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Jörg Becker
Mathias Eggert
Sebastian Schwittay

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Jörg Becker, Mathias Eggert, Sebastian Schwittay

University of Muenster, European Research Center for Information Systems (ERCIS),
Leonardo-Campus 3, 48149 Muenster, Germany,
E-Mail: {becker|mathias.eggert}@ercis.uni-muenster.de

Abstract

To comply with legal regulations becomes a more and more challenging task for companies of all industry sectors. In particular business processes have to comply with legal requirements. Its checking and control lead to tedious tasks for compliance managers. In order to reduce the compliance management effort special checking approaches have been developed that enable an automatic check of processes regarding their compliance with laws and regulations. Until now, these approaches appear in research but lack in practical evaluation. To close this gap an evaluation method based on the technology acceptance model and focus group sessions as well as its application is presented in this paper.

1 Introduction

After a period of deregulation, in the light of the financial crisis, the level of regulation in the financial industry increased steadily. For example, German financial institutions are now legally required to prevent all kinds of indictable actions that can compromise the assets of the institute [42]. With new regulatory requirements and related controls, the already high level of pressure on organizations to comply grows further. In a recent study by PricewaterhouseCoopers [28] the role of regulatory requirements as major cost driver of the industry was confirmed.

Due to industrialization efforts within the last years Business Process Management (BPM) gained significant attention in firms of all business sectors. Compliance of these business processes to regulations, laws and other external or internal norms is of great importance. Compliance violations caused by non-compliant business processes can damage the reputation of organizations, have legal consequences and endanger the survival of the organization [32]. All activities to ensure the compliance of processes are defined as Business Process Compliance Management (BPCM). One major resource to reach compliant business processes are process models [9]. However BPCM is costly due to two reasons. First, organizational process landscapes (i.e. the set of business processes an organization uses) are large and complex requiring many resources to analyze them manually. Second

compliance rules related to this landscape can change frequently depending on the regulatory environment. In order to reduce costs for compliance management and to improve its efficiency, automated process compliance checking approaches were conceptualized in literature in recent years [e.g. 17; 23]. Examples are the detection of patterns such as “Activity A must be executed before activity B begins” or the check of adequate separation of duties. To practically evaluate these approaches and to identify weaknesses can be a valuable input for researchers and facilitate incremental improvement cycles for them according to design science research [27]. Based on an Action Research [2] approach this paper provides a concept to evaluate such compliance checking methods. In addition, we present results from a workshop that applied the developed evaluation concept.

In section two we briefly describe the theoretical foundations of the technology acceptance model (TAM) as well as common evaluation methods for real-world artifacts. Based on the focus group method, in section three, we present an evaluation approach which was applied in a large German retail bank. Insights into that application will be provided in section four, before section five concludes the paper and addresses further research potential.

2 Theoretical Foundations

2.1 Technology Acceptance Model

The overall objective of the artifact real-world evaluation is to assess the potential of the artifact to be adopted in practice in order to improve the efficiency and effectiveness of business process compliance management. Perceived ease of use and perceived usefulness are perceptual measures for efficiency and effectiveness [3]. Both are central concepts of the TAM which aims at predicting individual intention to use and actual use of information systems at different points of time [6]. For example, Venkatesh and Bala [38] measure perceived usefulness and perceived ease of use at four points in time before and after adoption of a system.

In this paper, we focus on pre-adoption attitudes of potential users regarding the use of an information system similar to the evaluation approach of Purao and Storey [29]. While most use cases of TAM and its successors focus on the ex-post evaluation of information system adoption, Purao and Storey [29] used constructs of the TAM to predict the potential adoption of an IS artifact by potential users. After a short presentation of the artifact, they asked potential users that had no prior experience with the artifact to respond on a questionnaire that measured intention to use, perceived usefulness, perceived ease of use, and compatibility of the artifact with existing organizational structures. Reflecting on TAM as basis for pre-adoption evaluation they concluded that it is a valuable starting point.

