorative setup and procedure (3.1.) as well as the data analysis (3.2.). The results of our undertaking are presented in section 4. In that chapter we illustrate the classification framework which categorizes the results based on the maturity level of the performance measurement systems and the strategic importance of KPIs for the BM. Our findings are further discussed in section 5, before we conclude our work and propose starting points for future research in section 6.

## 2. Business models and business processes

As a foundation for our study and to position the to-be-developed classification framework, three research streams need to be considered. First, we view the BM concept as a mediating layer between strategy and processes (cp. [8], [9]). Second, we use the value chain concept as a coarse grained abstraction of BPs. Finally, key performance indicators (KPIs) are seen as process performance measures which transmit bottom-up feedback from the process layer back to the BM layer (see Figure 1). While our study focuses on this particular link, it is important to understand the interdependencies of the full picture in detail.



**Figure 1: Layers of business modeling and their interdependencies (adapted from [8])**

Conceptually, BMs subsume the actions of an enterprise concerning the creation of value, whereas BPs encompass the concrete process implementation of a scenario which can be explained by the production of an output by the use of several input factors [3], [10–12]. Hence, the design of BPs generally is supposed to begin with the determination of the company’s BM and its strategic goals. By

starting from the top, a clear understanding about the aspects to be modeled can be gained, as modifications within the BM cause changes within the underlying BPs [13], [14]. BMs in this top-down perspective provide a sense to BPs by explaining the way the processes have to be carried out.

A BP represents a chain of coherent activities which have to be carried out in a certain logical order [15], thus implying a strong relation to organizational aspects [13]. Another definition describes BPs as a certain amount of activities that have to be carried out to deliver a specific value in form of an output to a company’s customers by use of several input factors [11]. Furthermore, a dynamic relationship between BPs and their underlying IT systems exists, which has to be taken into consideration [16]. The BP model contains an implementation of a concrete scenario into BPs [17].

Considering these diverse aspects covered by a company’s BPs, they can also be perceived as an expressive unit of analysis in the context of organizational realignments. Helpful information for the conceptualization of BMs and BM adaptations can be gathered from BPs. This viewpoint provides a second, bottom-up perspective to the relationship between BPs and BMs. In a nutshell, BMs and BPs are hence characterized by a continuous mutual alignment and permanent optimization of both layers.

Figure 1 illustrates the connection between BPs, BMs and a firm’s strategy. The BM as a mediator between strategy and BPs impacts both. Inversely, changes within a firm’s strategy and within its relevant BPs both have an effect on the BM. For this reason, BM analysis should not only be conducted top-down, but also bottom-up, beginning from the BP layer. In doing so, implications caused by external or internal process 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 BM to meet countermeasures. Moreover, enterprises must be able to measure and monitor the quality of their (adapted) BM.

Once key measures for each BM element are defined, a new kind of BM adaptability can be reached through an automatic propagation of change events across model layers. Thus, an evolutionary dynamics support can be realized by defining rule sets to define adaptation measures or to provide the relevant data basis for subsequent recommendations and analysis [3].

With this background set, we focus the following sections on describing the three concepts relevant to our study. We review BMs, BPs, and KPIs in the context of the software industry and in their concrete conceptualizations used for our study.

## 2.1. Business models

The concept of BMs can be considered a rather young field of research. Most research was published in the past decade, a time period associated with the digital economy [18]. However, a lack of consensus can be identified with respect to a BM's constituting elements. While each of the BM conceptualizations has its particular focus and merits, our work requires a representation that supports our research goal. To analyze the transformative influence of BPs on the BM in the software industry, the concept needs to be specific to the industry and it should be feasible to be applied by the interviewed practitioners.

The conceptualization put forth in [19] fulfills these criteria. We hence base our further work on this BM concept. It consists of 25 elements that are specific to the software industry and its applicability to various software firms has been demonstrated. As the nature of the concept is very specific, by providing choice options for each element, it can be used to explain to the interviewees what a BM is and what a change thereof means.

## 2.2. Software industry value chain

A firm's value chain, as a coarse grained abstraction of BPs, defines the activities which are combined in processes in order to deliver value to the customer. In [20], a value chain specific to software firms, which is independent of particular characteristics like size or product type, is proposed. We briefly summarize it in the following.

