Rule-based versus Principle-based Regulatory Compliance

Brigitte BURGEMEESTRE\textsuperscript{a}, Joris HULSTIJN\textsuperscript{a,1} and Yao-Hua TAN\textsuperscript{a,b}

\textsuperscript{a} Vrije Universiteit, Amsterdam
\textsuperscript{b} Delft University of Technology

Abstract. There is an ongoing debate in law and accounting about the relative merits of principle-based versus rule-based regulatory systems. In this paper we characterize what kind of reasoning underlies the two styles of regulation. We adapt an original account of Verheij et al (1998) to take aspects of the implementation context into account, such as the process of adoption of a new norm and the roles of the participants. The model is validated by a comparison between EU and US customs regulations intended to enhance safety and security in international trade. The EU regulations (AEO self-assessment) are essentially principle-based, whereas the American system (C-TPAT) is rule-based.

Keywords. compliance, formal reasoning, principle-based, rule-based

1. Introduction

In the domains of accounting [2,20,9] and law [10,15,16,8,14] there is a long standing debate about the relative merits of rule-based versus principle-based regulatory systems. Rule-based regulation prescribes in detail how to behave: “On Dutch highways the speed limit is 120 km/hour”. In principle-based regulation norms are formulated as guidelines; the exact implementation is left to the subject of the norm: “Drive responsibly when it is snowing”. Many regulations are implemented through IT. For example, accounting standards are coded in ERP systems, and business processes are re-designed for compliance [17]. In general, IT requires detailed and specific requirements. Therefore principles first need to be tailored to a company’s specific situation, before they can be implemented [14]. A common way to adopt principle-based regulation, is to first identify control objectives and then design a system of control measures, which can be implemented as rules in computer systems [19]. Rules require less interpretation to be implemented.

One would expect that the application of principles requires a different form of reasoning than the application of rules. However, Verheij et al [21] claim that the differences between rules and principles are merely a matter of degree. They show that rules and principles have the same logical structure, but show different behavior when applied in practice. This is in line with recent work, both in law and accounting, which argues that principles and rules are extremes on a continuum [18,15,8].

\textsuperscript{1}Corresponding Author: Department of IT Audit, Faculty of Economics and Business Administration, Vrije Universiteit, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands, jhulstijn@feweb.vu.nl
In our empirical research about EU customs regulations [5], we find large differences in the way principles and rules are adopted. Implementation of a principle requires legal knowledge and expertise about the domain. Moreover, adoption of one principle often involves a trade-off with another principle. For example, companies need to invest in control measures to make their supply chain more secure. The principle of security must be weighed against the principle of profit. How much control measures are sufficient? Solving such dilemmas requires a different kind of reasoning than straightforward application of rules. This leads to the following research question.

Is it possible to explain the differences in the regulatory process of principle-based regulation and rule-based regulation, by differences in the reasoning process?

The remainder of the paper is structured as follows. In Section 2 we introduce the main characteristics of principles-based and rule-based forms of regulation. We identify a number of dimensions to determine whether regulation is predominantly rule-based or principle-based. In Section 3 we present a case study of EU and US customs’ regulations concerning security in international trade. We compare implementation of the AEO legislation in the Netherlands, which may be considered principle-based, with the US C-TPAT regulations, which may be considered rule-based. In Section 4 we characterize reasoning with principles and rules, using a formalism adapted from Verheij et al [21].

2. Characterizing Principles and Rules

In the debate between rules and principles we often see a tendency to classify legislative systems as either principle- or rule-based. The advantages of principles are then depicted as the disadvantages of rules, and vice versa. However, in practice the distinction is not so clear cut. In fact, most regulatory systems contain a mixture of rules and principles. Rules may become more principle-like through the addition of qualifications and exceptions, whereas principles may become more rule-like by the addition of best-practices and requirements [14]. “One reason why relatively younger standard setting regimes […] appear more principles-based is that they havent had as much time to accrete rules.” [18]. Therefore: “Every accounting standard will exist somewhere along a spectrum between rules and principles. The goal must be to seek the ‘sweet spot’ on that spectrum.” [9].

In legal theory, Cunningham [8] suggests three dimensions to localize a regulative system on the continuum: temporal, conceptual and functional.

