Towards an Integration of GRC and BPM – Requirements Changes for Compliance Management Caused by Externally Induced Complexity Drivers

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Abstract. The paper discusses a selection of business challenges faced by organizations in context of integration between governance, risk, compliance and business process management. The focus is set on three complexity drivers for compliance, which are externally imposed on organizations by a business environment which itself is characterized by recent supervision system failures leading to major market crises as well as ongoing globalization. The examined complexity drivers are 1. heightened complexity of business processes with an increased number of process interfaces, 2. rising frequency of process changes and 3. a continuously growing amount of compliance regulations. A selection of fundamental research works is discussed to assess the visibility of the three complexity drivers, i.e. whether the authors show awareness of the selected complexity drivers implicitly or explicitly. The paper highlights a combined view on those three complexity drivers and, in consequence, derives requirements changes originating thereof for compliance management and modeling.

1 Introduction

The integrated view on Governance, Risk and Compliance (GRC) as an important concept to support the sustainability of modern organizations is gaining more and more attention in scientific research as well as business practice in recent years. A significant range of legislation has been established in this area, e.g. Sarbanes-Oxley, MiFID, Basel II, HIPAA and more. Current developments like extended financial market regulations through Basel III in the aftermath of the financial markets crisis and linked discussions in the media portend, that this trend will continue in the future.

The recent crisis revealed dramatic failures of supervisory and control functions as they are implemented today. Organizations nowadays face the challenge, that GRC efforts steadily become more complex and expensive across numerous industries. The

complexity of organizations and their business processes is continuously growing, for example due to extended cooperation with external parties, dissolution of organizational boundaries or outsourcing initiatives. Concurrently we perceive a significantly increased amount and diversity of laws, policies and regulations, which have to be adhered to by various kinds of organizations. Examples like the current case of the U.S. company Cignet Health demonstrate the potentially serious impact of non-compliance. Cignet was fined 4.3 million USD because they did not provide requested information to their customers in time and thus were failing HIPAA compliance requirements [1]. Due to these environmental changes, the requirements profile for the corporate GRC function has been altered in a way, which makes it necessary to support the existing compliance and risk management functions with new methods and solutions.

Within the current paper a selection of current business challenges is discussed, which organizations face in the context of integration between GRC and BPM. The focus is set on compliance aspects of the before mentioned integration, specifically on three complexity drivers which are externally imposed on organizations by a business environment as characterized above. For this purpose, the remainder of the paper is structured as follows: Subsequent to this introduction, the domain specific concepts and terminology as they are used for the paper are laid out in section 2. The authors identify a selection of significant complexity drivers for compliance management in section 3 and derive major gaps as well as challenges resulting from these. Building upon this a selection of fundamental research works in the field of compliance management and business process management integration is examined in section 4 to assess whether the three complexity drivers are considered in these papers. The visibility of the three complexity drivers is explored, i.e. whether the authors show awareness of the selected complexity drivers implicitly or explicitly, by mentioning them or by offering solutions to manage the respective complexities. An evaluation is performed to which extent a combined view on these complexity drivers for compliance management including resulting business challenges has already been explicitly discussed in the community so far and the results are put together in an overview. Based on their findings the authors present an outlook and potential for future research in this field in section 5.

2 Terminology

2.1 Governance, Risk and Compliance

As noted before, the term "Compliance" is often referred to as part of the triple "Governance, Risk and Compliance" (GRC) in recent discussion. Hereafter follows a condensed definition of these terms and further relevant concepts as they are understood in this paper. While the authors focus on compliance as one of the core concepts of GRC, it is considered useful to clarify the distinction between each of those terms as well as the links and dependencies between them.

