

# **Economic Assessment and Analysis of Compliance in Business Processes: A Systematic Literature Review and Research Agenda**

## **Full research paper**

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## **Abstract**

Businesses today are faced with the challenge of adapting processes to an increasing amount of compliance regulations. These expensive adjustments result in compliance management becoming an enormous cost driver. It seems all the more surprising that there is still a large research gap in terms of quantitative measures for assessing the efficiency of compliance in business processes. This challenge primarily motivates the topic of this paper, as an economic assessment of business process compliance (BPC) becomes increasingly relevant. Based on a systematic and rigorous literature review, this paper provides an overview of current research and thereupon investigates concepts to economic assessment of BPC with a focus on quantitative measures. The analysis shows that not all contributions dealt to the same extent with the economic assessment of BPC and that the resulting concepts cannot be strictly separated from one another.

**Keywords** Business process, Compliance, Economic assessment.

## 1 Introduction

Business processes that are performed in accordance with existing compliance requirements are understood as business process compliance (BPC) (Rinderle-Ma et al. 2008). Therefore, BPC involves the application of specific methods, i.e. analyses and controls, which are used to ensure compliance when focusing on business processes (Becker et al. 2012; Reichert and Weber 2012).

Corporate activities have been attached to the concept of compliance for a long time. The central trigger for this dates back to 2002, when the Sarbanes-Oxley Act (SOX) was passed (Becker et al. 2012; Fellmann and Zasada 2014). Therefore, companies today are faced with the challenge of adapting their entire business processes to the increasing amount of compliance regulations (Becker et al. 2012). These expensive adjustments make compliance management an enormous cost driver. Additionally, due to the complexity of information technology systems, the economic assessment of BPC becomes quite challenging (Kharbili et al. 2008; Kühnel et al. 2017). It seems all the more surprising that there is still a large research gap in terms of quantitative measures for assessing the efficiency of compliance in business processes (Sackmann et al. 2018). Thus, to serve this gap, an economic assessment of BPC becomes increasingly relevant which leads us to the following research questions (RQ):

RQ 1: Which concepts exist with regard to the economic assessment of BPC?

RQ 2: How do the concepts approach the economic assessment of BPC?

In order to answer our research questions, we conducted a structured literature review, which mainly consists of a literature search and a literature analysis. This review allows one to consider the current state of research (Reichert and Weber 2012). However, this review produces more than just an overview and generates new insights that have not been considered before (Fellmann and Zasada 2014). For the literature analysis, the fundamental components of the research framework are initially established by Cooper (1988), which enable a classification of the review (vom Brocke et al. 2009). Based on a systematic and rigorous literature review, this paper provides a current overview of the research field and thereupon investigates concepts for an economic assessment of BPC with the focus on quantitative measures. The resulting analysis synthesizes the approaches and examines their connections.

To answer the research questions the paper is structured as follows: in Chapter 2, the theoretical background of economic assessment in BPC is shortly presented. In Chapter 3, the research method is outlined by presenting the scope of the literature review, the search process, and the conceptualisation of the search results within a concept matrix. This matrix illustrates the scope of economic assessment concepts to BPC and, therefore, enables a discussion of the results. In Chapter 4, the concepts of the extracted contributions are analysed in more detail and reviewed critically by providing a research agenda in Chapter 5. The paper ends with a conclusion in Chapter 6, in which the content is summarized and an outlook for future research is presented.

## 2 Theoretical Background

As groundwork for further investigations of different concepts of economic assessment in BPC, we refer to the definitions of Fellmann and Zasada (2014). According to them, we state that scientific approaches of BPC develop methods to enable the use of compliance in business processes. Looking at the practical perspective, there are various technical aspects to consider which can lead to a number of challenges in the implementation of BPC. One of them is, e.g., the linguistic reconstruction of compliance requirements in a business process, since legal or self-imposed guidelines are usually not formulated in a way that they can be implemented directly into a business process. Another challenge involves the supervision of a process owner over its process. It must be possible for the process owner to intervene in a controlling manner in BPC in order to be able to coordinate changing compliance requirements (Rinderle-Ma et al. 2008).