1. The temporal dimension indicates when the content of a regulation is provided: rules define boundaries ex ante, i.e., before adoption and implementation, whereas a principle is settled ex post, when compliance is being audited. Rules provide certainty: when you follow a rule, you know that you will be compliant [16]. A rule-based system initially requires more effort from the regulator, because details need to be fixed in advance; a principle-based system requires effort from the subject.

2. The conceptual dimension distinguishes between principles and rules by the properties of being general versus specific, abstract versus concrete and universal versus particular. The number of clarifications, details, exceptions or limitations may serve as an indicator. The properties generality, abstractness and universality may be combined under the label of ‘relative vagueness’ [8].
Table 1. Characterization of rules and principles by dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Typical Principles</th>
<th>Typical Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. temporal</td>
<td>ex post</td>
<td>ex ante</td>
</tr>
<tr>
<td>2. conceptual</td>
<td>general / universal / abstract</td>
<td>specific / particular / concrete</td>
</tr>
<tr>
<td>3. functional</td>
<td>large discretionary power</td>
<td>little discretionary power</td>
</tr>
<tr>
<td>4. representation</td>
<td>declarative (what)</td>
<td>procedural (how)</td>
</tr>
<tr>
<td>5. knowledge needed</td>
<td>quite a lot</td>
<td>relatively little</td>
</tr>
<tr>
<td>6. exception handling</td>
<td>allow for exceptions (defeasible)</td>
<td>all or nothing (strict)</td>
</tr>
<tr>
<td>7. conflict resolution</td>
<td>by weight (trade off)</td>
<td>no conflicts possible</td>
</tr>
</tbody>
</table>

3. The **functional dimension** considers the relative discretionary power of the participants in the regulative process. Rules are defined by the regulator. Principles tend to give more space for interpretation to both subjects and auditors.

In addition to these legal dimensions, we can also consider characteristics derived from artificial intelligence and formal reasoning. The legal dimensions above apply to regulatory systems; the characteristics below apply to a single rule or principle.

4. A **declarative representation** specifies what situation is required. How this should be achieved is left to the discretion of the implementer. **Procedural descriptions** specify how, i.e. by what actions, an objective should be achieved. Generally principles are formulated in a declarative way; typical rules are procedural.

5. What **knowledge is needed** to apply a regulation? Applying rules requires relatively little knowledge. Knowledge of the rule itself and the instantiation of the concepts involved, suffices. Applying principles requires more knowledge, such as knowledge of the context and of all other relevant principles.

6. How are exceptions handled? A form of reasoning may be **defeasible**, in the sense that exceptions may occur and overrule the original line of reasoning, or **strict**, in the sense that no exceptions are allowed. This can be modeled in defeasible logic [1].

7. To **resolve conflicts** between different exceptions we will need a kind of priority order or weight. In other words: for principles there is a conflict resolution mechanism; for rules no conflicts are possible.

These last two characteristics are famously addressed by Dworkin [10]. In his terms, typical rules have an **all-or-nothing** character: incorporating an exception would in fact alter the rule. Principles can have many exceptions, but this does not diminish their validity in the legal system. Unlike rules, principles do not prescribe, but they point in a certain direction. It is possible that competing principles point in different directions. So we will have to find out which principle carries most weight.

Please note that these dimensions are not meant as necessary characteristics of either rules or principles. For example, one can easily find declarative legal rules, or legal rules which allow for exceptions. Such examples show that indeed rules and principles form a continuum. The dimensions are only meant to characterize to what extend particular regulations resemble ‘prototypical’ rules or principles.

We apply the dimensions to the case in Section 3 to determine whether the regulatory system is predominantly rule-based or principle-based.
AEO – Article 14

(b) appropriate access control measures are in place to prevent unauthorized access to shipping areas, loading docks and cargo areas;

C-TPAT – Security criteria for foreign manufacturers

Procedures for the issuance, removal and changing of access devices (e.g. keys, key cards, etc.) must be documented

Proper vendor ID and/or photo identification must be presented for documentation purposes upon arrival by all vendors

Alarm systems and video surveillance cameras should be utilized to monitor premises and prevent unauthorized access to cargo handling and storage areas.