According to Becht et al. the term "Corporate Governance" is derived from an analogy between the government of states and the governance of corporations [2]. It

describes a way of (good) responsible corporate management following all applicable legislation and generally accepted standards of diligent organizational management. Generally it can be described as a framework of policies and rules, which is applied to steer and manage an organization. Shleifer and Vishny emphasize on the shareholder perspective by observing that Coporate Governance "deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment."[3]

The term "risk" has been subject to comprehensive research in economic sciences. In their standard ISO 31000 (2009) the *International Organization for Standardization* defines risk as the "effect of uncertainty on objectives", where uncertainties include the potential occurrence of events and uncertainties caused by a lack of information or ambiguity. It has to be pointed out, that this definition includes both negative and positive impacts. Hence, for the current paper risk shall be interpreted as a potential deviation from a target, which was defined in a situation of incomplete information availability. Extending this, risk management shall be defined as structured process with the aim of achieving a unified and anticipating handling of risk in an organization [3]. This encompasses in the shape of an iterative risk management process specifically an assessment of risks as well as the implementation of detective, preventative and compensating controls for identified risks. During this process all identifiable risks should be reduced to a level which is consistent with the organizations individual risk appetite. In this case the result is considered economically efficient and the residual risks are accepted by responsible management.

Compliance is defined by Sadiq and Governatori as "ensuring that business processes, operations and practice are in accordance with a prescribed and/or agreed set of norms" [4]. As such it encompasses laws and regulatory requirements, organizational policies, internal codices and guidelines as well as ethical norms in all kinds of organizations. It is important to distinguish precisely between this meaning and the usage of the term "Compliance" in a medical/psychological context, where it refers to cooperative behavior of patients and adherence to therapy. This ambiguous usage of the term requires special attention and diligence in every related literature review. Compliance management (CM) in general denotes a process for enforcing compliance by taking suitable provisions. CM strives to ensure that an organization adheres to all relevant laws and policies. Its ultimate aim is to effectively and efficiently fulfill all external and internal regulations applicable in an organizations individual business context. Responsibility for this is generally assigned to senior management.

The three individual subjects "Governance", "Risk (Management)" and "Compliance" are often merged into an integrated concept "GRC" in recent literature. In their frame of research Racz and Weippl derive a comprehensive definition based on a literature review and an online expert survey:

"GRC is an integrated, holistic approach to organisation-wide governance, risk and compliance ensuring that an organisation acts ethically correct and in accordance with its risk appetite, internal policies and external regulations through the alignment of strategy, processes, technology and people, thereby improving efficiency and effectiveness." [5]

2.2 Business Process Management

According to a recent literature review on business process management performed by Houy et al. [6], a business process can be understood as a chronological sequence of activities to fulfill a business task during which a value is delivered by transformation of materials or information. Highlighting the element of client demand in accordance with Hammer and Champy [7], business processes can be defined as sequences of intra-organizational activities which are performed to satisfy the needs of customers. Business process management (BPM) denotes the corresponding management discipline comprising a set of methods, techniques and software tools to support the design, implementation, monitoring and analysis of operational business processes in order to facilitate an optimized value creation [8]. BPM can be applied by organizations as an instrument to retain or gain competitive advantages [9]. Current research activities support an evolutionary view, where BPM itself is conducted as an iterative process following a lifecycle model to facilitate continuous improvement of business processes [10].

2.3 Business Process Compliance (BPC)

Conceptually, business process compliance (BPC) denotes the execution of business processes in adherence to applicable internal and external regulations and as such represents an integrated view on business process management and compliance. Figure 1 illustrates the evolution of BPM and GRC integration towards BPC in recent years.
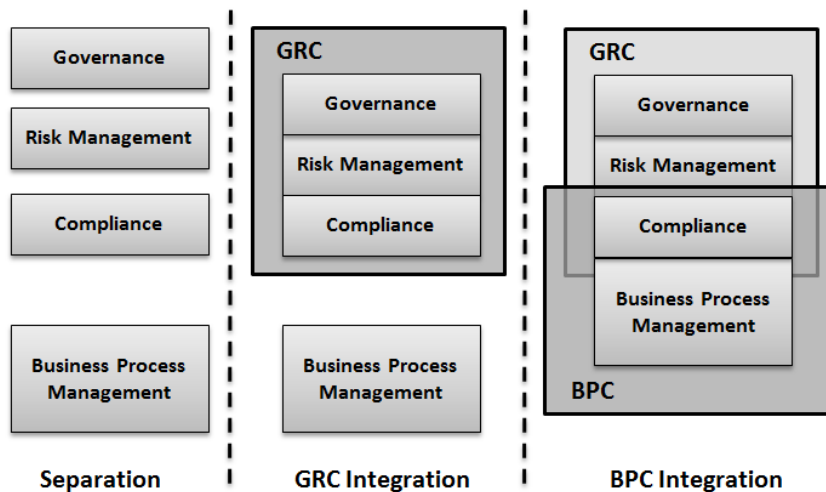