The software value chain has been derived in multiple steps: First, a broad literature review was conducted and the value chain defined. Next, 15 expert interviews were conducted, asking them to depict their make or buy strategies based on the given framework. These interviews made some conceptual weaknesses apparent, such as too coarse-grained activities or unnecessary activities. The original value chain was thus modified and 12 additional expert interviews were conducted in order to evaluate the comprehensiveness of the activities. Furthermore, the experts were asked some economic properties of the activities in order to comply with the requirement of different economics of activities [21]. The resulting value chain consists of 10 activities:

*Research* comprises: A product vision is developed and fundamental algorithms are researched. Major technologies and subsystems are selected. A first proof of concept is provided through a prototype or analysis of algorithms, technologies and subsystems. The result is a product idea, algorithm or proof of concept.

*Development* comprises the actual software development process. Based on requirements, a software design is created. The entire system is decomposed into subsystems. Subsystems are programmed and tested separately, before they are integrated and tested as a combined system. The user documentation is created and the product is compiled to an executable and versioned product. The result is an executable version of the product.

*Maintenance* is similar to development, but the focus is on bug fixing and enhancing an existing product, whereas the activity development aims at the creation of a new product. Within maintenance, disruptive changes are not allowed. Instead, incremental changes are made by the producer to an existing product in the marketplace.

*Production:* Software and respective documentation are bundled to one package. The assembled software package is printed to a physical medium and the documentation is printed on paper. In packaging the physical product artifacts are packaged in a physical package. The result is a product with all attributed artifacts, which is ready for shipment.

*Marketing:* Providing a means by which buyers can purchase the product and inducing them to do so, such as sales and promotion. The result is the readily marketed product in the marketplace, such that potential customers are aware of the product and the product is available for purchase.

*Replacement* deals with the decision if the product (once it becomes outdated and reaches the end of its lifecycle) shall be replaced by an alternative system. If the decision for an alternative is made, data needs to be migrated from the legacy to the new system. Subsequently, the legacy system is shut-down. A seamless transition to the new system is the main target at this stage. After the irrevocable data destruction of confidential information, the shut-down activity is completed.

*Installation* comprises the transmission of the packaged binaries to the customer's information system. Moreover, it ensures that the binaries can be executed without runtime errors. Configuration allows the setting of software parameters and software modifications according to the customer's needs. Finally, adaptations can be performed that modify or enhance the functionality of the software product and employ BP changes.

*Training* is aimed at users and third party firms. In addition, certifications attest users and third party firms a certain degree of seniority in the handling of a software product.

*Support* can be differentiated in primary and development support. While the first sub-activity deals

with the support of users, the second activity relies on deep technical knowledge and implies code reviews.

*Operation* ensures the execution and management of a product on an information system during actual usage by customers. By monitoring, the system behavior can be analyzed and supervised. To minimize damages through data loss, regular data back-ups need to be planned, run, and administered. Finally, the information system needs to be upgraded to new releases during its lifecycle.

### **2.3. Performance measurement in the software industry**

As introduced in the previous sections, BMs guide the design of a company's underlying BPs. However, there is a need to monitor a BM's quality continuously by analyzing the performance of its underlying BPs. Therefore, relevant feedback parameters must be defined that allow enterprises to receive, for each element of their BM, feedback about its current state. Such feedback parameters are KPIs, which are measures of a firm's particular processes and activities [22–24]. Within the enterprise, KPIs form the basis for performance measurement as they are able to measure the efficiency of an organizational unit to which specific target values are assigned. Performance measurement encompasses an approach for achieving an enhanced entrepreneurial efficiency regarding decision support and resource allocation by means of control, measurement and planning of the activities related to value creation. Hereby, performance measurement is adopted across layers beginning from the level of information systems and BPs to strategic level [25].

It should be considered that decisions about KPIs to be measured should be in accordance to a company's specific strategy [22]. Characteristics specific to KPIs include [26]:

- KPIs address a company's executive board and management.
- KPIs offer a precise reporting regarding the assignment of activities to employees.
- KPIs offer the assignment of responsibility to specific teams and divisions within the company.
- KPIs serve as motivation for adequate activities within the enterprise.

With regards to a company's strategy and BPs, KPIs establish a connection between both layers. They support enterprises in measuring the achievement of their strategic goals and the realization of their BMs into practice [27].