In the last two decades, several authors have examined the significance of different general determinants of perceived usefulness and perceived ease of use (e.g. [39]). In addition to general, technology-independent determinants, the TAM has been extended by technology-specific determinants to increase the prediction quality of the model for these technologies. In this paper, general determinants of the TAM constructs perceived usefulness and perceived ease of use that are potentially relevant for compliance checking approaches are described and discussed based on the Technology Acceptance Model 3 [38].

2.2 Evaluation Methods for Real-World Artifact Evaluation

According to Riege et al. [31] methods for a real-world evaluation can be classified in *construction of a prototype, surveys, field experiments, and action research*. In addition, Tremblay et al. [37] discuss *focus groups* as evaluation method for design science artifacts.

The *construction of a prototype* can be used to evaluate the feasibility of technically implementing an artifact. It can be complemented by the *application of the prototype* to a real-world problem using real-world data [31]. Doing so allows for demonstrating and assessing the functionality of both, prototype and underlying conceptual artifact. The simulation of artifact behavior using a formal simulation model can be used for real-world evaluation, if the relevant characteristics of the environment are captured sufficiently within the model parameters [31].

In addition to *surveys*, Kaplan and Maxwell [12] describe *interviews* as data collection method for evaluation. Semi- or unstructured interviews aim at collecting subjective views and experiences of respondents. The interviewer is not limited to a predefined set of questions but free to explore unanticipated information by asking adequate follow-up questions. Similarly, surveys are an option for larger groups where individual interviews are not possible due to resource limitations (if they include open-ended, explorative questions).

Field experiments, often conducted following lab experiments that proved the general feasibility but not the value of an artifact regarding the real-world problem, are an accepted evaluation method for real-world evaluation of design science artifacts [e.g. 11]. Potential users apply the prototype to solve a real-world problem in their organizational context. Research prototypes are often not mature enough for use by practitioners and the integration into existing organizational settings [29]. Thus, field experiments are better applicable in later iterations of an artifact design cycle.

Action research is another accepted way of real-world evaluation [31]. In contrast to other evaluation methods, researchers directly interact with the real world, diagnose problems, identify solutions, infuse solutions for these problems in an organizational context, observe and evaluate whether the theorized effects are realized and whether they provide a solution to the identified problem, learn and repeat this cycle [2]. The *focus group* method originates from marketing and the assessment of new products by groups of potential customers. In semi-structured, moderated discussions, participants evaluate an artifact with a focus on a small set of issues [34]. We follow the suggestion of Gibson and Arnott and use this method for the evaluation of a design science artifact [10].

3 Evaluation Method

3.1 Applying the TAM

3.1.1 Determinants of Perceived Usefulness

In the context of the TAM and its successors, *job relevance, output quality, result demonstrability, subjective norm* and *image* were found as general determinants of perceived usefulness with a significant level of support [38]. The presented evaluation method focuses on the pre-adoption phase which results in the exclusion of constructs due to missing artifact application. Result demonstrability is not considered in this method because method effects

cannot be measured without a proper application. The subjective norm covers the aspect of pressure on employees to adopt a certain technique [39]. Since compliance checking techniques and pattern matching tools for business processes are currently not known in practice, no group pressure will be created. Thus, we skipped measuring the subjective norm. Finally, we also do not consider the image aspect since it is questionable whether potential users perceive a change in their image when using business process compliance checking approaches. Fig. 1 depicts the evaluation constructs that are relevant for the evaluation method. Grey shaded elements are not considered as particularly relevant for the evaluation at hand. The evaluation constructs and their relationships cannot be seen as a causal model. Rather they provide an overview about used and non-used constructs.

Job Relevance

It is assumed that the *regulatory environment*, an organization acts in, influences the relevance of capabilities to achieve business process compliance. Dynamic capability theory (DCT) aims at explaining the link between an organizations environment and the nature of its dynamic capabilities. It understands dynamic capabilities as the ability of an organization to adapt internal competences to changes in the environment [35]. DCT is applicable to compliance checking approaches, as these approaches can be interpreted as part of a BPM capability that enables organizations to adapt their business processes to the environment [24]. In line with the argumentation by Eisenhardt and Martin [8], compliance checking approaches for a highly dynamic regulatory environment are expected to be perceived most relevant by potential users if they are flexibly applicable to different regulation scenarios.

