Managing Legal Interpretation in Regulatory Compliance

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ABSTRACT
Maintaining regulatory compliance is an increasing area of concern for business. Legal Knowledge Management systems that combine repositories of legislation with legal ontologies, can support the work of in-house compliance managers. But there are challenges to overcome, of interpreting legal knowledge and mapping that knowledge onto business processes, and developing systems that can adequately handle the complexity with clarity and ease. In this paper we extend the Legal Knowledge Management system Eunomos to deal with alternative interpretations of norms connecting it with Business Process Management systems. Moreover, we propose a workflow involving the different roles in a company, which takes legal interpretation into account in mapping norms and processes, and uses Eunomos as a support.

1. INTRODUCTION
Regulatory compliance has been increasing in volume and complexity in recent years, and the trend is set to continue as a result of the financial crisis. Compliance is an issue for all kinds of businesses, including shipping, ICT, food and health, and especially the financial sector.

Until ten years ago Societas delinquere non potest was the dominant doctrine in Italian financial law. This meant that if the director of a bank or insurance company committed a crime, (s)he may be tried and punished, but the organisation would not be liable. Legislative Decree 231/2001 was a radical piece of legislation that established a different principle: financial organisations can be held responsible for criminal activities carried out by their employees even when such activities were not prescribed or authorised. Similar legislation was implemented all over the world. In the European Union, the Markets in Financial Instruments Directive 2004/39/EC (MIFID) imposes further regulations, albeit subject to different interpretations as the directive is transposed into various national legislations, and adopted.

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The fact that norms can come from different sources, many of which are updated constantly, makes it very difficult for organisations to keep track of relevant legal obligations. Laws must be interpreted and adapted to the specific business processes of the organisation. Politicians writing the laws are (ideally) only interested in the intended effects. The laws and regulations are aimed at creating that effect (what should be done) without providing all the implementation details (how it should be done) (see p. 70 of Gong [15]). For implementation further interpretation of the law is necessary. The assumed separation of concerns is that politicians focus on what should be done, whereas the administration is responsible for execution and realizing how it should be done. In reality this relationship is more cumbersome and the separation is not that clear.

Companies and auditors, who carry out audits to verify that a company is adhering to regulations, have to navigate compliance problems in an environment of uncertainty [19]. Companies and auditors both have to decide between different interpretations of norms and legal concepts used in the domain and how these apply to specific business processes. Moreover, both parties have to decide which aspects of legislation to focus on in adoption or enforcement. The details of such decisions matter. These details need to be tracked, as both the business processes or the legislation may change.

From a compliance point of view, interpretation of how norms apply to specific processes takes place at two separate stages: firstly by the auditee in designing and adapting business processes, and secondly by the auditor when assessing the compliance of the auditee. The auditee usually attempts to interpret the law in a way that anticipates how the auditor is going to interpret it. Occasionally, auditees may decide it is not worth conforming to certain norms when the cost of implementation is great compared to the fine or loss of reputation they would face in case of non-compliance. Another issue is timing: for auditees, there can be an advantage in delaying compliance in case the effects are not immediate. During the first stage, auditees sometimes do not initially have a clear view of what constitutes compliance to a particular norm, as the legal community works through the issues on a case-by-case basis. There are certain areas, such as IT security, where there is high mutual trust and transparency between auditors and auditees, so that a dialogue can take place at the adoption stage about what constitutes a proper interpretation [7]. But this is not the case in general. Usually the dialogue will take the form of a negotiation or argumentation at the audit stage, where...
parties clearly have opposing interests. The auditee’s task is made difficult by the fact that auditors can interpret norms more or less strictly, depending on public opinion and the policies of the day. How an audit is performed exactly (the working programme) is kept secret. The main reason for secrecy is that auditors cannot and do not validate everything. They validate a subset, which must be unknown to the auditee before the audit, because otherwise the auditee may decide to conform only to the audited subset if there could be an advantage in non-compliance with other norms.

All in all, it appears that there are strategic as well as material aspects to compliance. Every organization has to deal with operational risks: the risks arising from the execution of a company’s primary business functions. Operational risks include monetary loss, fraud, physical or environmental risks, risks related to human resources, regulatory compliance and so forth. Risk Management departments typically collect and assess data for each risk in order to make management decisions, increasingly also using ICT support [19]. The Enterprise Risk Management framework [9] - which comprises detailed procedures for dealing with strategy, operations, reporting and compliance, and the growth of quasi-legal officeshelves within organisations - such as chief reporting officers, health and safety officers as well as compliance officers - are according to Power [19], page 9, “a standardized response to uncertainties in organizational environments.” Power goes on to say that the “politics of uncertainty” which seeks to balance the risk appetite of organisations with the blame culture emerging from the public, media and legal domains has resulted in a compromise solution whereby “the possibility of failure and imperfection is accepted and made public” and “risk-based approaches become central to an active blame management process via the ability to demonstrate a rational process trail...”

