A Business Process-Based Modelling Extension for Regulatory Compliance

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Abstract: Financial scandals and the related increase in mistrust of investors represented in the public view through the Enron and Worldcom cases led to various legal and community driven initiatives in recent years resulting in a tighter regulation context for companies with the overall goal to regain and strengthen stakeholders' confidence and trust. The paper at hand presents how IT can support regulatory compliance. The IT-support is based on a conceptual approach for integrating compliance management and business process management by using meta-modelling concepts and provides then the example of the actual implementation. Furthermore, the applicability of the approach is presented through a case-study which was realised within a project on the basis of the regulations of the Sarbanes-Oxley Act of 2002.

Introduction

Due to a couple of collapses of large enterprises, e.g. Enron, Worldcom in the US or Parmalat in Europe, and the ensuing financial scandals, the faith of investors in presented financial reports but also in the company and the processes performed within the company has decreased dramatically. The result was the apparent deterioration of the reliability of information by virtue of odd balancing practices and the declaration of insufficient and fudged reports of enterprise values. A demonstration in numbers shows the drastic consequences of these negative tendencies: Experts are talking of a loss of market capitalisation between March 2000 and fall 2002 amounting to $5 trillion, which in consequence leads to a huge negative impact in market performance [FG04]. A well-known example of an enterprise, which nearly lost its complete market capitalisation, was Enron by getting bankrupt overnight, at least in the perception of investors [Le02], [Me04].

As a result of the eroding of the investor confidence, various regulative initiatives have been presented in recent years resulting in tighter regulations for enterprises. All these initiatives serve - directly or indirectly - the management reliability and aim to the

transparency of flows and decisions of business processes within enterprises. Through compliance management - either mandatory through regulations or voluntarily through the adoption of corporate governance standards – the confidence of all stakeholders should be increased and strengthened.

In the U.S. for example, the Sarbanes Oxley Act (SOX) regulation has been passed. Public enterprises who issue securities in the U.S. and are listed on U.S. stock exchange, must comply with this law. Other countries' securities regulators, such as the Ontario Securities Commission (Canada) have also adopted similar (but less restrictive) measures. The European Commission passed the 2006/43/EG Directive in June 2006, publicly known as EUROSOX. Member states of the European Union must implement this regulation until the 29th of June 2008 in national law. Although the details and outline are different from SOX the overall target followed is the same [ES07]. The intent behind SOX has been to increase trust in public reports on a company's record. A "SOX-compliant" company follows particular reporting procedures and has a higher awareness of how its business is conducted [KMS07].

The assumptions followed for all the objectives within this paper are based on the outlines of the SOX regulation. Section 2 describes the requirements for regulatory compliance from a business-driven view and shows how the use of business processes represents a valuable approach for IT-based regulatory compliance. Section 3 describes the elaborated concept of a compliance framework and how this has been realised based on a meta-modelling approach. Section 4 describes the technical implementation of the solution; section 5 provides evidence of the proposed solution through a case study with an U.S. insurance company where the solution for regulatory compliance management based on a business process-oriented approach has been implemented. Section 6 concludes and shows additional IT-support implementation topics for regulatory compliance.

2 Regulatory Compliance: A Business Process-oriented Approach

Although the paper at hand deals with the topic of regulatory compliance, it is quite quickly obvious that enterprises face different types of compliance. As a general outline compliance demand can come from either 'third parties' located outside the enterprise or from different bodies of the enterprise itself. While 'third-party' induced compliance tends to be mandatory, either through legislation or pre-requisite criteria to achieve a certain certification, 'self-induced' compliance is driven internally being an equally strong demand.

In the way of achieving an enterprise's mission (may it be profit or also non-profit-oriented) the board of directors has to select strategies, has to derive concrete operations and tasks out of the strategies, has to report on the operations and finally has to check whether their actions reach compliance [Co04].

When deciding which type of compliance to align to enterprise executives need to bear in mind whether they look at the "regulatory approach" or the "standardisation approach" of compliance management.