These examples highlight the fact that BPC brings a wide range of challenges for an efficient implementation of compliance with it. As the number of compliance regulations grows, so does the demand for methods and techniques that automatically ensure the compliance status of business processes without or with less manual support. This seems to be necessary especially considering that with time the compliance requirements for the respective business processes and process levels are becoming more sophisticated (Reichert and Weber 2012; Rinderle-Ma et al. 2008). Refusing to adapt the high number of compliance requirements to a business process is not an appropriate option considering the added value of efficient BPC. Its implementation has a far-reaching advantage for the respective company: to the inside of a company, it offers the opportunity to identify risks and to initiate

appropriate countermeasures in a short period of time; to the outside, it creates a new basis of trust between the company and its stakeholders (Kharbili et al. 2008; Rinderle-Ma et al. 2008).

As already mentioned, there are various reasons that play a decisive role in the establishment of BPC. However, besides social and normative reasons, in this paper we only consider economic ones for the implementation of BPC. As every company is forced to act economically for reasons of competitiveness, this seems rather obvious. However, caution is required, since an economic assessment is not equivalent to monetary factors (Kühnel et al. 2017; Lehmann Nielsen and Parker 2012). As with other business areas, economic efficiency factors of compliance also relate to material parameters that are highly relevant to the productivity of a company. This is, for example, the case if certain plants or processes have to be shut down for a certain period of time due to an error in BPC. Although this has an impact on profitability, it cannot be expressed directly in monetary terms, but primarily in quantitative indicators (Lehmann Nielsen and Parker 2012). The same applies to the consequences of imprisonment as a result of compliance violations. Although the deprivation of freedom of an employee cannot be directly monetarily expressed, the resulting consequences (for example damage to reputation and therefore a possible loss of trust among corporate partners) usually have indirect consequences on the profitability of a company (Kühnel et al. 2017; Lehmann Nielsen and Parker 2012).

In the case of economic assessment itself, it sometimes proves to be complex in the field of information systems, which include BPC, due to the context of IT systems (Hirnle and Hess 2005). For this, efficiency and cost are relevant factors that determine whether a company's goals can be met without violating the respective compliance guidelines (Kharbili et al. 2008). This is where the maximum principle of the two 'Economic efficiency principles', which demands the highest possible result of an economic action (Wolff et al. 2008), becomes relevant. The minimum principle in turn applies to the cost factor. Operational performance should therefore aim to keep the costs of compliance management and its integration into the business process as low as possible. For a meaningful assessment of the cost-efficiency of BPC, it is therefore necessary to include all assignable financial benefits, all measures for achieving efficiency, and all assignable costs in the calculation (Kühnel et al. 2017). In addition, for an all-encompassing assessment, alternative business processes should also be assessed which, although aligned to the same goals, could lead to cost benefits (Kharbili et al. 2008).

To the best of our knowledge, there is no overview on concepts for an economic assessment of BPC. Thus, in the following we present an overview of the current state of research as well as a systematic literature analysis.

### **3 Research Method**

To ensure a rigorous and systematic literature review, we conducted the research mainly according to the 'Framework for literature reviewing' of vom Brocke et al. (2009). In phase 1 we define our scope of the literature review. For a better understanding, we brought forward the second phase of the framework and have presented the theoretical background already in Chapter 2. In phase 3 we illustrate the process of our literature search. In phase 4 we analyse and synthesise the selected literature and in phase 5 we derive our research agenda.

#### **3.1 Scope of the Literature Review**

In phase 1 of the literature review, we systematically determine the scope of our literature review. The six characteristics suggested by Cooper (1988) are used with the subdivided categories to classify the corresponding literature review, which is shown in Figure 1. The focus of the literature review (1) is to generate research outcomes, though there is no guarantee that there will be no overlaps with theories. The goal (2) is to integrate the content of past literature in order to identify main issues and to be able to derive conclusions from them. With regard to the perspective (3), an effort is made to present the content in a neutral way, although the possibility of complete neutrality is highly questionable. The coverage (4) represents a unique characteristic of literature analyses. We aim to make valid statements regarding the economic assessment of BPC. Although this requires an exhaustive literature search, the analysis is carried out with a selected number of contributions. The results of this literature analysis (5) are structured on the basis of a disciplinary classification and synthesis and thus use a conceptual organization. The paper should particularly address an audience (6) of specialized scholars, who already have previous knowledge in the area of IT compliance and BPC.