The need for interpretation, consultation and risk management in compliance is rarely addressed in the literature on compliance monitoring systems. An exception is the compliance life-cycle, as described in the COMPAS\(^2\) project. However, commercially used rules-management systems do not begin to address the complex interpretative workflow at the heart of compliance monitoring. These types of system try to provide a declarative approach to the regulatory knowledge that applies to business processes. As they say: “separate the know from the flow” [24]. This means that there are separate repositories for rules and for process descriptions. Commercially available software systems focus on management of the current set of rules only; generally they do not provide explicit support for change management, in particular, for maintaining the correspondence between the rules and legal sources (legal changes), nor for mapping the rules onto business processes (business changes).

Research Questions.

Regulatory compliance management involves strategic aspects. One of the main objectives is to interpret the law in a way that anticipates how the auditor is going to interpret it, and to demonstrate responsible compliance management with respect to the foresight interpretations by means of an audit trail. In order to do so, compliance management needs to be supported by workflows integrated with software for Legal Knowledge Management, combining repositories of legislation with legal ontologies, to maintain a representation of relevant legislation for a specific business context. The research questions at the heart of this paper are:

(a) How to derive and maintain a representation of a specific piece of legislation, taking into account different interpretations and evolution of norms over time?
(b) How to map representations of norms (prescriptions) to business rules and business processes?
(c) How to create compliance management workflows that takes interpretation into account?

Research Approach.

In this paper we will investigate the possibilities of current approaches to compliance management and discuss challenges for Legal Knowledge Management systems. Our research approach is to extend the existing Eunomos legal knowledge management system [4] according to deal with these challenges, and integrate it in a workflow for compliance management based on [13].

The remainder of the paper is structured as follows. Section 2 surveys the state of the art in Business Process Management and regulatory compliance. Then we determine challenges for a compliance management framework in Section 3, taking into account legal interpretation. In Section 4 we describe an extension of the Eunomos system to meet the challenges, and in Section 5 we propose a workflow for compliance supported by the extended Eunomos system. The approach is illustrated by a case study in Section 6. The paper ends with an overview of future work and conclusions.

2. STATE OF THE ART

It is impossible to consider compliance monitoring without taking into account the growing trend for using Agile technologies to create business processes. The dominant methodology is Business Process Management Notation (BPMN). With specialist software such as ActiveVOS\(^2\) or Activiti\(^3\), business users can create executable business processes quickly, using a simple diagramming tool. Each diagram is converted into executable code in Business Process Execution Language (BPEL). Workflows and business processes typically involve a mix of machine and human activities: when a business process is initiated, it executes all that can be done by a machine, and then assigns tasks to the relevant personnel, either individual or by group. Individuals can then view tasks assigned to them and ‘claim’ tasks. The issue of who is authorised to do what is managed by an identity server. It is possible to assign a deadline to activities, so that overdue tasks can be escalated.

It is not surprising therefore that much academic research in compliance, e.g., [2], [16], [18], [12], have sought to develop a notation to represent norms and annotate existing business process models. Technically, business process models are reduced to traces, which can be labelled intuitively as ideal, where execution paths do not violate obligations; sub-ideal, where violations are recovered via compensatory measures; or non-ideal, where violations are not repaired [16]. However, while technically sound, the labelings are difficult to create and the notation is difficult to read for the intended

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rather than procedural: if-then rules are used to specify. Crucial in this type of approach is that it is declarative, for complex administrative processes, see for example [24].

Koehler [17] states that the first two patterns can be overcome the problem that SBVR “is not tailored towards declarative process modelling because it lacks a built-in vocabulary for expressing process-related concepts such as ‘agent’, ‘activity’, ‘event’ or ‘deontic assignment’.” (page 2) The ontology of EM-Br²ACE concepts include the following:

• Roles, such as buyer or seller
• Composite activity types, such as oversee sales order
• Atomic activity types, such as place order
• Activity event types: created, assigned, started, completed
• Event types: timeout, obligation violated
• Business concepts, such as order line
• Business fact types, such as order has deadline

A business agent (which can be an individual or an entire department) can fulfill a role such as authorising certain activities. Activities and events are distinguished - activities are performed by agents and have a certain duration, whereas events are discrete state changes that can be associated with activities. A deontic assignment represents a legal commitment of an agent to perform some activities by a certain date. Business rules can be assigned a level of

iv. business rules dynamically direct the business process flow, creating new business processes on the fly from given components, depending on the interplay between context-sensitive business rules. Some variations even generate business rules on the fly.