In practice, there already exist several performance measurement systems for the software industry, such as CMMI (Capability Maturity Model

Integration) and PMI Maturity Model. CMMI is characterized by a staged representation, consisting of five levels of process maturity [28]. For each of these levels, specific KPIs are assigned bottom-up, beginning from process level. Process KPIs within CMMI include the "ability to remove defects", "costs of defect removal" or "process capability & maturity". These KPIs have a strong focus on the intrinsic view of the software product, i.e. they are used to assess the quality of the software development process and the software product. There is, however, no link to the actual business needs of the software customers in such metrics. Other KPIs have to be considered to interlink BPs with both strategic goals and the components of a BM for the software industry.

One further performance model referring to EA is the EA Performance Reference Model of the Federal Enterprise Architecture. It enables companies to link their strategy and their goals to the underlying process KPIs. The main focus of this framework, however, is on aspects about modeling and strategic alignment. A positioning of companies within a certain industry branch according to their maturity of performance measurement and resulting implications on strategy and on BM level is not offered within this reference model [29].

## **3. Empirical study**

### **3.1. Setup of the study**

As the review in section two showed, interdependencies between BMs and BPs are a so far understudied area of potentially high practical relevance. The bottom-up perspective – that is, the feedback loop from the BP back to the BM layer – has rarely been studied and KPIs that transmit process feedback up to the BM level are not conceptualized. Hence, to gain insights as to how software companies shape and implement this feedback mechanism in practice, an empirical study was conducted.

Due to the lack of existing theory in the area of interest, we employed an explorative case study design [30], [31] that follows the ideas of grounded theory [32]. 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" [33].

The cases in our study comprised software companies from different fields of business in the software industry (from network to gaming) and of different sizes (from 20 employees to several thousand). The data was collected in semi-open telephone and face-to-face 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 [34]. 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 study were experts covering parts of the value chain and were able to share deep insights into processes and feedback mechanisms in their specific area.

The left part of Table 1 presents an overview of the interviews conducted, including a classification of the companies as well as the corresponding expert’s position and area of expertise as part of the generic software industry value chain.

A guideline-based and only partly standardized interview guide was developed for the purpose of the study. The semi-open design was chosen in line with the intention of the study to break new ground and to gain new insights into the usage of process KPIs to influence strategic decisions. Personal semi-

structured interviews offer room for in-depth questions where strict questionnaires do not discover further detail and allow shortening too detailed enquiries where no more knowledge on the expert’s side can be reached. There is, however, still enough structure given to ensure a certain extent of comparability [35]. The interview guide included an introduction to the topic, the aim of the study, a mix of open and closed questions and a concluding evaluation of the topic’s relevance in practice. The main part of the introduction was devoted to the software industry BM and value chain concepts, to give the interviewee an understanding of the theoretical frame of the study. Subsequently, the expert was asked to classify his own field of expertise into the value chain’s set of ten activities. For each of the activities indicated by the expert, the same set of questions was asked with regards to KPIs and their monitoring, connections to BM elements and past examples for strategic decisions based on KPI evaluations. The experts’ personal appraisal of the topic was surveyed, also in the context of their company.

### 3.2. Data analysis and rating scheme

The derivation of qualitative data out of the interviews was guided by the suggested approach of Meuser and Nagel [34]. The recorded interviews were first transcribed verbatim. Subsequently, they were paraphrased in a non-selective manner and marked up with headings to avoid too early classification of the data. Finally, the paraphrased passages were

**Table 1: Overview of interviews and matrix ratings**

No.	Company size	Field of Business	Expert’s Position	Value Chain Areas Covered										Rating Matrix			Field in Classification Framework					
				Research	Development	Maintenance	Production	Marketing	Replacement	Implementation	Education	Support	Operations	0 – Incomplete	1 – Initial	2 – Managed		3 – Defined	4 – Quantitatively managed	5 – Optimizing	0 – Not relevant	1 – General awareness
	<i>Determined by number of employees</i> <i>Small: &lt;50</i> <i>Medium: &lt;500</i> <i>Large: &gt;500</i>																					
1	Big	Enterprise Applications	Senior Process Officer									X	X								X	B
2	Big	On-demand Software	Operating Officer	X								X	X								X	D
3	Big	Enterprise Applications	Cross Development Productivity	X								X		X							X	B
4	Big	Enterprise Applications	COO, Primary Support									X					X				X	A
5	Medium	Gaming	Marketing Director				X								X						X	A
6	Small	Workflow Mgmt	Head of Customer Support							X		X							X			C
7	Big	Consulting	Consultant						X			X						X				C
8	Medium	Gaming	Interface Designer	X								X							X			C
9	Big	Business Infrastructure	Process Excellence Lead	X						X	X			X					X			D
10	Small	Network Services	Chief Executive Officer	X	X		X				X	X		X					X			C
11	Medium	E-Learning	QM Representative	X	X		X							X					X			D
12	Small	Communications	Regional Manager	X	X	X	X	X	X	X	X	X		X					X			C
13	Big	Enterprise Applications	Field Sales Representative				X							X					X			C

thematically compared, redundancies were redeemed and the aggregated data was theoretically generalized into categories of systemized results.