(c) measures for the handling of goods include protection against the introduction, exchange or loss of any material and tampering with cargo units

A high security seal must be affixed to all loaded containers and trailers bound for the U.S. All seals must meet or exceed the current PAS ISO 17712 standard for high security seals.

A seven-point inspection process is recommended for all containers: Front wall, Left side, Right side, Floor, Ceiling/Roof, Inside/outside doors, Outside/Undercarriage

The cargo should be accurately described, and the weights, labels, marks and piece count indicated and verified.

Private passenger vehicles should be prohibited from parking in or adjacent to cargo handling and storage areas.

(f) the applicant conducts, in so far as legislation permits, security screening on prospective employees working in security sensitive positions and carries out periodic background checks;

Application information, such as employment history and references must be verified prior to employment.

| Table 2. Linking a selection of AEO principles and C-TPAT rules |

3. Case Study: Safety and Security of International Trade

In this case study we compare European (AEO) and US customs regulations (C-TPAT). Both initiatives try to enhance the safety and security of international trade. Although they address similar topics, they use a different approach to compliance.

**AEO** A company can apply for Authorized Economic Operator (AEO) if it is reliable throughout the EU in the context of its customs related operations [13,11]. AEOs receive several benefits in customs handling within all EU member states that can lead to considerable cost-reductions. For non-certified enterprises customs will continue to carry out the traditional supervision. Customs can direct their efforts towards checking non-certified companies to increase the security of international supply chains, while reducing the administrative burden for AEOs.

To qualify for the AEO status a company must perform a self assessment to determine whether it meets the criteria, described in the Community Customs Code and the AEO guidelines [13]. The first step is that a company collects information relevant for the AEO status, such as business processes, safety procedures, licenses and certificates, IT systems, etc. Next, the company must identify risks to which the business is exposed (using the AEO guidelines) and identify the measures that must be implemented to mitigate them [11]. The last step is to evaluate the remaining risks in relation to the line of business, and determine if additional measures are needed. The company then decides to...
either submit the AEO application or implement additional measures first. The customs first assess the validity of the application. Next, they determine the type of audit, based on the type of AEO application (customs simplification, security, or both) and on historical data about customs and tax compliance. An audit is needed to check whether the self-assessment is performed correctly, whether the company identified all the risks and has taken appropriate measures, and whether these measures are operational.

**C-TPAT** Customs-Trade Partnership Against Terrorism (C-TPAT) is an initiative of the United States Customs and Border patrol (CBP) to try and increase the safety and security of supply chains in international trade [6]. Like AEOs, C-TPAT members are entitled to certain benefits (reduced inspections, priority handling, etc.) if they can ensure the integrity of their own security practices. Furthermore, C-TPAT is a prerequisite for the Free and Secure Trade (FAST) program, which provides fast expedited cargo processing at the US borders with Mexico and Canada.

In joining C-TPAT, companies sign an agreement to work with CBP to protect the supply chain, identify security gaps and implement specific security measures and best practices [6]. Additionally, C-TPAT partners have to provide CBP with a security profile outlining the specific security measures the company has in place and how security is addressed throughout their supply chain. A certified partner is a participant that has had their security profile reviewed and deemed acceptable. The last step is validation, in which the CBP reviews the security measures and procedures to verify that the company’s security plans are effective and accurate.

**Characterizing AEO and C-TPAT** In Table 2 we show three principles from article 14 of the AEO legislation concerning safety and security [12] and selected some matching C-TPAT rules from the Security criteria for foreign manufacturers [7]. Using these regulations as example, we will now try to locate AEO and C-TPAT on the scale by the dimensions of Section 2. The results are shown in Table 3.

1. Under AEO, a company must interpret what is meant by regulation (c): “measures ... against the introduction, exchange or loss of any material”. This interpretation is verified afterwards, when the auditor makes a visit. C-TPAT indicates in advance which measures are obligatory: “PAS ISO 17712 standard for high security seals”.

2. Table 2 shows that AEO is indeed more general and abstract. C-TPAT is more specific and concrete. To use the same example: the general requirement to protect “against the introduction, exchange or loss of material” corresponds to the concrete requirement to implement a “high security seal”. AEO guidelines are also more universal. High security seals can only be applied to containers, but for bulk goods which are shipped in high-pressure tanks, the concept does not make sense.