The "regulatory approach" covers the legislation stipulating guidelines which are mandatory to be followed – like SOX, EUROSOX, MIFID etc. – as well as the corporate governance. The decision to implement corporate governance is voluntary. Nevertheless its impact on organisational structures and business processes is major, as everything needs to be aligned to the bundle of guidelines defining it. Executives expect to receive as a return flow from the effort invested in corporate governance higher investor trust and subsequently easier access to financial resources.

When applying the "standardisation approach" enterprise executives can decide between certification, again 'third-party' induced, as auditors awarding different certificates are normally external to a company, and the utilisation of best practices. The quality management certification like ISO9000 represents a well-known example for certification while ITIL® (IT Infrastructure Library) or CoBiT® (Control Objectives for Information and Related Technologies) are widely utilised best practices.

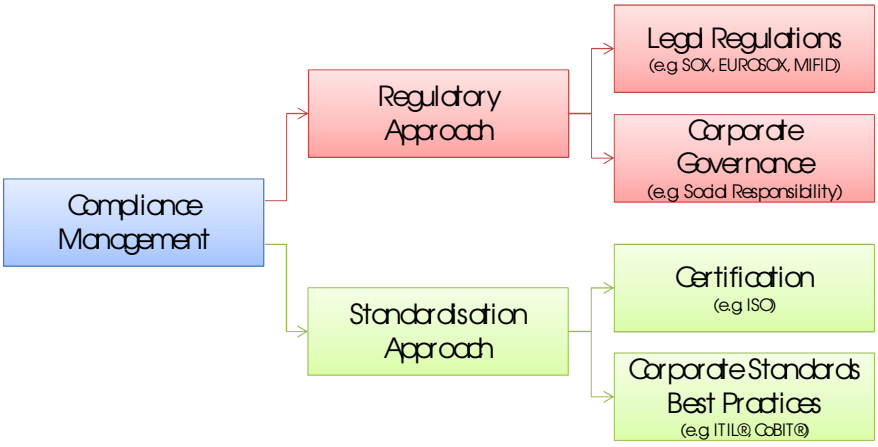


Figure 1: Elements of Compliance Management

In the pursue of compliance management an enterprise will choose its individual sub-set of compliance concepts for different needs.

In the following the paper will focus on the legal regulations when using the expression compliance management. In this domain, the documentation of risk management and implementation of related procedures as it is shown in [KG03], [Ls05] is regarded as crucial. The Enterprise Risk Management (ERM) approach issued by the Committee of Sponsoring Organisations (COSO) elaborates a framework that can assist companies in their aim to achieve regulatory compliance [In04].

The ERM approach is a procedure model, which determines three dimensions and its divisions all of which build a comprehensive framework that should support organisations to provide key performance indicators (KPI) for effective management in terms of limitations, internal controls, roles and responsibilities. Meeting legal regulations, like SOX, means that the company has to well know its processes, structures but also shortcomings with the implied ambition to overcome these or at least control these effectively [SGN07].

Business process management (BPM) already delivers well elaborated concepts and procedures for specific application areas, like quality management, process-based application development, process-based knowledge management and sets in with the documentation and analysis of the service provision processes of a company. Therefore, a proper documentation of the company's business processes on a detailed level means being in a good starting position to analyse the company's risk situation.

The Business Process-oriented Approach applied is based on the derivation of concrete operations and tasks out of the strategies and their enrichment by the enterprise risk management components as applicable laws may require a detailed report on the developments within an enterprise in this area.

The meta-modelling based business process approach [Ka95] additionally integrates the compliance management view. For this some of the business process models might need to be extended with either various different parameters or entities. Depending on the actual content of the underlying regulation, these may be for example risks, controls, events, IT structures, procedures, etc. The integrated view, the term BPM-ERM, will be used in the following section.

3 Regulatory Compliance: Conceptual Design

The conceptual design of the afore-presented business process based view for achieving compliance is based on the so-called meta-model approach.[1] Due to its flexibility, it allows the creation of a comprehensive design of models for the inclusion of regulatory aspects into an enterprises' business processes. The meta-model approach has already been applied successfully in a range of projects and realisations in various domains, as for instance for performance management frameworks [Ro05], knowledge and intellectual capital management frameworks [WK05], [Ne06a], or also educational frameworks [KNF07].