Characteristics	Categories			
1. Focus	Research Outcomes	Research Methods	Theories	Practices or Applications
2. Goal	Integration		Criticism	Identification of Central Issues
3. Perspective	Neutral Representation		Espousal of Position	
4. Coverage	Exhaustive	Exhaustive with Selective Criticism	Representative	Central or Pivotal
5. Organization	Historical		Conceptual	Methodological
6. Audience	Specialized Scholars	General Scholars	Practitioners or Policy Makers	General Public

Selected Category      Non-Selected Category

Figure 1. Scope of the literature review

### 3.2 Literature Search

Building on the findings of Cooper's taxonomy, phase 3 of the literature review was started and the literature search process was conducted, in order to find relevant literature on the economic assessment of BPC. The search frame of our literature analysis consists of a pure database search. For covering both the specific focus on information systems and the broader context of business and compliance, the search was conducted in databases that are suitable for IS research, leading to the selection of AIS Electronic Library, ScienceDirect, SpringerLink and IEEE Xplore Digital Library. The search terms were previously defined and resulted from significant combinations of the main topic of economic assessment in BPC. This enables the replication of the search. In all four databases, a dual combination of search terms was used, namely: <<"business process compliance" AND (metrics OR measure OR indicators OR assessment OR monitoring OR evaluation)>>. To achieve hits that focus on the economic assessment of BPC, the first try was to look for hits resulting from a title search only. In each of the databases used, this search produced either no hits at all or only very few. To increase the number of hits and still receive contributions with matching content, we conducted another search, where in the title we still searched for <<"business process compliance">>, whereby the search terms <<(metrics OR measure OR indicators OR assessment OR monitoring OR evaluation)>> were searched in all possible search fields. The results of this strategy were convincing and, thus, led to an application of the second search string.

To achieve the best possible replicability and scientific accuracy in this literature analysis, the definition of exclusion criteria, which decide on the selection of the final literature to be examined, is undeniably necessary. We excluded hits whose contributions (1) do not relate to economic content, (2) do not cover generally applicable assessment or control models, (3) predominantly present juridical or political content, and (4) predominantly present empirical analyses.

Finally, the literature search consisted of 6 steps, which are visualized in Figure 2. First, the database search was started and resulted in a total number of 89 hits as a basis for the initial selection. Therefore, all contributions were finally documented in a list, whereas the database, the authors, the title, the year of publication, and the place of publication were captured. As second step, one duplicate was identified and removed. The resulting contributions were used to start with the initial selection, using the exclusion criteria as step three. The first selection led to a reduction in contributions down to 32, which could now be further selected in the second review (step 4). In this, the abstracts of the remaining contributions were read by two researchers with expertise in the field and selected for further analysis. The same extraction criteria were applied and the number of contributions was reduced to 9. In the final review (step 5) the remaining contributions were extensively read as a whole in order to critically evaluate their content. This step serves as a final check to determine whether the content of the contributions corresponds to the topic of our literature review. As a result, one last contribution was excluded from the corpus of contributions with a result of 8 contributions.

As recommended by Webster and Watson (2002) and vom Brocke et al. (2009), in addition to the literature research already conducted, as the last step, a backward selection was carried out. The backward search expands the radius of the contributions examined and therefore ensures that as many relevant contributions as possible are included for the analysis of economic assessment in BPC. For this, the contributions mentioned in the literature references of the final 8 contributions were analysed in the same way as the literature search carried out previously. At the end, only 2 contributions were reviewed. One of them turned out to be unsuitable, so that only one further contribution emerged from the

backward selection and could be used for the analysis and synthesis of the research results. The final number resulting from the literature search was, thus, 9 contributions.

Year of publication															
'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	
1. Search Results															Hits
2	4	3	3	5	10	6	11	5	8	6	9	7	5	5	89
2. Duplicate Removal															▼
2	4	3	3	5	10	6	11	5	8	6	9	7	5	4	88
3. First Review															▼
0	1	1	1	1	6	2	2	1	6	1	3	4	1	2	32
4. Second Review															▼
0	0	1	1	0	1	0	0	1	1	0	1	2	1	0	9
5. Final Review															▼
0	0	1	1	0	1	0	0	0	1	0	1	2	1	0	8
6. Backward Selection															▼
0	0	1	2	0	1	0	0	0	1	0	1	2	1	0	9

Figure 2. Literature search process

## 4 Literature Analysis and Synthesis

In the analysis of the resulting contributions, an author-centric matrix was created and thereon transformed into a concept matrix. This step introduces the fourth phase of a structured literature analysis according to vom Brocke et al. (2009), in which the extracted results from the literature search are analysed and synthesized.