Koehler [17] states that the first two patterns can be observed today, while the last two patterns are rarely used.

There are software suites that are used by corporations and government agencies to handle knowledge management for complex administrative processes, see for example [24]. Crucial in this type of approach is that it is declarative, rather than procedural: if-then rules are used to specify what should be the case, not how this is to be achieved. For this reason, in principle, it becomes easier to maintain large sets of legal knowledge, independently of the processes to which they are applied. The slogan is to “separate the know (domain knowledge) from the flow (sequence of activities)”. This is supposed to ensure adaptability of business processes and reusability of process components.

However, in practice there are also problems with this kind of approach. Apparently, there is not enough guidance how to use the software. As a result, the knowledge repositories tend to get large and unwieldy, which makes it difficult to maintain and map them onto business processes. In practice, therefore, people use the software to model specific business rules, rather than generic legal knowledge. For this purpose the software may be very useful, but the claimed separation between knowledge and process is not delivered. Moreover, these systems do not support multiple interpretations of the same legislation existing alongside each other. Therefore different interpretations cannot be easily compared and managed separately and mapped to business rules and processes.

Gong’s approach [15] proposes to use agent technology for mapping legal rules onto business processes. Certain operational processes are performed by agents, so that the know and flow are further segmented in a semantically-intuitive way. Gong [15] does not take the sources of law as a starting point, but the interpretation of these sources as represented in the rules repository. The interpretation is captured by three separate domain ontologies: (1) the domain ontology for describing a unified vocabulary and taxonomy, (2) the Semantic Web Service (SWS) description for describing the basic Web Services needed to connect modules and collect information, and (3) the Business Rules model for maintaining a semantic representation of the Business Rules (in RIF and BDI format). The business rules capture the interpretation of the laws and can be executed by using resources described as SWS. These can also be human resources. Although this provides flexibility and agility to reconfigure processes, the translation from laws to interpretation is not addressed.

Goedertier et al.’s [14] have developed EM-Br²ACE to overcome the problem that SBVR “is not tailored towards declarative process modelling because it lacks a built-in vocabulary for expressing process-related concepts such as ‘agent’, ‘activity’, ‘event’ or ‘deontic assignment’.” (page 2) The ontology of EM-Br²ACE concepts include the following:

• Business rules, as embedded in the business process model (BPMN) as gateways;
• Business rules are kept separate and consulted in gateway decisions. In more complex variations, several domain-specific rule sets are maintained;
• Business rules consulted in gateway decisions depend on the outcomes of other processes or on previous instances of the current process;
• Business rules dynamically direct the business process flow, creating new business processes on the fly from given components, depending on the interplay between context-sensitive business rules. Some variations even generate business rules on the fly.

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enforceability to distinguish advice (what ought to be true) from strict obligation (what should be true). A temporal deontic rule can be used to express conditional commitments such as “It is necessary that when the buyer places an order, the buyer has an obligation to pay the seller within two time units after the seller ships the goods.” Another useful feature of the EM-BR²ACE framework are activity exclusion constraints such as “It is necessary that the activities accept order and reject order are mutually exclusive.”

The most comprehensive research project that we know of in this area is the COMPAS project, which aims to support the entire compliance life-cycle, consisting of modelling, specification, static verification and validation of process specifications (all at design time) as well as generation, usage and dynamic verification and validation of business processes (all at run time) [23]. They do so by means of a design-for-compliance approach in order to ensure compliant composition of services. Like other work on process compliance much of this work is inspired by the success of conformance checking: verifying whether a business process description conforms to some specific set of compliance requirements [22]. The COMPAS project architecture does maintain a Compliance Requirements Repository, separate from the rules that implement them, but the project does not state how this repository must be filled. How are legal requirements specific to a particular process selected and derived from the relevant legal texts, internal company policies, best practices and domain specific technical standards? How to make this selection process acceptable to lawyers?

It is also worth mentioning that there has been some research on the automatic generation of normative SVBR rules based on natural language specifications [3]. While such techniques may well be useful as a starting point for fine-tuning legal rules, the research downplays the fact that legal rules cannot be applied to business processes without an extensive interpretation process involving lawyers, compliance experts and operational managers.