Figure 1: Evolution of BPM and GRC Integration

A classification given by Kharbili et al. [11] distinguishes between three general validation mechanisms for BPC: While the "design-time" approach utilizes validation of process models during the modeling phase to identify compliance conflicts, the "runtime" approach inspects via process monitoring individual process instances during execution in order to highlight potential discrepancies towards a predefined set of rules. "Backward" validation as the third concept follows a retrospective approach and uses data and process analysis methods to extract potential compliance violations ex post.

3 Requirement Changes for Compliance Management

Recent experiences revealed significant weaknesses in established systems for business supervision and control. Organizations face the challenge, that GRC efforts steadily become more complex and expensive. As this can be observed specifically in the area of compliance management, the following analysis will focus on this part. We will identify three significant changes to be observed in today's business and market environments, which lead to an unprecedented level of complexity for compliance management. It is important to note that while various other sources of complexity, e.g. ambiguous business language and regulation specifications, stem from compliance management inherently, the highlighted complexity drivers are externally imposed on compliance managers and need to be treated. Two of those are related to general changes in business processes, the third one is specifically linked to one of the core matters of compliance, i.e. regulations. First of all, the complexity of organizations and their business processes in general is continuously growing with advancing globalization being one major driver for this development [12]. Extended cooperation with external parties and intensified outsourcing initiatives entail a further dissolution of organizational boundaries. This trend together with other developments like a long-term growing rate of mergers and acquisitions [13] does not only result in tightened complexity of processes, it also brings forth a higher frequency of process changes. In financial institutions the average periodic cycle of process changes has dropped from 84 months to 6 months during the last 20 years [14]. Taking this into account, beside general process complexity an increased rate of process modifications constitutes a second significant change in the way business is conducted and needs to be appropriately reflected in compliance management. The higher the complexity of processes and the more volatile they are, the more difficult it becomes to fully capture such processes in a formal structure. Thus these developments implicitly lead to a growing share of semi-structured processes which have to be adequately treated from a compliance management perspective.

Concurrently with this rising process complexity we observe a significantly increased amount and diversity of laws, policies and regulations, which have to be adhered to by various kinds of organizations. To name a few notable examples of established regulation frameworks, Sarbanes-Oxley, MiFID, Basel II, HIPAA, and MaRisk can be mentioned and the trend continues with current developments addressing extended financial market regulation, e.g. Basel III. From the authors

perspective this growing plethora of legislation and internal guidelines marks a third significant source of additional complexity for compliance management in the future.

We recapitulate the three complexity drivers outlined before:

1. **Growing complexity of business processes**

2. **Increased rate of business process changes**

3. **Plethora of laws, regulations and policies**

These developments give an indication that the requirements profile for the corporate GRC function has changed in a way, which makes it necessary to bolster existing compliance and risk management functions with new methods and solutions.

To meet the changed requirements compliance management needs to become more efficient in practice. BPM methods and specifically process modeling could potentially be utilized to support this in various ways. Past experience in the rigorously regulated financial sector and discussions with practitioners confirm that in many companies those business units responsible for compliance and those responsible for business process management are traditionally separated from an organizational perspective. A loose coupling between these functions is often implemented in the context of new process setup and process modifications by requiring compliance department input or formal sign-offs for selected items. Furthermore there is a need to transfer knowledge about new compliance requirements from compliance specialists to those organizational units who ultimately are subject to the new requirements in an efficient way. In order to assess to which extent existing research and approaches to support compliance management with business process management methods already address the issues stated above, we analyze in the following chapter a selection of well-respected publications in this area. We will inspect whether the authors explicitly refer to changed requirements in compliance management and specifically to one or more of the three complexity drivers outlined before. If so, we will point out how those are treated in the respective publication.