### 4.1 Development of an Author-centric and Concept matrix

An insightful literature analysis is guided by certain concepts during the evaluation of the research results. This is decisive for the further outline of our paper, since the final 8 contributions must first be structured. There exist a variety of possibilities for a scientific structuring of research results. For our paper we chose a combination of an author-centric matrix and a concept matrix. While the first is characterized by the summary of central findings of the analysed contributions, the latter assigns the scientific contributions to a defined concept (Webster and Watson 2002). Due to the concise derivation of key elements, the concept matrix presents a more effective method for gaining new insights in a research area (Templier and Paré 2015). In addition to collecting concepts relevant to the topic, the matrix also provides the basis for discussing these concepts in the further course of the literature review and for identifying research gaps (vom Brocke et al. 2009).

In the case of this paper we chose a combination of the two presented matrix forms, since the combination provides both a classification of the final literature and a conceptualization of economic assessment concepts. For this purpose, we will first develop an author-centric matrix, which is based on the categorization according to Schatz and Bashroush (2017). Finally, in order to connect the content across all the final contributions and to identify open research gaps (Müller-Bloch and Kranz 2015), the described concepts are linked to create a concept matrix (Webster and Watson 2002).

As previously mentioned, the development of an author-centric matrix is necessary for the subsequent conceptualization of economic assessment measures. (Schatz and Bashroush 2017). In this matrix, the contents of the analysed contributions are reduced to the most important findings. The developed author-centric matrix (Figure 3) can be found at the following URL: <https://cloud.uni-halle.de/s/YRxOLcqfgd43lXh>. As the economic concepts will be discussed later in more depth, a conceptualization of the contents of the contributions, originating from the author-centric matrix, is necessary. For this, the content components of the final contributions were grouped. This process shows how concepts of economic assessment in BPC can be elaborated and it also allows us to finally answer RQ 1 by presenting the resulting concepts in a concept matrix. Therefore, a detailed descriptive analysis

was used to link concept and contribution. The matrix (Figure 4) is fundamental for the subsequent discussion of the economic assessment of BPC.

Contributions	Concepts								
	1. Optimisation problem	2. Financial indicators	3. Process design	4. Compliance life cycle	5. Process patterns	6. Cost-efficiency	7. Business objectives	8. Compliance investments	9. IT and software deployment
Narendra et al. (2008)	x		x			x	x		x
Bhamidipaty et al. (2009)	x			x		x			x
Doganata and Curbera (2009)		x	x			x	x	x	x
Becker et al. (2011)			x		x				x
Alaküla and Matulevicius (2015)					x	x	x		x
Kühnel et al. (2017)		x	x			x	x	x	
Kühnel and Zasada (2018)			x		x	x			
Sackmann et al. (2018)				x		x			x
Kühnel et al. (2019)		x				x			x
<b>Σ</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>3</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>7</b>

Figure 4. Concept matrix

Regarding RQ 1 the concepts of economic assessment of BPC are the optimisation problem, financial indicators, process design, compliance life cycle, process patterns, cost-efficiency, business objectives, compliance investments as well as IT and software deployment.

## 4.2 Analysis of Concepts

To appropriately answer RQ 2 a detailed analysis and synthesis of the concepts is carried out across the entirety of the final contributions:

**1. Optimisation problem:** Narendra et al. (2008) and Bhamidipaty et al. (2009) are the only ones discussing the use of economic measures within a mathematical optimisation problem. In both contributions the problem is based on the similar two optimisation criteria for control points in compliance monitoring. One of them aims at minimising both the total cost of compliance assessment in a business process and the cost resulting from non-compliance. Regarding this business context, the costs of preventing compliance incidents are weighed against the possible costs of non-compliance and therefore allows cost-effectiveness. The second optimisation criterion strives to reduce the number of control points within a business process, as it assumes that only some of the control points can be monitored through the use of IT, making an additional costly manual check essential. In both contributions, the key challenge therefore is the critical selection of control points in BPC balancing the risk of non-compliance against a cost-effective compliance checking.