No current system that we know of enables legal interpretation, which is a real problem for organisations attempting to apply the law to their area, particularly where norms are purposefully open and not specific, where European law has yet to be transposed into national law, or where there have been few test cases on what the norms mean in practice. Moreover, no system caters adequately for the ever-changing nature of the law, which can result in an unwieldy rules model. Norms and the interpretation of norms need to have a status, active or inactive, and to be linked to explanations and sources for clarification as needed.

3. CHALLENGES

In this section we summarize three general challenges for compliance management. Overcoming these challenges may serve as a kind of requirement for Legal Knowledge Management software.

1. Open norms. Compliance involves assessing the organisation’s business processes to see whether they comply with norms - which is often difficult to do with certainty. Norms are purposefully general so that they can cover a range of different scenarios, including unanticipated future developments [11, 6]. By contrast, business processes and the computer systems that support them are specific to a situation. Compliance systems should therefore be made for translating the law into executable business processes, which requires further interpretation and translation.

Consider the following example. Suppose you have the rule that some social security benefit only applies to people with less than a certain income. That means we need evidence of the income of the applicant. This does not say anything on how the administrative processes should be executed. Probably the process will contain steps like: (1) receive application, (2) validate data, (3) collect additional information (e.g. from the Tax Authority to verify income), (4) make a decision, and (5) submit the result. However, the order and importance of these steps may vary. For instance, step 3 can be left out or replaced by another verification step, based on data from the applicant or even on physical inspections.

The example shows that it requires expert interpretation to determine what range of possible processes satisfy a norm and whether a specific organisation’s business processes fall within that range, and in some cases it also requires selecting the most likely interpretation among many.

2. Communication across disciplines. Compliance is a complex area which requires the involvement of specialists with very different backgrounds - compliance officers, legal experts, business process designers, operational managers and senior managers - who are all used to discussing and viewing compliance issues in their own domain-specific language.

A common way of relating the responsibilities of the various departments is called the Three Lines of Defense model, see e.g. [10]. The first line of defense is located in the business, which should have controls built into the business processes to mitigate regulatory risks. The second line of defense consists of risk managers, compliance officers and other specialists in a role of setting norms. The third line of defense consists of internal and external auditors, who must verify whether the norms are adhered to and are effective.

3. Dynamics. Compliance management takes place in a fast-paced dynamic environment; business processes can change, and the law is constantly being updated, which brings about important requirements for a comprehensive compliance support system:

- the ability to rapidly change the legal model
- the ability to rapidly change business processes
- the ability to rapidly assess which business processes are affected by norms
- the ability to rapidly change the business model to comply with the new norms
- the ability to record decision-making and changes made to satisfy the audit trail

Business processes in financial institutions are heavily reliant on software, and compliance is pressuring organisations to change their business processes faster than the traditional software development cycle can support. This pressure has dominated the compliance system research agenda.

Below we describe how we address the above challenges. First we describe the extension of Eunomos and then we present how it is used in the workflow of compliance.
4. COMPLIANCE MANAGEMENT WITH EUNOMOS

Our starting point is the Eunomos Legal Management System, which is the result of a collaboration between the University of Turin’s Law and Computer Science Departments in the context of the ICT4LAW project. Eunomos [5] is a web-based interface for legal researchers and practitioners to manage knowledge about laws and legal concepts in different sectors and different jurisdictions. The premise that laws and legal terminology are inherently context-sensitive and replaceable is built into the system.

Each piece of legislation in the Eunomos database stored in accordance with the Norme in Rete (NIR) legislative XML standard using the ITTIG CNR parser, and each piece of legislation, document, article and paragraph is assigned an XML tag with an Unique Reference Number (URN). This means that it is easy to reference the authoritative text of the law as required.

The system links legislation to jurisdiction-specific multilingual ontologies based on the European Taxonomy Syllabus [21] created to model EU law. Terms within the legislation are linked to relevant definitions in the ontologies. Legislation-specific and generic definitions can co-exist. The rationale is that legal concepts are defined in some legislation which usually provides the context of their application. To go beyond this context, the European Taxonomy Syllabus makes it possible to formulate a more general definition based on different legislative definitions of a concept together with doctrinal work. Alternative definitions are linked by relations such as substituted by, or transposed into, or group by for generic definitions created by gathering together different definitions.