3.1 Meta-Modelling Approach

The underlying meta-model approach is a four layer construct that has been established in the course of the introduction of the meta-object facility (MOF™) [BG01]. The hereby referenced conceptual architecture contains a hierarchy of four levels, whereas

[1] For the definition of meta-models, please refer to [KK02], [Ho07], and [Ka07], respectively.

each of these layers represents an instance of the above level. The four levels are characterised as follows [BL97], [At97], [BG01], [AK03]:

- The lowest layer M_0 contains data, meaning nothing else than data objects that can be manipulated by actors.
- The next level M_1 includes models of the data of M_0.
- M_2, the third layer covers meta-models, whereas they offer required information for the creation of models of M_1.
- Finally, the M_3 level is called the meta-meta-model layer (often also called meta^{2}model) that holds information of 1 to n meta-models of M_2.

Figure 2 depicts the application of the meta-model approach for the regulatory compliance issue that shall be achieved by the combination of an organisation's business processes on the one hand and a respective accompanying model covering risk and control mechanisms for achieving compliance on the other.

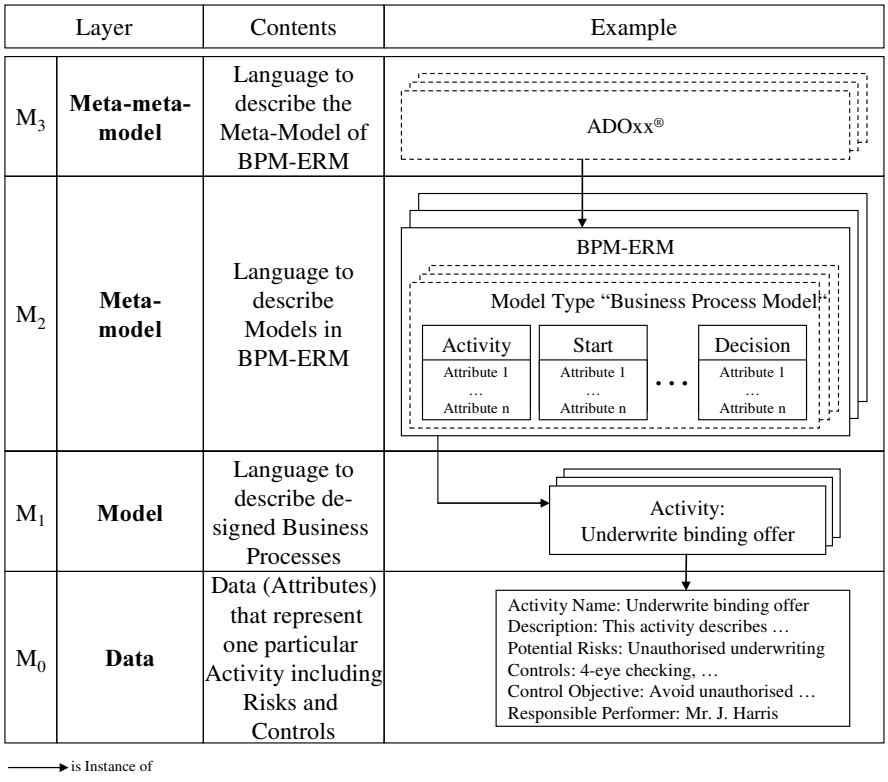


Figure 2: Application of the Meta-Model Approach [At97], [BL97], [BG01], [Ne06b]

A meta-model is further defined by three interdependent parts: Syntax, semantics, and notation [KK02]. The syntax describes classes, relations, and attributes of the corresponding meta-model(s) and defines rules that are required for the instantiation to models by referring to a certain grammar. Semantics determine the meaning of meta-models, whereas two major parts come into play: On the one hand this is the semantic domain, i.e. the expression of the meaning of a meta-model's language by applying mathematical expressions. On the other, the semantic mapping, represents the connection between the syntax and the semantic domain. Finally, the notation constitutes the visual representation of the corresponding meta-models.