Following the goal of our study to develop a classification framework, particular attention was given to identify patterns that could serve as the starting point for the development of such a framework. Two characteristics to classify the usage of process KPIs in enterprises emerged over the course of data analysis. The first one is the maturity and elaboration of the case companies' performance measurement systems that are used for the definition, measurement, monitoring and tracking of KPIs. Several companies already set up a measurement system, some are about to conceptualize such a system, but others have not established any data collection mechanism concerning process KPIs. Secondly, we identified many different perceptions concerning the importance of process KPIs for strategic decisions as well as the strategic orientation on those performance measurement systems. To allow for an objective analysis and comparison of the cases, we found it worthwhile to develop a rating scheme for both characteristics. Based on the scheme and the case data, three of the authors rated the cases independently. Conflicts between ratings were discussed and jointly resolved subsequently [36]. With this approach, a framework to classify the usage of process KPIs in software enterprises could be developed and applied (see section 4).

The first characteristic, the maturity and elaboration of performance measurement systems, was operationalized by adapting the process improvement approach of the Capability Maturity Model Integration (CMMI) model. Since the levels 0 to 5 describe "each a layer for ongoing process improvement" [37], each level is based on the previous one, leading to an "ordinal scale for measuring the maturity". The characteristics of the CMMI maturity levels were translated to the maturity of performance measurement systems. Accordingly, six levels of system maturity were defined: incomplete, initial, managed, defined, quantitatively managed and optimizing. Other than the level 0 "incomplete", the "initial" stage (level 1) already involves the existence of a measurement system with just few defined KPIs; "managed" (level 2) additionally implies a certain routine with established process KPIs. The complete set up of a performance measurement system is subsumed under the "defined" level (3), whereas in "quantitatively managed" (level 4) the KPIs are measured in a more organized manner and in more detail. The maturity level "optimizing" (5), finally, indicates the

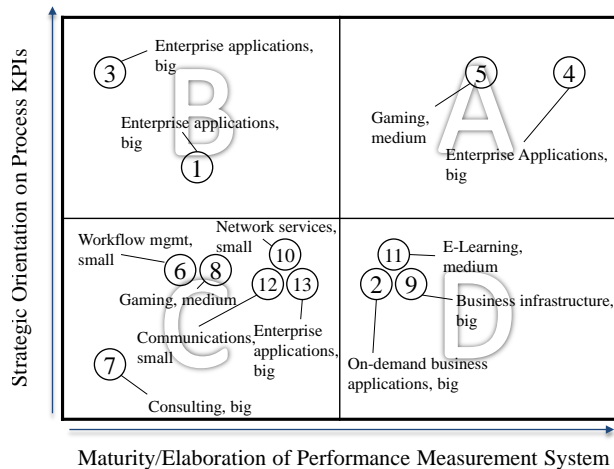
automatic measurement within the performance measurement system.

The second characteristic, the strategic orientation on process KPIs, was rated in a similar vein based on four self-developed consecutive levels. While level 0, "not relevant", indicates no awareness for the strategic relevance of process KPIs, level 1 was assigned if a general awareness of the connection between process KPIs and the BM became apparent from the case data. If the interviewee explicitly highlighted the perceived importance of such a performance measurement system for business model decisions, this was rated as level 2. Level 3, finally, was assigned if the companies were able to give concrete examples for past strategic adjustments in their BM caused by certain process KPIs.

## 4. Results

As first and foremost result of the study, it has to be noted that KPI usage in software enterprises is very fragmented. As the interviews showed, the most diverse perceptions about the constitutional definition and evaluation of software industry 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 the specific elements of their BMs. 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 BPs. 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.