Another important feature of the Eunomos system is that it provides a mechanism for abstracting norms as special concepts called ‘prescriptions’ ([4]). Each prescription is necessarily connected to concepts in the ontology with the following relations:

- Deontic clause: the type of prescription: obligation, prohibition, permission, exception.
- Active role: the addressee of the norm (e.g., director, employee).
- Passive role: the beneficiary of the norm (e.g., customer).
- Crime: the type of crime resulting from violation of the prescription, often defined in other legislation such as the Penal Code.
- Sanction: the sanction resulting from the violation (e.g., a fine of 1 quote, where quote is defined in other legislation).

JH: what about constitutive norms, e.g. definitions? They are not prescriptions?

The system provides a powerful knowledge base for keeping up to date with the law in areas of interest. While it can potentially be used by anyone who needs to research the law, much of the legal knowledge collected and distributed by Nomotika s.r.l., a spinoff of Università di Torino, is based on the requirements of the financial sector, since they have a pressing need to keep up with an ever-changing area of the law and comply with their legal obligations. However, the system currently addresses only the normative side. The natural next step is to map norms to business processes in a way that helps companies make compliance decisions and demonstrate in an audit trail which decisions they took.

In Figure 1 we illustrate how Eunomos is extended and used as a plug-in of a BPM system in a compliance setting. We focus here on prescriptions, i.e., concepts representing obligations. A distinguishing feature of Eunomos is that it allows concepts to be related to multiple pieces of legislation, since norms rarely derive from a single legal text.

Article 1 of Law 1 in the figure can be interpreted in more than one way: Prescription1 and Prescription2 are alternative interpretations - as represented by the relation in the ontology - due to the fact that Prescription2 takes into account regulation Article 1 of Law 2. Although Eunomos is a lightweight ontology to be used by lawyers, and lacks formal semantics, the alternative relation is inspired from specifications hierarchies where specifications of a concept can be labelled as disjoint. Interpretations should be specified as being candidate or non-candidate, where in the latter case the company has determined that the interpretation is unlikely, undesirable or irrelevant. Graphically this is represented by the dotted line of Prescription1. Where there are more than one candidate interpretations, this represents an area of possible conflict, which requires careful analysis and consultation with domain and legal experts to resolve.

Figure 1: Conceptual Model of Eunomos to Support Interpretation

A similar mechanism to that described in [1] for ontological terms is used to model change over time in Eunomos for prescriptions. Legislation is amended continually, and, as a result, prescriptions need to be changed to align with the new coordinated text. Consider Article 2 of Law 3 in the figure. It is interpreted as expressing a norm: Prescription1. However, later Article 2 of Law 3 is amended by Article 1 of Law 4. The modification link is maintained in the Eu-
nomos knowledge base based on the URN identifiers of the NormalInRete standard. The modification link is reflected in the ontology: a new Prescription is linked by an override arc to Prescription, which as a result becomes inactive. Note that the new prescription is connected both with Article 2 of Law 3 and the new amending legislation Article 1 of Law 4. As described in [1], a new concept overriding a previous one inherits its relations by default, which are then adapted by the legal expert.

All these relations have an impact on the mapping with business rules and processes. E.g., Prescription is mapped onto the legal rule Rule. Rules and processes mapped to inactive or outdated prescriptions are inactive as well (see, e.g., Rule and Process). This mechanism allows the compliance manager to maintain an up to date view of both sides: the legal interpretation and the business rules. As we have seen above, in current rule-based systems for knowledge management [24, 14], rules and legal interpretations are conflated. It is possible to create, maintain and update relations between data in the Eunomos plug-in and the BPM system, since both systems use XML to structure and identify data. The prescription ontology becomes the place to add meta-information concerning compliance. E.g., Prescription is not marked as adopted; not yet or because of an explicit decision. Information about which role selected the interpretation can be added too. Creating connections from legislative text to prescriptions, to legal rules, to business rules and to business processes may seem like a lot of work, but there are clear advantages. It ensures maximum traceability, exposes potential areas of conflict and ambiguity, and helps identify those business processes that need to be examined in the wake of new legislation or amendments to legislation.

The prescriptive interpretation of new (code) legislation to prescriptions, to legal rules, to business rules and business processes may seem like a lot of work, but there are clear advantages. It ensures maximum traceability, exposes potential areas of conflict and ambiguity, and helps identify those business processes that need to be examined in the wake of new legislation or amendments to legislation. It is possible to create, maintain and update relations between data in the Eunomos plug-in and the BPM system, since both systems use XML to structure and identify data. The prescription ontology becomes the place to add meta-information concerning compliance. E.g., Prescription is not marked as adopted; not yet or because of an explicit decision. Information about which role selected the interpretation can be added too. Creating connections from legislative text to prescriptions, to legal rules, to business rules and business processes may seem like a lot of work, but there are clear advantages. It ensures maximum traceability, exposes potential areas of conflict and ambiguity, and helps identify those business processes that need to be examined in the wake of new legislation or amendments to legislation and justify choices in the auditing phase. The aim is to ensure that business users and compliance officers understand alternative interpretations. The company’s position on specific norms can be recorded in the ontology as well.