4 Consideration of Requirements Changes in Related Work

4.1 Selected research publications

A keyword search in three major citation databases (Thomson Reuters Web of Knowledge, EBSCOhost, DBLP) for combinations of "business process management", "compliance", "risk management" and "governance" was performed. Based on the results a selection of fundamental research works in the field of compliance management and business process management integration (see table 1) has been examined to assess whether the three requirements changes emphasized on in chapter 3 are taken into account in these papers. For the evaluation (see table 1), visibility of the researchers awareness of the three selected complexity drivers constitutes the central criteria. A distinction is made between "explicit" discussion of

one or more of the selected complexity drivers and statements that are implicitly linked to a complexity driver. Explicit references are considered to demonstrate a stronger awareness of a complexity driver compared to implicitly supportive statements. The main focus is set on evaluating the authors awareness of the selected complexity drivers without the necessity to offer sophisticated solutions at this stage. We will investigate how complexity drivers and changed requirements for compliance management as laid out in section 3 are reflected and take a closer look on the implications suggested by the authors where applicable. Only such research work was selected, which was regularly referred to by other authors in the given domain, generally in the sections explaining theoretical foundations and notable research in the area of business process management and compliance. A focus was set on recent papers for those authors with various research contributions in the investigated field.

4.2 Awareness of Complexity Drivers and Changed Requirements

Governatori and Rotolo present in [15] a formal language to express regulatory constraints with the capability to model chains of reparational obligations. While the authors illustrate selected complexity drivers they encountered during their research they focus on aspects directly linked to formal modeling. The three externally induced requirements changed under review in this paper are not discussed.

In their work [16] Schumm et al. introduce the concept of "Compliance Fragments", denoting such parts of business processes, which serve to support compliance. They develop a rule language and utilize sub-graph matching techniques to extract and highlight or hide compliance relevant activities, e.g. validation and control steps. This method enables the authors to automatically generate process models with various grades of detail, denoted "Process Views". Schumm et al. consider Process Views an apt technique to tackle the increasing size of business processes. This supports our first statement of changed requirements due to risen process complexity. References to a quickening pace for process changes or a higher amount of applicable regulations are not stated in the latter contribution.

Ly et al. present in [17] with their SeaFlows Toolset a framework for compliance verification of process models. The authors enrich process models with a layer for compliance rules expressed in a graph-based specification language. Process structures are then validated against these rules implementing design-time compliance checking. Furthermore a data-aware compliance checking component is introduced to support validation of process instances at runtime. Ly et al. focus on the implementation of the SeaFlows prototype and the related requirements for (semi-) automated compliance verification. In this context they identify growing complexity of process models, which implicitly links to a growing complexity of processes themselves, as one of the main drivers for their efforts stating that increasing process model complexity necessitates automated compliance verification. They discuss the probability of process modifications over time briefly and argue in this context that solutions need to be developed, which allow for a swift assertion of compliance during and after process changes. The latter claim implicitly supports our second complexity driver ("Change Frequency"), as a higher rate of process changes implies more efficient ways of validating processes against all relevant regulation

frameworks. Still, none of the three examined complexity drivers is explicitly discussed by Ly et al. in the selected publication.

Already in 2007 Lu et al. [18] presented first concepts towards a quantitative approach for measuring compliance of business processes against a given set of control objectives. They point out that for the time being compliance is often considered a burden rather than an opportunity by companies and discuss the advantages of compliance-by-design concepts versus established retrospective reporting approaches as a potential way to alleviate this burden. The authors refer to a new set of challenges due to corporate scandals and new regulations, which implicitly aims towards the direction of requirements change no. 3 (regulation degree), but they do not further elaborate on this issue. Later Lu et al. describe the lack of sustainability as most serious drawback of established retrospective compliance approaches and highlight difficulties in adopting established compliance monitoring systems to changing legislatures. This statement supports the increasing relevance of business process change frequencies as a complexity driver. It can be stated, that the authors implicitly support two of the three changed requirements examined here, but none of these are covered explicitly in detail.