To grade the investigated companies into groups of similar characteristics, both characteristics (the maturity of performance management systems as well as the strategic orientation on process KPIs) are rated as per the above framework (see right half of Table 1). A four field matrix is chosen to illustrate the firms' positions (Figure 2). The levels 0 to 2 of the maturity/elaboration of performance measurement systems are classified into the fields B and C, the levels 3 to 5 into the fields A and D. Accordingly, fields C and D include the levels 0 to 1 of the strategic orientation on process KPIs, the levels 2 and 3 can be found in the fields B and A.



**Figure 2: Classification framework with investigated companies**

Field A displays the most advanced users of performance measurement systems in the light of strategic decisions. Those companies possess a highly elaborated and complete KPI framework. Moreover, they put high importance on process KPIs that they monitor by means of their performance measurement system for business model decisions.

An online gaming company (interview 5), for instance, described its work as being highly KPI driven in the light of the fast changes in this relatively young branch. As example KPIs which induced changes in the BM the number of “game starts” as well as the “duration of game play” were mentioned. The reduction of these KPIs as early warning indicators for the loss of customers led the company to change their BM from a pay-to-play (subscription) model to a free-to-play model combined with micro transactions (that is, buying in-game items). With changing their BM, the company gained a huge customer base that now partly buys virtual items for very small amounts of cash. These items can be of only “cosmetic” character (e.g. a more beautiful sword or helmet) or act as “helpers” that support the players in their game play (e.g., gaining more energy in jump & run games or more horse powers for cars in racing games). This new BM is continuously monitored and optimized as well. While selling virtual items, each step of the buying process is now being tracked for dropout rates. The company discovered that most customers cancel the buying process when the credit card information is required. Therefore, the company now offers alternatives to buying items by credit card, namely to either fade in “walls of offers” from their partners (advertising model) as well as the option to earn virtual money by inviting friends to register

(incentive model). Referring to the software industry BM [19], BM elements in the field of the revenue dimension as well as the upstream dimension were changed.

The second example in field A is represented by the traditional on-premise area of a general business software company (interview 4). Taking a closer look at its processes in the support area, the respondent clarified that KPIs are organized in several dimensions such as customer satisfaction, report frequency per customer/productive installation and efficiency of the two previous points. The related KPIs are measured automatically and have already led to strategic adjustments in the BM. The primary support unit handles incoming requests, tickets and incidents of its customers. Process efficiency targets (the same level of customer satisfaction at the same or lower costs) led to the strategic decision to relocate support centers to low or mid cost locations. Due to efficiency KPIs, the customer support is no more necessarily organized in the customer’s respective country, but regional support centers have been set up. Relating to the BM concept [19], the downstream dimension and the usage dimension were affected by BM changes, namely the localization and the support model.

Field B comprises companies which consider the strategic orientation on process KPIs as very important in terms of their BM, but have not yet set up a structured performance measurement system or are about to.

A big enterprise application software company (interview 1) reported that frameworks such as process maps do exist and structure the company’s value chain into several activities that span multiple lines of business. The company aims at a “clean measurement of performance KPIs” as the basis for BM improvements, but their systems are not yet mature enough to track KPIs at an in-depth level. Still their goal is to improve their KPI system as it receives high attention in terms of strategy.

Another big enterprise application company (interview 3) provided similar feedback, but interestingly it already conducted strategic changes to their BM according to a rather high level process KPI, namely the “duration from idea to market”. In order to reduce this KPI the company decided to offer software not only to enterprises but also to consumers and started to launch applications for mobile devices which they are now able to bring to market much faster than their enterprise applications. By doing so, they made changes in their BM, namely the upstream, downstream as well as the revenue dimension (cp. [19]).

As displayed in Figure 2, many cases fall into field C. Those companies have not yet started to set up a performance measurement system or they are not even planning to do so in the near future as they do not link

process KPIs to possible adjustments in their BM. Some of the experts judge the whole topic of process KPI driven strategic decisions as “too academic” and “at most financial KPIs as being board relevant” (interview 10). Others consider the usage of additional non-financial KPIs to be too number oriented, disregarding content and quality. One of the interviewees working in support, for instance, does not regard the average number of solved tickets as very relevant. The employee utilization, which is determined by the number of open tickets, is the only KPI that they need to optimize the operational level (interview 6).

Field D, finally, contains companies that possess highly mature performance management systems, but do not consider them to have a highly strategic influence on their BM.