Another factor is the size and complexity of the *process landscape* that influences the pressure to improve the efficiency of compliance checking and automate activities. In small organizations with few business processes, compliance experts are assumed to be able to maintain a good overview of the process landscape and identify potentially relevant business processes for a specific compliance requirement manually. However, in large organizations with hundreds of business processes, compliance experts have to rely on business experts that know small fragments of the overall process landscape. Finding processes that are potentially affected by a regulatory requirement becomes tedious in such situations.

Output Quality

As further determinant of perceived usefulness, the *output quality* of a system was identified by Venkatesh and Davis [39]. It describes the extent to that users believe that a system performs a task as expected. Compared to job relevance, the focus lies on the advantage of using the artifact instead of using alternative artifacts or performing the task manually. In case of compliance checking, the output quality depends on the quality of process models and pattern definitions as well as the correctness and performance of the matching algorithm. Potential users have to be sure that the system has “desirable attributes” [19]. Due to the special responsibilities and personal liabilities of compliance experts (i.e. potential users), their trust is crucial for compliance checking approaches. Liability is an issue that has been discussed for different classes of information systems such as expert systems [22] and geographic information systems [25]. In the context of compliance management, a negative effect of personal liability on the attractiveness of compliance officers job was identified [1].

3.1.2 Determinants of Perceived Ease of Use

For perceived ease of use, the following determinants were identified as significant in literature [38]: *Computer self-efficacy*, *perception of external control*, *computer anxiety*, and *computer playfulness*. Computer self-efficacy describes an individual's beliefs in his ability to perform a specific task using information technology [5]. Considering the relative high complexity of process modeling and compliance pattern definition we see this aspect as not measurable in a pre-adoption phase and thus, skipped it. *Computer anxiety* is the level of hesitation a user experiences when confronted with the possibility to use computers [39]. Focusing on the specific situation of compliance experts within modern organizations, the aspect is considered to be irrelevant given the intensity of information technology use in modern companies. *Computer playfulness* is the degree to which potential users tend to „interact spontaneously, inventively, and imaginatively” with information technology [41]. Without hands-on experience in using the artifact, an effect of individual computer playfulness on the perception of ease of use is not expected in the pre-adoption study. The determinant *perception of external control* captures an individual's beliefs into the existence of organizational and technical resources that support the use of a technology [40]. This determinant is important in the context of automatic compliance checking, as compliance checking approaches rely on existing organizational resources such as process modeling capabilities and more generally BPM capabilities.

BPM maturity describes how advanced the BPM capability of an organization is [33]. Organization-wide defined and standardized processes as well as automated process analysis are a common characteristic of high maturity levels. Thus, a high level of BPM maturity is considered valuable when introducing an automatic compliance checking approach as potential users are more familiar with fundamental concepts of BPM such as process modeling and process analysis. In consequence, less training effort is required.

In addition to BPM maturity, *BPM compatibility* is expected to be an important determinant of ease of use [e.g. 20]. We understand BPM compatibility as the ability to integrate the compliance checking approach into an existing BPM landscape consisting of organizational routines, methods and software. However, automatic compliance checking can also benefit from existing resources such as process models [13], if they are first, available in an analyzable format supported by the compliance checking approach and second, of a sufficient level of detail to cover compliance-relevant aspects.