Kharbili et al. [11] performed a review on the state-of-the-art of business process compliance checking in 2008. They give an overview on approaches for design-time and run-time compliance checking - both subsumed as "forward compliance checking" due their preventive nature – as well as retrospective approaches denoted as "backward compliance checking". Although they acknowledge the relevance of formal modeling as proposed by many existing approaches, Kharbili et al. view the complexity of current solutions and prior knowledge necessary for users as a significant adoption barrier. While the authors do not elaborate explicitly on the three changed requirements examined here, they confirm a need to keep compliance costs reasonable while adapting to the complexity of ambiguous and continuously changing regulations combined with evolving business processes.

Zur Muehlen et al. [19] aim at a more strategic approach to compliance management and provide an analysis of the expressive power and representational capabilities of selected process and rule languages as well as combinations thereof. While increased process complexity or change frequencies are not covered the authors state in conformance with our changed requirement no. 3, that the pressure to adhere to a growing amount of regulations is a core driver for business demands directed towards advanced compliance management solutions.

In their *Methodical Framework for Aligning Business Processes and Regulatory Compliance* [4] Sadiq and Governatori emphasize on the challenge arising from continuously increasing obligations and regulatory requirements for organizations. This corresponds with changed requirement no. 3 concerning degree of regulation.

In a research report of the IBM Research Laboratory Liu et al. [20] present a static compliance checking framework for business process models. They propose an approach where in a first step business processes as well as compliance rules are modeled separately in a high-level language (BPEL and BSPL respectively). After this an automated transformation to lower-level formal specifications performed. The authors utilize Pi calculus and Finite State Machines for processes as well as Linear Temporal Logic for compliance rules. According to the authors the process specifications can then be verified against defined compliance rules, allowing for

efficient compliance checking of large process model repositories. In this context Liu et al. refer to growing process complexity and especially highlight a growing amount of regulations to be adhered to by organizations, which correlates to two of the changed requirements under review in this paper.

Becker et al. [21] present a design-time model checking approach to support business process compliance explicitly focusing on the financial sector. In their paper they refer to all of our three identified complexity drivers. The authors acknowledge a growing complexity of business processes. They point out a high frequency of business rule changes in the examined domain as one of the most prominent complexity drivers. For the financial sector as industry subject to their review the authors observe a high level of regulation with a trend to further growth in the future.

Publication	Year	Complexity Driver 1 "Process Complexity"	Complexity Driver 2 "Change Frequency"	Complexity Driver 3 "Degree of Regulation"	Overall Complexity Driver Awareness*
Governatori et al. [15]	2010	○	○	○	
Schumm et al. [16]	2010	◐	○	○	◐
Ly et al. [17]	2010	◐	◐	○	◐◐
Lu et al. [18]	2007	○	◐	◐	◐◐
Kharbili et al. [11]	2009	○	◐	◐	◐◐
Zur Muehlen / Indulska [19]	2007	○	○	●	●
Sadiq / Governatori [4]	2009	○	○	●	●
Liu et al. [20]	2007	◐	○	●	●◐
Becker et. al. [21]	2011	●	●	●	●●●

Complexity Driver Awareness: ● - yes   ◐ - implicit   ○ - no

Table 1: Awareness of Complexity Drivers in Selected Literature

As demonstrated above all of the three selected complexity drivers concerning integration of business process management and compliance are supported by leading authors in this field of research. Still, the analysis revealed that although the reviewed publications in many cases implicitly support the complexity drivers and resulting requirements changes stated here, a distinct awareness for them has rarely been articulated. An explicit consideration of all three changes together and hence an overall perspective on arising consequences could only be observed in the most recent 2011 publication by Becker et al.

These findings could trigger a broader discussion on the state of requirements engineering concerning the modeling of compliance obligations in context of business process management. After certain fundamental research has been performed in recent years on how compliance obligations can be modeled, one of the future challenges will be the question of economic efficiency of existing approaches, i.e. does the benefit derived from modeling compliance and following a certain approach overcompensate its costs. For this calculation not only setup costs (training, modeling etc.) but also operational costs (adjustments, maintenance etc.) must be taken into

account and potential alternatives up to ultimately not implementing measures for certain compliance regulations should be considered.