A specialized e-learning software company (interview 11), for instance, has introduced a system in which customers can enter bugs within their software. Subsequently, the number of bugs can be visualized to demonstrate developments and trends over time. These key measures are also seen as an indicator for fulfilled customer demands. By this means, a connection to the company’s customer satisfaction is drawn by connecting the “number of complaints” and the “number of bugs” to the perceived customer satisfaction. These KPIs, however, are only collected to set priorities in product development and have not led to any BM changes so far.

Another example for field D captures the on-demand area of a general business software company (interview 2). The rise of on-demand software allows software providers to track usage KPIs that were not available before. Therefore, companies in the on-demand area usually possess mature performance measurement systems. The development unit of the investigated company generates usage statistics of the on-demand application. More specifically, it tracks and evaluates which parts of the application are used by customers in their daily work and how intensively. These statistics influence marketing activities as well as priorities in product development. In detail, the company allocated more development and marketing resources in the field of their sales application, since the KPIs showed a lot of “traffic” in this part of their application. Now they are able to offer more sophisticated solutions and market these enhanced solutions accordingly.

## 5. Discussion

The evaluation of the expert 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 BMs, besides the interviewees’ general attitude towards the usage of process KPIs for strategic decisions.

The classification matrix (Figure 2) also displays the logical tendency that most companies are located on the diagonal of the four fields. That is, the maturity of the performance measurement systems is adapted to the strategic orientation on process KPIs. Those companies are found in the fields A and C of the matrix. Field A generally contains companies that feature a highly elaborated performance measurement system already established in their daily business as well as a significant strategic orientation on process KPIs. The high representation of experts working in areas with high customer and user contact stands out, as they essentially obtain their feedback through those process KPIs. Field C, in contrast, indicates little strategic orientation of process KPIs and, due to that, no elaborated performance measurement system in the company.

Overall, the fact that BPs can exert a transformative influence on the BM in reality cannot be disregarded. Three concrete cases (interview 3, 4 and 5) illustrated this point. These three examples highlight the diverse range of BM areas that are influenced by process KPIs, thus confirming the relevance of the proclaimed connection between the two layers [8] in practice. Most of the companies use KPIs to track processes and align their BM and BP layers accordingly. Yet, the connections are only partially formalized and hardly automated. Many companies track KPIs in specific areas only and do not possess a comprehensive performance measurement system.

Furthermore, from the interviews it became apparent that most interviewees could only overview just one particular value chain activity. This suggests that KPIs must be defined with detailed knowledge of one particular activity. Thus, when defining their KPI systems, firms should focus on those activities which are most important to them. The value added created by an activity is one possible measure to identify most relevant activities and a firm should bring experts from different value chain activities together.

The results do not provide us with any insights as to which of the four classes within our framework is the most favorable one. Whereas we avoid taking a normative perspective here, we do feel that field B can only be a temporary solution. There firms exploit their KPI systems for strategic choices. However, since the maturity of the systems is low, a firm should improve its KPI system’s maturity in order to provide a sophisticated ground for its strategic decisions.



## 6. Conclusions and Outlook

This paper clarifies the connection between BPs and BMs by taking the bottom-up perspective and investigating the influence of BPs on BMs. We present a framework that depicts a firm's KPI system maturity and its strategic importance. This framework is further used in interviews with practitioners from software firms. Our results indicate that some firms see their BPs as a valuable source for BM influences. However, most of the firms are not aware of such influences or do not attempt to exploit them. In general, it appears that the usage of performance measurement systems for strategic BM purposes is very diverse. We regard this as a promising ground for further research in the determinants of performance measurement systems' strategic usage.

To our best knowledge, the bottom-up link of BPs on BMs has not been subject to research. We provide first conceptual and empirical results for practice and research. The classification framework can serve as a starting point to achieve a thorough understanding of the bottom-up connection between BPs and BMs. Practitioners who attempt to exploit their KPI systems for strategic purposes need to position their systems between the two dimensions KPI system maturity and strategic importance. While the results do not allow for recommendations in general, we suggest that firms should take their value chain in consideration before implementing the bottom-up approach. We also suggest that firms actively exploiting BPs should reach a high maturity in their performance measurement systems.

Our study followed an explorative approach, providing first conceptual and empirical results. Naturally, it is subject to several limitations. The proposed framework is of descriptive nature without providing explanatory insights on a firm's BP/BM influences. The empirical results are based on a limited sample size of 13 interviews. Our further research will focus on conducting additional interviews, especially targeting interviewees on higher hierarchy levels in order to find out what determines the high diversity observed in this paper.

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