3.2 The BPM-ERM Approach

By considering the components of the meta-model approach, meta-models for the BPM-ERM concept have been designed. Figure 2 depicts the conceptual architecture of the meta-models and their interdependencies in UML class diagram notation.

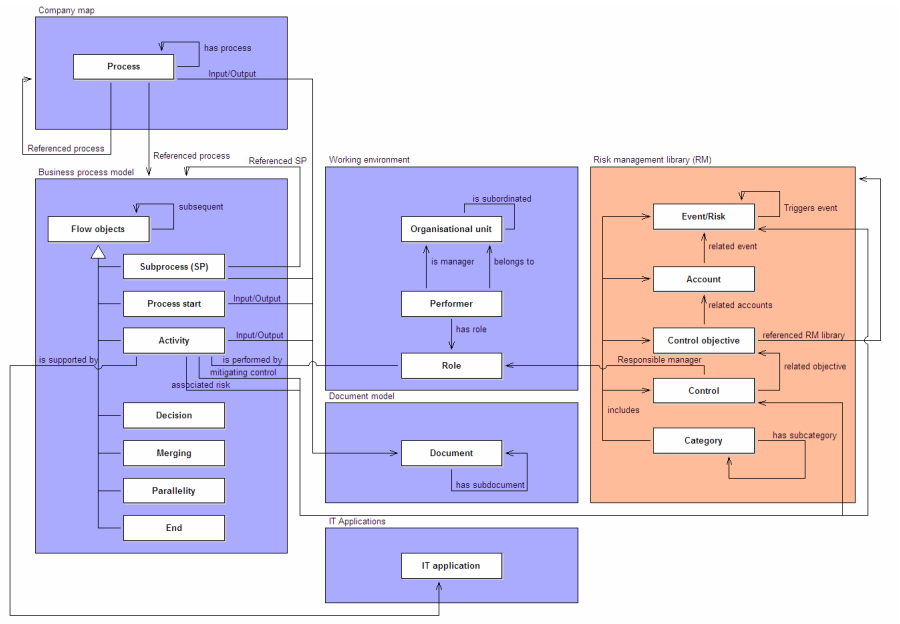


Figure 3: The BPM-ERM Meta-Models

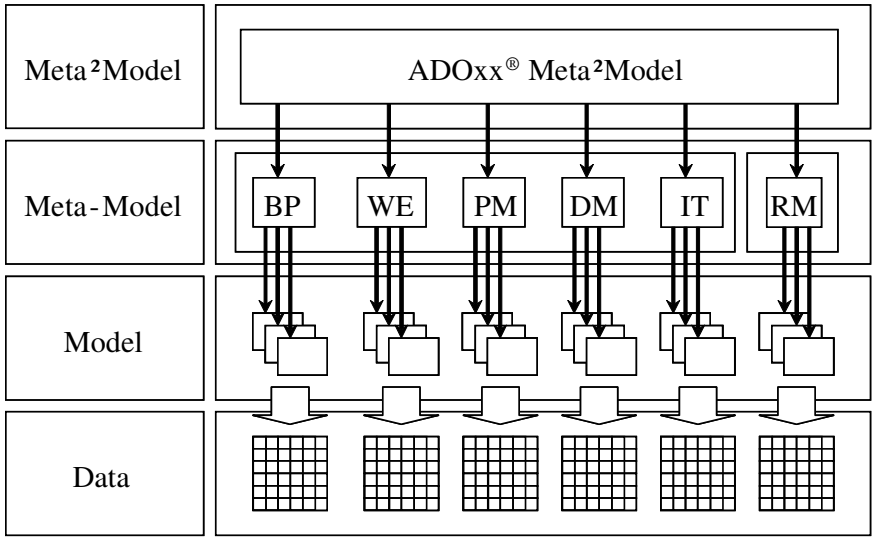
As outlined above in the discussion about risk management, an organisation's business processes play a major role when defining a meta-model for the company's risk management. Therefore, corresponding meta-models have to be included into the conceptual design. The business process and working environment meta-model serve as a cornerstone for the determination of the occurrence of potential events and risks, respectively, and eventually also the definition of appropriate control objectives and

controls. Thus the business process, working environment, company map, document, and IT applications meta-model represent the basis for the extension of an ERM that is based on an organisation's business processes.