5 Conclusion and Outlook

In the given paper current challenges for GRC were laid out with a focus on aspects of compliance management. A need for enhancement of available solutions as well as development of new tools to cope with the continuously growing requirements concerning GRC in business practice was pinpointed. Three externally induced complexity drivers for business processes - namely growing complexity of business processes, frequent process changes and an increasing level of regulation – were examined in detail in a context of their implications on requirements changes for compliance management. A selection of leading publications in the area was reviewed in order to assess to which extent the mentioned external complexity drivers are reflected in current research. Though a partial, implicit coverage in certain publications could be elucidated a lack of distinct, express consideration of all three complexity drivers was perceived.
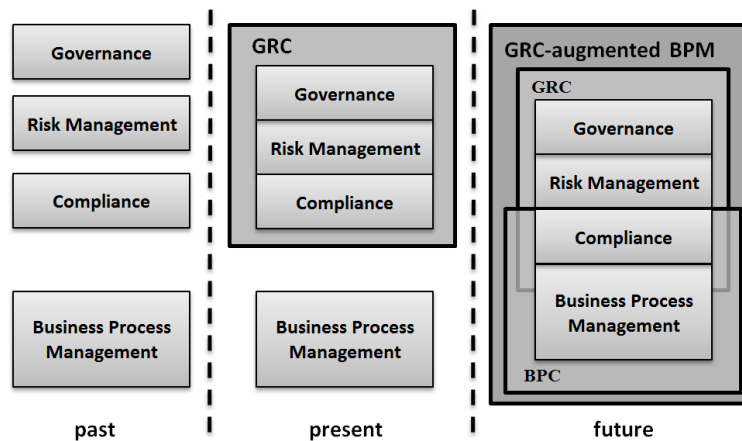

Figure 2: GRC-augmented BPM

Yet the combination of these complexity drivers implies changes in the requirements for compliance management and the approaches supporting it. They shift attention towards economic aspects and questions on how to implement compliance management efficiently. The prevalent concepts for modeling compliance have to be validated against these requirements. A tighter integration between GRC and BPM might offer potential for future progress in this area. While in the past both fields were treated separately by experts focusing on their individual disciplines we perceive a process of integration today. With BPC as execution of processes in adherence to applicable regulations an important integration step is on its way. Still, integration should not stop at this point, it might go further and cover the whole GRC domain. A

potential outcome could be a "GRC-augmented BPM" (see figure 2), where the individual building blocks mutually profit from each other. While in BPC processes are enhanced with compliance knowledge, established BPM concepts could be applied to improve compliance management vice versa. One might think of organizational aspects or the before mentioned considerations of economic efficiency here. Similar to the "time-to-market" concept for new products, a "time-to-user" concept could be established for new compliance obligations. There is a need for efficient methods to transfer knowledge about new compliance requirements from compliance specialists to those organizational units who ultimately are subject to the new requirements. We face the threat that if modeling compliance obligations is perceived as tedious and too expensive, organizations might opt for not modeling them any further past common textual representations which are not bidirectionally linked to relevant business processes. Currently it is still unclear in which cases the benefit of modeling compliance requirements outweighs the costs of time and resources spent for modeling and maintenance of these, i.e. under which conditions modeling compliance is economically efficient. Further research will be necessary in this area to develop suitable concepts and metrics to assess these economic aspects. Here again aspects of corporate governance as well as of risk management (e.g. risk appetite) are highly relevant for this discussion.

In business practice compliance is often still perceived as "expensive" where it should be cost-efficient and perceived as a "burden" where it should deliver added-value. As GRC requirements are traditionally rather perceived as a burden imposing additional efforts and costs on concerned companies and institutions, it is considered important to emphasize on the benefits gained from GRC initiatives. Hence, for the development of new concepts and tools to approach GRC, consideration of economic aspects should be self-evident.

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