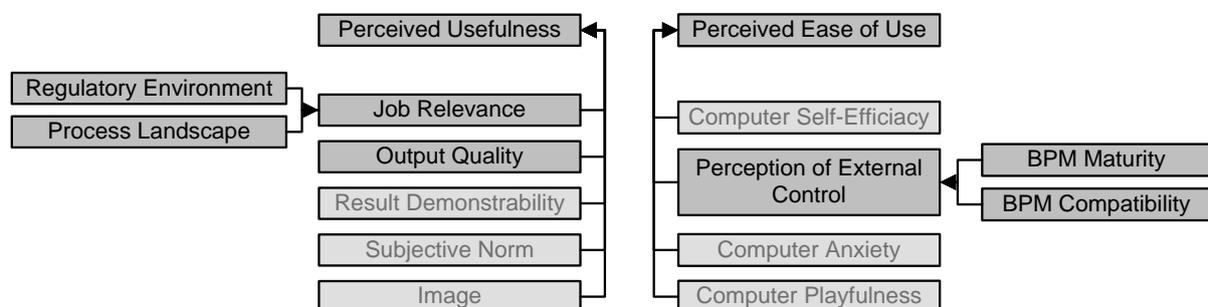


Figure 1: Evaluation constructs for compliance checking approaches

3.2 Applying the Focus Group Method

3.2.1 Configuration of the Focus Group Method

The number, duration and size of focus group sessions are important configuration parameters for the focus group method [e.g. 34]. The session is planned for a length of 90 minutes representing a trade-off between the amount of information that can be gathered and available resources. Especially the limited availability of professionals from practice for research projects limits the possible length of focus group sessions [34]. Therewith, the duration is within the recommended time span for focus groups [26, p. 385]. For the size of focus group sessions, a lower bound of 4 participants is recommended; 10-12 as an upper bound [26; 34], as larger groups reduce the possibility for every participant to contribute significantly, which might influence the participant satisfaction with the session [7]. To restrict the group size to the lower bound is useful in order to allow each participant to contribute individual perceptions and ideas. In addition, a complex subject like compliance checking approaches can be explained faster for a small group.

The moderator plays a critical role during focus group sessions [15]. He has to validate provided information by asking follow-up questions [34]. Generally, the moderator should be open-minded to new insights and have a “sound global view of the topic” [30, p. 72]. Researcher-induced bias can influence the focus group session design, the direct interaction with participants as well as the analysis and interpretation of data. To avoid this bias, the moderator should try to facilitate the discussion in a neutral way outbalancing tendencies in participant responses [15] and domination of any participant [10]. Furthermore, it is considered beneficial if the moderator conducting the focus group session is not the artifact designer [36].

3.2.2 Focus Group Session Design

Focus group sessions are semi-structured group discussions based on a session guideline. We align the session guideline to the questions that cover aspects based on TAM. They are formulated in a neutral, open-ended, singular and clear way [26] and aim at initiating discussions among session participants. “Dichotomous response questions” [26] that suggest “yes” or “no” are avoided. Furthermore, the number of main open-ended questions is strictly limited to no more than 10 per hour of discussion following the recommendation of Patton [26]. Given the 90 minute time-frame, limiting the session to 10 main questions, allows roughly 15 minutes for the initial presentation of the artifact and 15 minutes for answering initiating questions on each topic that use predetermined scales and require participants to give their answers more thought and reflect about the new topic [16].

Depending on the on-going discussion, follow-up questions can be used to “test the limits of a concept”, “direct the group back to the focus”, “change the level of abstraction to allow discussions about uncomfortable topics”, “neutralize emotions” or to explore feelings of participants [34]. To facilitate a natural flow of discussion the moderator should be aware of participants signaling the possible closure of a topic by using “commonplaces” or “minimal response” [21]. For the overall structure of focus group sessions in the context of design science artifact evaluation, different suggestions exist in literature [e.g. 10; 36]. Given the complexity of the topic, the focus group session for the compliance checking approach

evaluation follows the structure introduced by Gibson and Arnott [10] and starts with some general, introducing questions. In the following, all asked questions are italic typed. The complete structure, contents of different phases as well as used methods and tools are depicted in Fig 2.

Phase	Contents	Methods & Tools
Introduction	<ul style="list-style-type: none"> • Present Purpose • Define Ground Rules • General Understanding of BPC • Motivation for Approach 	<ul style="list-style-type: none"> • Interview Guide
Transition	<ul style="list-style-type: none"> • Presentation of Approach 	<ul style="list-style-type: none"> • Powerpoint
In-depth Investigation	<ul style="list-style-type: none"> • Ease of Use • Usefulness • Behavioural Intention 	<ul style="list-style-type: none"> • Interview Guide • Predetermined Scales for Rating • Follow-up Questions • Powerpoint
Closure	<ul style="list-style-type: none"> • Summary of Discussed Aspects • Demographics • Participant Feedback 	<ul style="list-style-type: none"> • Moderator Notes • Questionnaire