As can be seen in Figure 3, the risk management library meta-model is constructed as a pool of both events/risks and corresponding accounts as well as control objectives and controls, which are altogether classified through categories. As is illustrated by the relation "associated risk", it is foreseen to link the class "activity" to the class "risks/events" for assuring the precise location and determination of risks. Furthermore, also the class "controls" can be directly linked to activities via the relation "mitigating control" to activities that may be affected by potential risks. By undertaking these relations, a concise cause-relationship chain can be established and occurring risks can be met with predefined controls that have been determined according to certain control mechanisms (as can be seen in the "risk management library meta-model").

4 Regulatory Compliance: A Technical Realisation

The afore-presented BPM-ERM meta-models as well as their interrelations (see also Figure 3) have been implemented in the meta-model platform ADOxx® by using the languages ALL and AdoScript [JKS+00], [KK02].



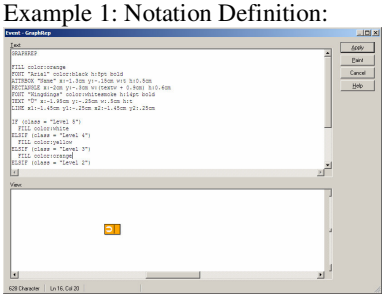
BP … Business Process Meta-Model
DM … Document Meta-Model
IT … Information Technology Meta-Model
PM … Process Map Meta-Model
RM … Risk Management Library Meta-Model
WE … Working Environment Meta-Model

Figure 4: Four-Layer Conception in ADOxx® for BPM-ERM Meta-Models [Ne06a]

Figure 3 depicts the transfer of the conceptual BPM-ERM meta-models into the structure of ADOxx®. The highest layer in Figure 4, the meta²model layer is represented by the ADOxx® meta²model, which covers basic settings, like abstract class and relationship definition, export/import functionalities, and the like. The meta-model tier is composed of the afore-described BPM-ERM meta-models. They serve as the foundation stone for defining potential risks and corresponding controls in the risk management library as with the aid of this model, the interconnectivity between the enterprise's daily business processes and their risk-intensive part(s) can be depicted and eventually also reported. In the third layer, business process, working environment, and risk management library models, as well as other supporting models that have been created by decision makers, can be found. Finally, the fourth and last layer, the data tier, covers the information about the potential risks and their occurrences themselves, i.e. the values with which decision makers aim to support the development of an adequate and efficient concept for risk and control management. The data is therefore entered and stored in so called notebooks.

Thereby, the afore-discussed three components of a meta-model, the syntax, semantics, and notation have been realised for guaranteeing an intuitive and clear way of how to model an enterprise's business processes and eventually also of how to identify potential risks and determine effective controls within these processes. Thus, Figure 5 depicts small excerpts of the implementation of the syntax and notation functionality of the risk management library meta-model.

Example 1: Notation Definition:



Example 2: Syntax Definition:

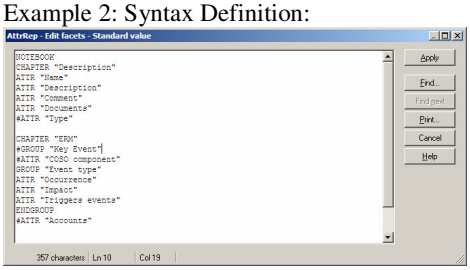


Figure 5: Excerpt of Syntax and Notation Functionality

In the following, Figure 5 shows a potential business process that has been annotated with risks and associated controls. Furthermore, the description of risks is stored systematically in the risk management library model. The same is valid for the determined controls which may be directly assigned to the respective risk to be controlled.