**2. Financial indicators:** In terms of indicators for the economic assessment of BPC, Kühnel et al. (2017) identified a potential use of financial indicators to quantify compliance risks. Typical indicators, such as the return on investment (ROI) or the net present value (NPV), enable a differentiated efficiency measurement of compliance activities. However, this requires a monetary representation of compliance risks and measures, whereby a generally valid statement on the monetisation of such risks cannot be given, therefore limiting the possibility of a quantitative efficiency measurement. Doganata and Curbera (2009) also referred to the ROI in order to determine which investments in compliance management are effective. For this to be beneficial, the ROI should be at least positive, i.e., the risk exposure should be reduced by at least the costs of compliance management. Finally, for the economic assessment of BPC, the use of financial indicators offers the significant advantage of quantification in BPC and thus an efficiency-oriented measurement. The challenge, however, is that their application depends on the existence of monetary data and that monetisation of compliance risks is not yet possible in an all-encompassing manner.

**3. Process design:** The concept of economic assessment by Becker et al. (2011) addressed an efficient integration of compliance in a business process. With the help of a model-driven approach, the high costs which primarily result from the initial investments are reduced in the implementation of business

process modelling and management. In the modelling of efficient BPC, the authors placed particularly high value on acceptance and compatibility with different modelling languages as well as on the possible integration of many different BPC requirements in a process. Kühnel et al. (2017) addressed the economic process design of BPC from a different perspective. They were guided by an iterative phase model for ensuring compliance, which is closely linked to the risk management process. To sum up, the concept of process design enables efficiency by flexible process modelling. However, a still present barrier is the efficient and automated identification and process mapping of relevant compliance requirements.

**4. Compliance life cycle:** In the analysis of Sackmann et al. (2018) the authors considered compliance management as a life cycle that is based on a PDCA cycle for implementing BPC. In this context, the assessment of a cost-effective compliance integration could be assigned to the last cycle phase, the 'optimisation phase'. However, due to the wide variety of cost-effectiveness, new concepts need to be developed within the optimisation phase for a more specific assignment. In addition, Bhamidipaty et al. (2009) also address the concept of Compliance life cycle as they suggest a three-step approach that consists of modelling a business process in accordance to its compliance requirements, measuring the results of optimal compliance auditing and analysing the results of the audit.

**5. Process patterns:** Among others, Kühnel and Zasada (2018) captured BPC using selected process patterns. To this, the researchers add the criteria of 'reliability' in the execution of compliance activities to the economic assessment. Thereby, reliability relates to the extent in which compliance damage can be prevented. Depending on the process pattern, the influence of reliability differs based on the course of a process, so that probabilities of occurrence for individual process steps must therefore also be considered. Based on the process patterns combined with the criteria of reliability and probability of occurrence, calculation formulas and variables are introduced, which make it possible to quantify compliance risks, the compliance damage that results in the case of damage, the costs of compliance measures and their economic benefits. Alakūla and Matulevicius (2015) were similarly addressing the use of process patterns by measuring the efficiency of BPC before and after the establishment of security patterns. These security patterns provide a generally applicable security solution to a recurring security risk which can be applied to the context of the process patterns and this paper. In both contributions, it becomes clear that the use of process patterns enables a simple, efficient, and structured implementation of BPC. However, the application is particularly suitable in cases where the use of alternative methods to ensure compliance would be possible and therefore the most cost-effective one has to be determined.

**6. Cost-efficiency:** Basic principles for measuring the cost-efficiency of BPC are the maximum and minimum principles (Kühnel et al. 2017). The minimum principle tries to achieve a certain result by using as few resources and costs as possible. Since, regardless of the resources used, it is never possible to completely prevent compliance damage, the maximum principle is also applied to optimise efficiency. It tries to achieve the best possible result from a selection of suitable compliance measures (Kühnel et al. 2017). Likewise, Kühnel and Zasada (2018) examined the cost-efficient management of BPC. As already indicated in the section on process patterns, the risk of a compliance breach can be quantified with the help of assumptions made in the form of variables and formulas. Doganata and Curbera (2009) addressed the measurement of cost-efficiency of BPC using a combinative control mechanism. It is based on both the use of an automated auditing tool and the implementation of manual auditing of business processes. To measure the efficiency of the dual mechanism, a budget target is set for implementation, which is used to identify the largest possible amount of non-compliance process steps. The process is considered efficient if, with the same budget, the number of non-compliance cases identified through the dual mechanism is higher than without the use of the auditing tool. Kühnel et al. (2019) also dealt with ensuring cost-efficiency in BPC, highlighting the need for a balance between preventive compliance costs and risk-aware BPC with possible financial damages resulting from non-compliance. The achievement of such a balance corresponds to an economic analysis, the complexity of which can be reduced with the help of software artefacts. These offer the advantage that, in the context of a process analysis, a good preparation of economic inefficiencies can contribute to simplified decision-making. In regard to the optimal control point selection, Bhamidipaty et al. (2009) also considered cost-efficiency, since excessive monitoring of compliance regulations quickly becomes a cost-intensive factor. On the other hand, the costs of non-compliance which can result from considering not enough control points must be carefully weighed up.