3. In C-TPAT the regulator (here: CBP) has already decided what counts as “being in control of security in the supply chain”. There is little discretionary power for both companies and auditors. By contrast, AEO guidelines leave much space for interpretation, based on the risk assessment.

4. It is easy to check in the examples that AEO regulations are formulated in a declarative way; C-TPAT on the other hand contains both declarative (e.g. “The cargo should be accurately described”) and procedural clauses (e.g. “A seven-point inspection process is recommended for all containers: Front wall, Left side, Right side, Floor, Ceiling/Roof, Inside/outside doors, Outside/Undercarriage”).
5. Both AEO and C-TPAT rules require expertise of the domain, e.g., what is a high security seal. However, the application of principles also requires a different kind of knowledge, namely, knowledge about what it means to be ‘in control’ of safety and security. In practice, this kind of knowledge is hard to obtain.

6. AEO deals with exceptions up-front, by ‘understanding the business’ and a risk assessment. C-TPAT does not have a formal procedure for handling exceptions. There are two solutions: a company implements a rule that has no real function, or the company must negotiate with CBP to allow alternative measures. This requires CBP to evaluate these measures against the principle that apparently motivates the rule.

7. In AEO applications the risk assessment determines the relative weight attached to certain business risks versus security risks. It is implicitly understood that security should weigh more heavily than, say, profit making. On the other hand, business principles will put a limit on security investments. Basic measures are good enough. In C-TPAT there are also trade-offs, but here the base-line (what is good enough) is set by the rules; not by the circumstances of the company.

What can we conclude from this characterization? It is clear that AEO self assessment does indeed classify as principle-based regulation. It has all the properties. C-TPAT has many of the typical rule-based characteristics, but also some of the principle-based ones. It can be located more towards the rule-based end of the scale.

4. Reasoning with Principles and Rules

Section 2 lists differences between principles and rules. Do these differences affect the reasoning? Verheij et al [21] claim that the logical structure of rules and principles is the same. Their argument runs as follows. “If the condition of a rule is satisfied, the rule is applied and its conclusion follows directly. [...] In contrast with a rule, a principle only gives rise to a reason for its conclusion if it applies. Moreover, there can be other applying principles that give rise to both reasons for and reasons against the same conclusion. A conclusion then only follows by weighing the pros and cons.” [21, p 2.] Next, they argue, also a rule may be represented as providing a reason for its conclusion. So for a rule or principle in isolation, the difference in logical structure disappears. When various principles apply, the difference lies in the weighing process. Moreover, they observe that legal rules are generally motivated by some underlying principles. For established rules, the potential conflicts between principles have already been solved in the political process. Such a rule is said to replace the underlying principles.
fact or principle

rule or principle

reason

validity

exclusion

applicable

applies

weighing

Domain, task and roles

The example used by Verheij et al [21] concerns an article from Dutch civil law, that the sale of a house should not terminate an existing rent contract. It embodies a dilemma between the principle that inhabitants should be protected against eviction, and the principle that a contract only binds the contractual parties. In this case, parliament has considered the first principle to be more important. Therefore, when the judge derives a verdict, there is indeed no difference in reasoning. In this paper however, we focus on a less ‘crystallized’ setting: safety and security in international trade.

Apart from the domain, also the tasks in the regulative process, and the roles of the participants are different. In the rental example, the task is adjudication: the judge delivers a verdict, based on the relevant laws, jurisprudence and evidence. In our example, we consider at least three tasks: adoption, implementing and auditing. The adoption task is similar to practical reasoning. This kind of reasoning may be compared to value-based argumentation techniques [3]: the company must justify with reference to control objectives (goals) and its risk appetite (values) why the control measures (actions) are appropriate and sufficient, given its line of business. In implementation, both rules and relevant principles can be applied, provided all relevant contextual factors have been decided on. Here, we find little difference. Finally, the auditing task is similar to adjudication: based on evidence, the auditor must judge whether the measures are sufficient, and are implemented effectively. In an established domain we find little difference between rule-based and principle-based reasoning, but without commonly accepted rules, the judge or auditor will first have to provide a practical reasoning argument to judge whether the subject’s conduct was reasonable given the circumstances. Note that ‘reasoning’ in a strict sense, i.e. applying a rule or principles, makes up only a small part of these tasks. Most effort will go into collecting evidence, selecting relevant laws and jurisprudence, and constructing a convincing argument.