Figure 2: Focus Group Session Structure

Introduction and Transition

The session, which is based on the rules defined by Gibson and Arnott [10], will be presented by the moderator. After all organizational topics are covered; the moderator initiates an introductory discussion about business process compliance and existing approaches used by practitioners. This discussion aims at creating a common ground and explicating the understanding of fundamental concepts discussed later by participants. In the following, all questions directly posed to participants are printed in italics. In order to understand the context in which the approach is evaluated, the first questions aim to get general aspects of process compliance management in the organization. *How do you assure the compliance of business processes in your organization?* Furthermore, the moderator asks participants to describe major challenges they experience in ensuring business process compliance. This question focuses on validating the research motivation of most compliance checking approaches (i.e. high level of complex, manual labour for compliance officers). After that the relevance of automated compliance checking approached can be questioned: *What are the greatest challenges that you perceive in assuring process compliance?*

In addition, to address the concern that prior experiences with other compliance checking approaches might influence the evaluation, the moderator should ask participants to report on experience with technologies that are related to process compliance checking. Thereby he should address an element of the research agenda that Rikhardsson et al. [32] formulated for compliance risk management. The authors state that it is important to understand how organizations actually use IT in compliance management. As the question is formulated rather broad, it allows drawing conclusions about BPM maturity as well, because automated process analysis is a characteristic of high maturity: *How far are business processes already analyzed automatically in your organization?*

A short presentation of the compliance checking approach, which presents the initiation of the *transition phase*, follows. The moderator presents the automatic process compliance checking approach in a neutral way focusing on the facts accompanied by examples. Furthermore, screenshots of the approach are presented. As the participants are not familiar with the rather complex approach, during the following discussion, the moderator shows relevant slides (e.g. an exemplary process model, compliance pattern or result presentation) to support the discussion visually.

In-Depth Investigation

To ensure that participants do not theorize when answering the following question but relate it to a concrete situation, the moderator provides a context in which the question should be considered. The question, focusing on the compliance checking approach, should be answered on a one-dimensional scale between very low and very high effort (in the following, these scaled questions are marked with a star (*)): *How do you estimate the effort necessary to use the approach for process compliance checking in your organization?**

Based on the feedback provided by the participants as rating on the predetermined scale between very low and very high, the moderator initiates a discussion about why they perceive the effort in a certain way. Thus, the following question provides only a guideline; the actual question asked within the focus group session should be adjusted to the rating provided by participants: *Which factors influence the effort most from your perspective?* Examples are: Availability of standardized business processes; Experience with process modeling; Clear idea about how to realize a compliance requirement; Experience with formal languages; Handling of compliance checking approach. Furthermore, the following question challenges participants and communicates that their suggestions are highly valued: *How could the effort of using the approach be reduced?*

After exploring relevant aspects of the ease of use construct of TAM, the focus shifts to the usefulness construct. Regarding job relevance, the moderator asks participants to estimate the relevance for their jobs: *How do you estimate the relevance of the functionality provided by the approach for your job?**

Which purpose a potential user imagines for the approach, depends on the idea of the approach he has in mind and in turn influences how he perceives the potential job relevance. Massey and Wells [18] call this idea "meaning" and see it as mediator of the perception. To understand the perception completely, the meaning a potential user assigns to an approach has to be clear. Thus, the moderator initiates a discussion by asking for ways in which participants would use the approach: *How would you use the automated pattern matching approach?*

The second determinant for perceived usefulness is the output quality of the approach. Again, the discussion about this determinant is initiated by an estimation of expected quality of outputs (i.e. found compliance patterns) by participants: *How do you estimate the quality of pattern search results?**

As it is expected that participants will struggle answering this question, some further information should be provided on how to interpret this question. For example, the moderator could mention the completeness and expressiveness of results as well as the quality of inputs (process models and compliance patterns) that influence the search result quality. Based on

the estimation by participants, the moderator poses a question on what participants expect from a high quality compliance checking approach: *What signalizes high quality of search results in the context of process compliance checking?*