Those process activities that have been enriched with potential risk occurrences provide also two more important notational effects: (1) the likelihood of the appearance of a certain risk (Lkh) that may vary from green (low likelihood) to red (high likelihood) and (2) also the potential (negative) impact (Imp) in the course of a risk appearance that may avoid an interference-free performance of the given business process.

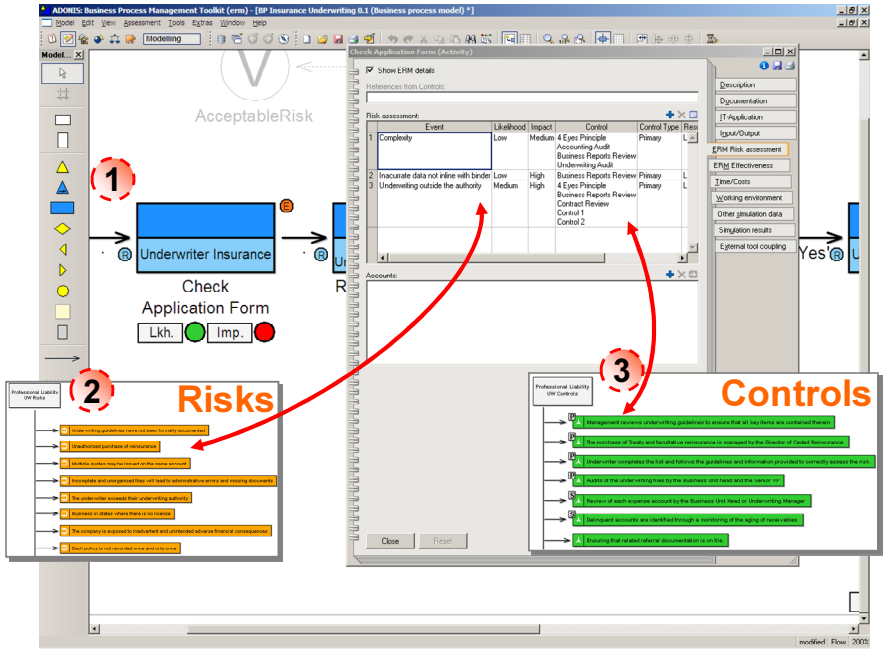


Figure 6: Excerpt of the Implemented BPM-ERM in ADOxx®

The risks themselves are classified and further defined in the afore-mentioned risk management library model, whereas specific information on the risks' nature can be defined by entering corresponding values. Based on these values, automatic risk and control reports can be initiated. They have been implemented as add-ons in the BPM-ERM [KNS06].

5 Regulatory Compliance: A Case Study on SOX

The Business Process-based Modelling Extension for Regulatory Compliance which has been described above has been implemented in an U.S. insurance company, obliged to apply SOX. The solution is set-up as a procedure consisting of five steps using the models and a portal offered through the ADO*xx*® platform. The final sixth step shown in the solution concerns a final quality check and approval from the company's auditor who must approve the company's SOX compliance. The six steps are portrayed in Figure 7.

It should be noted that after the initial set-up and in the absence of any updates to process models, only steps 4-6 are required to meet SOX compliance requirements. While originally planned to realise steps 1 to 4 within the modelling tool based on meta-models and steps 5 and 6 in a portal solution the actualities of the project showed that a better solution would be to keep steps 1-3 within the modelling tool, while putting steps 4-6 in the portal solution. As this paper focuses on the ERM-extension of a BPM-

Method the first three steps are described below in detail, while the last three are presented just in a short overview.

The first step, **Business Process Best Practices** involves the acquisition of detailed business processes. After all, business processes build up the basis that one can get an accurate and realistic view of existing risks and possible controls. This step results in well-elaborated and approved business process models that serve as basis for following tasks. If the business processes of a company are already in place, the tasks described in the first step could be reduced to determine the relevant processes for risk assessment and the internal control system.

Within the practical application case the acquisition and optimization of business processes had to be realised to the full extent as there where no existing business process documentation available in a unified format. Having the need to acquire business processes from the scratch proved advantageous as the design could be directly realised in a semi-formal graphical modelling language with possibilities of export in different standardized electronic formats for review and approval. Adaptations of the meta-model in terms of semantic, syntax and notation were realised through customizing in an iterative approach, finalizing and personalizing the meta-model to the needs of the users.