- the norm can be interpreted in only one way and is immediately applied (ideal compliance);
- the norm can be interpreted in various ways; the company has opted for one interpretation based on legal and managerial advice; the norm can be immediately applied (ideal compliance);
- the norm can be interpreted in various ways; the company has opted for one interpretation based on legal and managerial advice; the norm cannot be applied within a reasonable timeframe (ideal compliance);
- the norm can be interpreted in various ways; the company has opted for one interpretation based on legal and managerial advice; the norm cannot be applied within a reasonable timeframe and the company will pay fines as required (non-ideal compliance);
- the norm can be interpreted in various, conflicting ways, such that it is impossible for the norm to be applied with confidence; as such the company has deferred implementation until clarification ensues from regulatory sources (non compliance).

Such interpretation decisions should be recorded as ‘owned’ by the role making them: an operational manager, compliance officer, legal expert, or board of directors.

5. COMPLIANCE MANAGEMENT WORKFLOWS

We propose the use of business process management workflows in order to deal with complex legal issues in a methodical way, and to demonstrate a responsible approach to compliance to future auditors. These workflows involve communication between compliance officers, legal experts, operational management and executive management, depending on the difficulties involved. Workflows are needed to ensure compliance whenever laws or business processes are changed. When new laws come in, the workflow would cover the creation of new prescriptions and adapting existing business processes. The following workflow (Figure 2) for creating business processes and is adapted from [13]. The benefits of Eunomos are indicated for each step.

1. Analyse the nature and objectives of the process in context. The context consists of aspects like the stakeholders involved with their interests, business models and financing, the nature of the domain (financial, medical, legal, trade, etc.) Also the nature of the process matters: is it only information provisioning, exchange of information, or a full transaction which will alter the rights and duties of participants? This step should be done by operational managers or the executive management board.

2. Determine the relevant legislation from the Eunomos repository. What is considered relevant depends on the context (stakeholders, domain), jurisdiction and previous rulings, kinds of data and the objectives of the process. This step should be carried out by legal experts and compliance officers.

3. Model the new process, using the company’s business modelling system. Start from the underlying objectives, not from the current way the process is executed, because this may be improved upon. Analyse the information needs. Construct a data model for crucial concepts, for example using UML class diagrams. This produces an as-is model. This step should be carried out by modelling experts, operational managers and/or the executive management board.

4. Check if there are any prescriptions in Eunomos that are relevant to the process. Look specifically at attention points a-h listed below, in as far as they apply in context. If there are any elements of the process that are not covered by existing prescriptions, refer back to relevant legislation and check whether new (possibly alternative) prescriptions can be derived which apply to the process.

5. Using Eunomos, consider the impact of the candidate prescriptions on the business process and data definitions. This consists of a comparison of the new business process with the ideally expected situation, under various interpretations. Each comparison will lead to a list of possible conflicts and risks. For analysis purposes, one may use various simulation techniques and test alternative simulated processes, against variables such as a ‘degree of compliance’, ‘number of deviations’, ‘average lead time’, ‘average number of steps’, ‘average number of people involved’, ‘average number...
of corrections', etc. Then a selection should be made of applicable prescriptions and recorded in Eunomos. This step should be carried out by legal experts, compliance officers, rule and business modelling experts, operational managers and/or the executive management board, because each have a different interest in the business process.

6. Adapt the found deviations. This step should be carried out by rule and business modelling experts, in collaboration with operational managers, the executive management board, compliance experts and lawyers as necessary.

7.Explicitly accept the consequences of any remaining deficiencies. This responsibility lies with the executive management board.

The following process aspects are likely to have legal impact. They can serve as special points of attention, during the interpretation and adoption process.

- **Timeframes.** A set of process activities has to be performed within a certain timeframe, set by technical, legal or organisational demands. That makes the definition of process milestones relevant, e.g., entry; decision; feedback; completion.

- **Transfers.** Transfer of data and control flow between actors indicates a shift in responsibilities and may have to be accompanied by monitoring and confirmation of the transfer.

- **Messages.** Messages like reports, notifications and decisions represent the communication between actors.

- **Tasks, roles and responsibilities.** Of all process activities it must be clear who is authorised and who is responsible for execution. After execution, it must be always possible to ascertain who executed an activity in what organizational role.