**7. Business objectives:** As efficient planning of compliance activities can help to prevent the deterioration of a company's competitive position; business objectives are generally also evaluated against their economic benchmarks (Kühnel et al. 2017). Doganata and Curbera (2009) follow the same logic and state that while the costs for reducing the risk of compliance damage are very high, the absence

of compliance brings even higher costs. As a result, the implementation of compliance management ensures a company's competitiveness in the long run.

**8. Compliance investments:** To determine the individual level of investment in a company's compliance management, Doganata and Curbera (2009) referred to the 'risk exposure factor'. The authors define 'risk exposure' as costs resulting from an external audit of process steps that are non-compliant. Kühnel et al. (2017) even went a step further and examined in detail correlations between compliance investments and financial returns from loss prevention. For this purpose, a regression analysis was carried out on the data of 200 companies with the result of 'multicollinearity'. Accordingly, no significant correlation could be found between individual variables of capital expenditure and the reduction of the financial loss potential, which may have its origin in the inaccurate and non-targeted documentation of compliance investments. Only by combining all compliance investments into one overall variable can a correlation to reduce compliance damages be identified. The causal identification of investments to reduce compliance-related damage therefore remains a major challenge.

**9. IT and software deployment:** The use of IT and software systems is a common concept for the economic assessment of BPC. However, some of the analysed contributions examined address this topic only marginally. Becker et al. (2011) covered the challenge of integrating compliance requirements into the clear and rigorous syntax of modelling languages. Sackmann et al. (2018) also addressed the possibilities for digitising compliance. However, Kühnel et al. (2019) as well as Doganata and Curbera (2009) primarily discussed the use of IT and software in BPC in an explicit manner. The latter emphasised that compliance control and the control of business processes, in terms of time and costs, are particularly expensive without the use of automated software. Kühnel et al. (2019) approached this issue by reducing the complexity of the economic assessment of BPC through the application of a software artefact whose implementation uses log files as a concise data interface that serves as the basis for economic assessment. The artefact reduces the cognitive effort in monitoring BPC and provides a good overview of the entire business processes and their economic inefficiencies. However, even these tools are not without errors. They are based on information from various process events in which errors can be hidden, leading to incorrect decisions.

## 5 Research Agenda

The research agenda is devoted to the fifth and final phase of vom Brocke et al.'s (2009) 'Framework for literature reviewing'. Thereby, the concepts of the economic assessment in BPC are critically examined in order to derive challenges of future research. For this, it is helpful to identify those concepts that are discussed less in current research. Such identification is accomplished by creating links between the contribution's concepts. As a result, it shows that certain aspects of economic assessment are only addressed by one or a few contributions and research gaps are identified. Concessions must be made at this point as it is not possible to do so to the same extent as in a literature analysis based on a concept matrix derived from another scientific contribution (Müller-Bloch and Kranz 2015). When taking a concrete look at the analysed concepts, the concept of optimisation problems is discussed quite extensively, however, this only happens by one contribution and only a few substantive links to other concepts are created. A similar situation can be found with the concept of compliance life cycle. It is also analysed by only one contribution. Moreover, the concept is extremely isolated from the other concepts and does not show many substantive links to them. This marks a clear appeal for future research.

During the synthesis of economic assessment concepts, it was also noted that not all contributions dealt exclusively with the assessment of BPC. Many of them also addressed other aspects in parallel to assessment: a few describe how an economic implementation or integration of BPC could be realised and a large number are dedicated to the economic management and design of BPC. Either way, the results and discussion show that it is not enough to focus solely on the assessment of BPC.