The selection of the relevant processes to be optimized was also done considering step 2, the risks and possible controls. The processes/areas determined at the beginning of the SOX project by the companies auditors were handled with priority. While the realised business processes were highly qualitative the time and corresponding costs matched the invested effort.

For the second step, **Risk Assessment and Scoping** the SOX regulatory context for financial reporting did imply the following steps and tasks:

- Analysis of affected accounts for financial reporting and relation to the risk and control environment. If a tight coupling and control relation can be determined, these are labelled significant accounts and need to be looked at in depth. The basis for this analysis was the company's general ledger.

- Internal controls, along with an internal control framework, need to be set up, including activities or processes that influence financial reporting.

- In order to evaluate controls, relevant risks need to be identified and assessed.

Significant accounts are accounts relevant to the balance sheet of a company that have a major impact on reported results. Such accounts need to be identified as they hold a major portion of the content of financial reports. Examples of such accounts are ones for "Investments", "Gross Premiums Written", "Unearned Premiums" etc. During the "Risk Assessment and Scoping" step, these accounts have been associated with the business processes designed previously and have been recorded and documented in a "Significant Account Model", along with account-related data modelled as part of the risk management library to build up comprehensive SOX documentation.

Figure 7: Six-step framework for SOX compliance

The SOX-related risks have been identified and modelled next. This means that risks and negative events have been collected in a risk catalogue realized in the risk management library and the assignment of these to the activities of business process models susceptible to the identified risk has been realised. Risks may involve failed/incorrect processing of an invoice, missing data when creating a customer profile, or even insufficient skills for people who are responsible for critical steps within a business process. SOX is not concerned with business-related risks, e.g., the risk associated with a particular insurance contract.

The analysis of risks and the related business processes provided the company with a detailed overview of its risk situation. This has been used as the starting point for determining appropriate controls in order to reduce the likelihood that risks will occur, or to reduce their impact when they cannot be avoided.

After the identification of risks appropriate controls have been set up and put together to an internal control system. The assignment of controls to risks is a many-to-many relation meaning that a specific risk in the business process is covered by one or more controls identified Examples for risks identified are “Inacurrate data not inline with binder” and “Binding of unacceptable risks” covered and mitigated by controls like “Underwriting Audit”, “4 Eyes Principle”. For each control, there may be “control processes” and “control activities”. Control activities are part of the checking procedure of the entire control and are usually of a different business process than the activity incorporating the risk. Control processes are actual business processes which produce as a result the defined control for a risk in a different business process. This means that the control procedure is regarded as part of the company’s business and is dealt with the same priority as the actual business process.

The third step, **Design Effectiveness**, deals with the revision of internal controls, intended to balance risks and control. This means that internal controls have not been over-/under-engineered (by leaving in the system so-called “control free zones”)

[PWC04]. The Design Effectiveness has been evaluated according to the following functions/tasks (Figure 8):

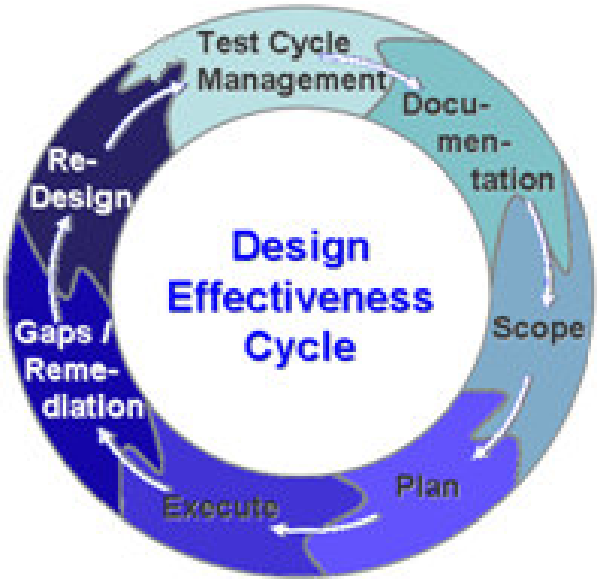


Figure 8: Single Steps of the Evaluation of the „Design / Operating Effectiveness“

- Documentation: within this task the link from business processes to additional information (like risks, controls, documents, IT-systems) belonging to the test cycle has been realised and integrated. The steps related to risk management have been accomplished in the previous task.