Following the discussion of relevance and quality, the focus shifts to the benefit participants expect from the approach for their individual jobs. Consequently, the moderator starts the discussion by an estimation question about the benefit: *How do you perceive the potential benefit of the approach for your job?**

By requesting the participants to describe concretely what properties of the approach they consider useful for their individual job, the moderator can pick up responses to the previous question on perceived benefits and explore the individual reasons for a certain perception: *Please describe why the approach is useful for your job.*

The next phase of the discussion focuses on the adoption potential of the approach as perceived by the participants. According to TAM, perceived usefulness and perceived ease of use are the determinants of the adoption potential. However, in order to identify potential deviations between the assessment of the two determinants and the adoption potential, it is important to ask explicitly for the estimated potential for adoption. Again, the moderator requests participants to give feedback based on a one-dimensional scale after the context for the questions is established. *Assume that the approach including its implementation would be available to you. What do you think about the probability of using the approach?** *How often would you use the approach?**

Prior to closing the session, an “all-things-considered” question [16, p. 26] is used to identify the single most important problem participants identify within the approach related to its applicability in their jobs: *What would be the main reason for you to neglect using the approach?*

Closure phase

In the closure phase, the moderator summarizes main results and asks participants to clarify unclear contributions and to confirm that the summary was correct [14; 16]. Additionally, to ensure no unanticipated aspects of the problem space were left unmentioned, he asks the participants whether important aspects regarding the approach were left unmentioned, as recommended by e.g. Krueger [16]. After closing the session, a brief survey asking for participant demographics (suggested by Kidd and Parshall [14]) as well as feedback on the session design and its outcomes is handed out to the participants.

4 Application

We applied the above described evaluation method with a generic pattern matching approach in a case setting that contains purchasing processes of a large German retail bank. Altogether four compliance and business experts attended in the evaluation session and enabled the application of the developed evaluation method to gain first experiences.

The advantages of focus groups compared to individual interviews or surveys became apparent. For example, participants referred to previous answers of other participants and explained different opinions. Individual interviews do not provide this kind of rich information. In particular, construct validity was increased by different participants reflecting on responses of other participants. Handing out sheets with a rating-scale facilitated critical thinking about

the posed question and initiated some discussions about the research design. However, there are also drawbacks to be mentioned. For future focus group sessions, a second researcher should assist the moderator (as recommended by Gibson and Arnott [10]) in order to be free in transforming the results into new questions. In addition, a pretest aiming at the identification of “unanticipated difficulties” [4] with the question guide could have helped to avoid some discussions about the research design within the focus group session. Participants questioned the formulation of some questions and the ability to answer them.

Regarding the contents of the focus group session, the limitations of concentrating on TAM constructs have been recognized. TAM theorizes about individual perceptions and intentions to use an information system. However, the participants turned out to take an organizational perspective rather than an individual one and considered the perception of other actors within the organization as well. For example, discussing the effort required to use the approach, they were more concerned about the acceptance by other organizational members such as business experts required to model business processes and did not focus on their individual effort expected. Due to the major implications of implementing automatic process compliance checking within an organization, the evaluation method focusing on the perception of compliance experts (and business experts to a smaller extent) has to be questioned. Especially in organizations with low BPM maturity, upfront investments across the organization for process modeling can be very high. These costs perceived by potential users of the approach might deter discussions on core aspects of the compliance checking approach as seen in the retail bank case.

5 Conclusion and Outlook

In this paper we propose a method to evaluate business process compliance checking approaches such as introduced by e.g. [17; 23]. The method is based on the TAM 3 [38] as well as on a focus group approach [10] and was applied in a large German retail bank. Application experience are provided and discussed.

Further research addresses two main tasks. First, the addressed improvement suggestions identified in section 4 are the basis for an ongoing development of the evaluation method. Next applications of the method should consider these suggestions to finally develop an evaluation method that is generally applicable, regardless of its case setting. Second, the focus on one single organization is problematic due to the “single case bias” [30]. The small sample of one retail bank is a first step towards the generalizability of the results. However further research should confirm its applicability.

From a research perspective, the method and its application results are an important contribution to the assessment of existing research in the field of business process compliance. From a business perspective, a method was introduced that enables the validation of future compliance management software products.

6 References

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