- **Data definitions.** Data and evidence must comply to certain legal definitions and requirements, including representation formats (e.g. XBRL format or taxonomies).

- **Reliability.** On the basis of the evidence collected in those processes, legitimate decisions must be taken. That means requirements can be put on accuracy, completeness and

- **Information security.** Sensitive data need to be protected. Specific security concerns are confidentiality (no improper access or publication), integrity (no improper manipulation or deletion) and availability (no loss of data, archiving). Measures must be proportional: the heaviest measures only apply to the most sensitive data. Such trade-offs require a risk analysis.

- **Operational requirements.** More technical or operational requirements may also be demanded by law. Consider for example the required order of activities, actors involved, and specific product characteristics such as requirements on use of languages or readability standards.

Table 1: Distribution of tasks in Figure 2 over roles

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6. **EXAMPLE: MIFID REGULATIONS**

The following section gives an example of a piece of legislation, MIFID, that is subject to heavy debates. It admits of several legal interpretations, each with a different impact on the business processes of a financial service provider. MIFID is an EU directive that aims to increase competition and provide consumer protection in investment services.
The directive covers most tradeable financial products, such as brokerage, advice, dealing, portfolio management, underwriting etc. MiFID requires financial institutions to archive and provide frequent reports about transactions. Particularly interesting is the following obligation:

(33) It is necessary to impose an effective best execution obligation to ensure that investment firms execute client orders on terms that are most favourable to the client. This obligation should apply to the firm which owes contractual or agency obligations to the client (Directive 2004/39/EC).

The question of what counts as most favourable has been the subject of interpretation and debate. Expert groups such as MiFID Connect in the UK, composed of various trade associations, responded to this challenge by organising hearings, writing guidelines and formally requesting clarification on certain issues. In response, the European Commission provided an explanatory letter (working document ESC-07-2007) with more details on scope and examples of interpretation. To harmonise regulators' responses, the Committee of European Securities Regulators (CESR), now the European Sales and Marketing Association (ESMA) issued guidelines. Within this space of possible interpretations, the financial institution will have to choose a position, that consistent with other policies and strategic decisions. It will also have to monitor what the competition is doing.

For a financial institution seeking to adhere to this regulation, the first challenge is therefore that there is no single 'legal text' from which a rule can be derived. The company must not only consider the text of the original EU directive, but also the national act implementing the directive, the various guidelines and best practices, internal corporate compliance policies and recent jurisdiction.

The Eunomos system provides a mechanism that is in principle capable of representing this complex scenario. The text of the European legislation should be transformed into legislative XML terminology defined or referred to from suitable ontologies, and prescriptions abstracted that link back to the text of the law. Alternative prescriptions can be created to reflect the various interpretations of the legislation, official guidelines and legal doctrine. The compliance officer and legal experts can examine the various interpretations and may conclude that there are conflicting, incompatible interpretations.

Many processes in an investment firm may be affected by MiFID prescriptions, and tool support is mandatory to archive detailed client profiles, which can have a huge impact on IT systems. Depending on the interpretation of the legal concepts, more or less evidence must be collected as part of the 'audit trail' to establish compliance later, and both the business processes design and audit trail are matters to be discussed with business and legal experts, with the aim of operating in a way that anticipates the interpretation most favoured by an auditor and which at the same time is cost-effective for the company.

For instance, MiFID requires investment firms to record detailed client profiles (see e.g. article 51(3) of the MiFID execution guideline), though how this is done depends on the existing application landscape. Such profiles must provide evidence that the institution has taken all reasonable steps to obtain the best possible result for the client. How much details are needed? For instance, do we need to record information about the clients' willingness to take risks (for example: risk averse, risk seeking)? In which application should such information be recorded? In the Customer Relationship Management (CRM) system? In the system that records the financial transactions, or in a separate system set-up for MiFID reporting purposes? Do we have to store alternative offers'? Under one interpretation it is enough to record the selected offer together with general historical information about interest rates and the state of the market on that day. Another, more demanding, interpretation would require records of various alternative offers made to the client, to prove the best one was chosen.

In practice, companies that trade by providing price quotes beforehand might argue that their clients are capable of comparing quotes and selecting the best execution. In that case, the first interpretation (no alternatives; historical information) is sufficient. Unless and until the auditor has reason to believe that the company should have known that this was insufficient, the company should be in a strong position to defend its actions, particularly if its decisions are explicitly recorded and motivated in a compliance management system based on Eunomos, and if the actual business processes in fact correspond to such decisions.