Further unresolved challenges resume from a brief resume of the discussed economic assessment concepts in Chapter 4. As part of the synthesis, the aspect of quantification and monetisation was addressed. This presents a great challenge with regard to many compliance penalties, such as deprivation of liberty, which cannot be directly presented in monetary terms (Kühnel and Zasada 2018). For this reason, academic work should continue to address this area of economic assessment in particular. The monetisation of positive effects of compliance measures has also often not been considered. However, a well-functioning BPC can lead to so-called 'upside risks', which ultimately lead to reputation improvements (Kühnel et al. 2017). In terms of monetisation, further research should be conducted on the progression of monetary damages in connection with the number, scope and type of compliance violation, since a linear progression of compliance risks with the number of damages does not seem suitable (Kühnel and Zasada 2018).



Another area requiring further research is the process design. A regular and detailed audit of compliance requirements is very costly. However, many process events, such as sending emails, still require exactly such a cost-intensive manual assessment due to, e.g. vague wording in the text. Thus, an automated application of auditing tools can lead to incorrect decisions, e.g. due to incomplete information in the analysed text (Doganata and Curbera 2009). This represents a decisive challenge, especially for the economic management of BPC, and therefore inevitably requires a more cost-efficient design of compliance auditing. The causal assignment of compliance measures and the results derived from them is another crucial task for the future. A more precise documentation of compliance expenses is essential in order to identify economic inefficiencies and, for example, to be able to fully exploit the potential of financial methods and indicators (Kühnel et al. 2017).

Last but not least, we would like to provide an additional outlook for further research in the field of BPC and point out that some researchers have also addressed the subject of non-economic assessment of compliance in business processes. Such studies could also have an influence on research into economic assessment in the future, since, as highlighted in this paper, any adherence to compliance requirements may have economic consequences (Kharbili et al. 2008; Kühnel et al. 2017). For instance, Varshney et al. (2008) describe a framework that enables process-oriented and objective modelling, assessment and interpretation of compliance in business processes. The authors focus on the degree of non-compliance and quantify it. A similar approach is taken by Shamsaei et al. (2010), who model and measure compliance of business processes by applying key performance indicators to individual compliance requirements. With the help of such indicators, components of a business process that do not meet the relevant compliance requirements can be highlighted and those requirements with a high impact on the fulfilment of business objectives can be identified. Ghanavati and Hulstijn (2015) address the partially open interpretation of compliance requirements and the associated challenge of finding the right path for implementation. For this, the authors develop a tool that can be used to support decision-making on the implementation of compliance by considering its effects on the business objectives.

## 6 Conclusion

Based on a growing number of technical requirements and legal regulations, BPC constitutes a significant cost driver for a company and makes an economic assessment of it highly necessary (Becker et al. 2012; Kharbili et al. 2008; Kühnel et al. 2017). In current literature, however, a large research gap regarding the holistic investigation of economic assessment concepts has been identified (Sackmann et al. 2018) motivating the research of our paper to identify and discuss the state of the art of concepts of the economic assessment of BPC. To achieve this goal, a structured and rigorous literature review based on a database search was conducted regarding the conceptualisation and synthesis of economic assessment in BPC. As a result, an author-centric matrix was created, which was transformed into a concept matrix. Finally, the results of the research were evaluated in a synthesis to elaborate their main characteristics. As a result, the synthesis proved that the listed concepts cannot be strictly separated in terms of content and often show strong references to one another.

This paper meets its objective to identify concepts of economic assessment of BPC with the help of a systematic literature analysis and therefore answers RQ 1 by listing the concepts resulting from the developed concept matrix. RQ 2 was answered by the analysis of the concepts and demonstrates that the concepts analysed are broadly diversified in terms of content.

This research provides a basis for further investigations in the research field, although it cannot be considered as a holistic investigation of the topic. However, it offers the opportunity to build on the newly gained findings, i.e. the resulting list of concepts of the literature analysis and synthesis. These findings offer the chance for a deeper understanding through further studies. For a clearer delimitation of the topic, more detailed search criteria could be set up for future literature analyses, which could be dedicated to a specific concept of economic assessment in BPC. In order to still achieve a high number of scientific contributions, a broader search frame would have to be set up, for example, by using a higher number of databases. Also, the development of a generally applicable concept matrix, e.g. in the form of a taxonomy, still represents a gap for research that could not be completely filled.

The result of our research provides a profound basis, which was created in this paper and is considered as a prerequisite for in-depth research work. Nevertheless, the synthesis of the concepts of economic assessment implies the need for further investigations as already pointed out in our research agenda.

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