- Scope: Within scoping the controls to be tested have been determined. This task reduces the number of controls to be tested and the frequency of testing.

- Plan: After scoping, the test plans have been created with parameters including: Test Plan Status, Test Plan Type, Tester, Test Period, Test Plan Description, Test Evidence and Sample Size. Every test plan automatically received a “Test ID” in order to be able to reference at any time to a particular entry related to the test as this makes the test traceable for audit purposes.

- Execution: This step has been concerned with the actual execution of the testing.

- Gaps/Remediation: After performing a test, the results were evaluated in order to assess the company’s situation. If a test was not passed, or passed with exceptions, improvement has been considered necessary. For this, remediation measures (from process redesign, documentation deficiencies corrections, etc) were defined.

- Re-Design: In some cases the outcome of the tests and/or the final assessment of the management lead to modification needs in the process models and/or controls. The tests have been then repeated for these parts. While the documentation of changes is vital for the valuation of the Operating Effectiveness, in order to avoid failed tests, this has not been fully implemented within the described project.

In order to check the design effectiveness a “gap analysis” has been performed. This considers situations where a company is unable to implement all necessary controls in one shot. Some controls require the set up of separate IT projects, meaning that design effectiveness is not addressed immediately. The ”gap analysis“ involves “testing” activities and testing cycles for monitoring the progress of the design effectiveness.

Within the company, the documentation of test results and evaluation of controls through a common and understandable schema, did play an important role for the success of the project since various unit dependent mechanism and procedures for internal control system evaluation have been replaced by a common agreed upon . Each involved party did know about the current status at any stage and could get the necessary information as needed.

As mentioned ahead the last three steps have been realised within a portal solution and are described only in general below.

The fourth step, **Operating Effectiveness**, is intended to determine whether internal controls are effective during actual operation. To answer this, the company either needs to conduct self-assessments, internal audit reviews or testing procedures of its controls. The actual steps are the same as the ones carried out for testing Design Effectiveness. The main difference between this phase and Design Effectiveness is that the test results of this phase are integrated with the financial reporting of the company. As before, and depending on the test results, appropriate remediation measures may have to be defined. If the test results are generally poor, it may be necessary to repeat the whole testing procedure. The external auditor decides if repetition is necessary.

In the fifth step, **Internal Management Review**, predefined strategic and operational goals are assessed against test results for determining whether the company is SOX-compliant. Management needs to sign-off the report to be filed as an official document to the external auditor. This report together with other financial reports constitutes the basis for assessing if the company is SOX-compliant.

In the sixth step, **Auditor’s Final Review**, the external auditor receives financial reports along with the internal management review report. Independent from these, the external auditor retains a continuous insight of the company’s financial and accounting situation.

6 Conclusion

The requirements a company has to fulfil in order to gain SOX compliance are comprehensive and affect the whole company. The document at hand shows a possible

way how to integrate business process management and compliance management in one solution. The solution uses a meta-models platform and the meta-modelling platform ADOxx® for describing the new essential classes and class properties for compliance management. A case study for the applicability of the solution the Sarbanes Oxley Act of 2002 has been used, presenting the results of a project in this field for an U.S. insurance company.

Based on the experiences during the different phases of the case study, e.g. from the conceptual design through the technical realisation and application on the SOX scenario, it may be stated that for the business units the business process-based approach to a given regulatory context makes it easier to work off and to structure the complexity caused by these regulations. Due to the different organisational tasks and the various involved parties the realisation of an "Execution Portal" in order to comfortably handle the compliance procedure would be reasonable. Additionally, topics like access rights, versioning of content to be analysed, results from gap analyses, etc may be addressed in such an additional IT support.

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