7. FUTURE WORK

Mapping laws onto processes is not a trivial task, and our future work will involve the use of advanced natural language processing techniques to help legal and business experts with this work. As stated above, this mapping is carried out (a) when new laws come in and (b) when new business processes are created. Two alternative approaches can be used: by similarity or by classification.

The first approach would be to use the so called Cosine Text Similarity facility in Eunomos to find related legislation and business processes. As new legislation comes in, business and legal experts can use the Eunomos system to find similar pieces of legislation. Prescriptions from the older related legislation need to be re-considered and reinterpreted. There may be new prescriptions deriving from the new legislation that explicitly or implicitly replace ones in the older legislation, and this should be noted in Eunomos using the 'replaced_by' relation. Alternatively, prescriptions may be created that combine norms from one or more legislation sources. Every business process that is linked to prescriptions deriving from the older related legislation could potentially be impacted by the new legislation, and would need to be reviewed accordingly. The Cosine Text Similarity facility could also be used to find similar business processes in order to find other business processes that may be affected and were not discovered earlier. The algorithm would in that case be applied to XML representations of the annotated business processes.

The second approach is to search for laws that are relevant to business processes by classification, using ontologies as intermediaries. Semi-automated ontology extraction and mapping can play a critical role in aligning norms with the processes they govern due to the size of the data: hundreds of legal clauses and thousands of processes with hundreds of steps described in natural language.

We plan to use Query Expansion techniques (QE) to face the problem of finding matches between laws and processes by enriching the contents to be compared. Pseudo-relevance
feedback (PRF) and lexical databases like WordNet are two different tools for enhancing the quality of the matching between regulations and processes. WordNet’s hyponymy and meronymy relations can help systems simulate real-world inference. Moreover, generated paraphrases with Wordnet homonyms can help address language variability. Finally, we will also investigate approaches for segment matching based on Textual Entailment.

Compliance management involves not only legal knowledge but also knowledge concerning the business processes, and we cannot assume that the two worlds share the same terminology. While every jurisdiction has its own terminology, the same can be said for organisations. Usually organisations will not have an ontology of terms, so automatic creation of ontologies from text can be a solution. In [8] the authors presented an algorithm called TMine for organizing terms extracted from textual contents in hierarchical organisations, suitable for navigation, visualization, classification, and tracking. TMine extracts the most significant terms from text documents and maps them onto a hierarchy in such a way that descendant terms are contextually dependent on their ancestors within the corpus of documents.

There has been a lot of interest in the use of formal argumentation techniques to help structure and automate aspects of legal reasoning. See for example [20, 26] for a brief introduction. Could such argumentative approaches not be used for addressing our interpretation problem? We certainly believe so. Moreover, our approach of allowing an intermediate representation of prescriptions, is a natural companion of such argumentative approaches. Argumentation presupposes that independent legal positions concerning the appropriate interpretation in a specific case can be identified, compared and debated. That means, that for argumentative approaches to be useful in corporate environments, software support systems should facilitate the storage and comparison of such legal positions. That is precisely what the extended Eunomos aims to achieve.

8. CONCLUSIONS

This paper has discussed the challenges of compliance monitoring in a dynamic environment of ever-changing and uncertain normative requirements and business processes. We reviewed the state of the art in software to support compliance monitoring and concluded that no existing tools provide a comprehensive methodology for handling the issue of legal interpretation so that companies can design compliant business processes and demonstrate an audit trail. We have proposed to address this gap by applying and developing the Eunomos Legal Knowledge Management System. We introduced a conceptual model for ensuring traceability from the text of the law to its application to business process, and a workflow for designing compliant business process.

Critical is that Eunomos allows various interpretations to be represented and examined. To do so, Eunomos provides for an intermediate representation of prescriptions, located between the various legal sources and the rule-sets chosen to be implemented in the business processes. These various prescription sets can in principle also be used to handle change management in different stages. In particular, and expected change can be studied, prepared and tested, before becoming valid. Similarly, obsolete prescriptions can be kept for archival reasons. The necessity of representing various interpretations along side each other, is illustrated by the case of the MIFID regulations, which was heavily debated among various stakeholder groups, before some consensus was reached. In such cases, there is no single authoritative legal text to base decisions on. Such cases also naturally call for formal argumentation techniques, an influential approach in artificial intelligence and law.

As our case study shows, the Eunomos system, thus extended, is based on mature understanding of the legal and financial domains, and can transform compliance management theoretically and practically in a sustainable way. As a large part of the success of such support systems depends on the way people choose to make use of them, further empirical research has to validate these claims.

9. REFERENCES