Reason Based Logic

Essentially Reason Based Logic is a version of Predicate Logic, with a number of primitives for expressing facts, rules, reasons etc (Table 4). The meaning of these primitives is ensured by a number of properties. A fact \( f \) can be a reason for a certain state of affairs \( sa \) holding: \( \text{Reason}(f, sa) \). To read the expressions in Table 4, realize that \( f \) is an instantiation of \( \text{condition} \) and \( \text{state of affairs} \) is an instance of \( \text{conclusion} \). A rule is applicable, when its precondition is a reason to apply it. Moreover, a rule can only be applicable when this fact is true.

\[
\text{Applicable}(\text{rule}(c_1, c_2), f, sa) \text{ is true iff } \text{Reason}(f, \text{applies}(\text{rule}(c_1, c_2), f, sa)) \text{ is true.}
\]

If \( \text{Applicable}(\text{rule}(c_1, c_2), f, sa) \) is true, then \( f \) is true.
A rule or principle applies when the fact that makes the rule/principle applicable is a reason for the conclusion, or, equivalently, a reason against the opposite of the conclusion.

For all $f, sa$ there are terms $c_1$ and $c_2$, such that $Applies(rule(c_1, c_2), f, sa)$ is true if and only if $Reason(f, sa)$ is true.

Note the difference between applicable and applied. When a rule or principle is applicable there are one or more reasons for applying it, but there may also be reasons for not applying it. By contrast, a typical rule applies exclusively.

Next we consider weighing. A set of reasons makes a conclusion true, if the pros outweigh the cons, provided that no con is overlooked. It is possible that one or more pros are overlooked; in that case there are already sufficient pros to outweigh the cons.

If $Reason(pro_1, sa),...,Reason(pro_n, sa), Reason(con_1, not-sa),...,Reason(con_m, not-sa)$, and $Outweighs\{pro_1,...,pro_n\},\{con_1,...,con_m\}, sa)$ are true, then $sa$ is true, or else there is a different con such that $Reason(con, not-sa)$ is true.

Reason-Based Logic itself does not determine which set of reasons will outweigh another set of reasons. This is an extra-logical fact. However, when all reasons point in the same direction, any set of reasons outweighs the empty set of reasons.

Reasoning in the case  We will now discuss an example, based on conversations with customs officers about an actual AEO application. We use a semi-formal representation, because a formalized version would require too much explanation about the domain.

Consider again principle (c) of Table 2. We follow the reasoning of a petro chemical company ‘PCC’ that has applied for both C-TPAT and AEO certification. PCC produces explosive liquids and gases. Production processes are almost fully automated. The cargo is shipped in large high pressure tanks. These tanks are transported by trucks over the road. Because of the nature of the goods, security is important but, because of the low value of the goods per unit, the costs of security must be kept low. This precludes new technological solutions. Their proposed solution is to hire trustworthy truck drivers and reduce their incentive to commit fraud by paying a high salary.

**principle**: Require (c) measures for the handling of goods include protection against the introduction, exchange or loss of any material and tampering with cargo units.

**context**: petrochemical company, explosive goods, low value of goods per unit, automated processes, transport in high pressure tanks, transport by road, ...

**priorities**: Security is important, but costs per product must be kept low.

**reasons pro and con implementation of control measures**:
- If tanks are under pressure, introduction, exchange or loss of materials is impossible.
- Inside PCC premises, tanks are well protected.
- Outside PCC premises, an electronic tracking device can be installed.
- Outside PCC premises, the truck driver is responsible.

**conclude**: For high pressure tanks, security seals are not needed.

**principle**: Explosive goods must be well protected.

**conclude**: Do not invest in electronic tracking. Pay truck drivers a high salary.
Note how hard it is to represent this kind of reasoning in condition-conclusion pairs. Instead, the decision making can be much better represented by a risk assessment, as required by many security standards, or by an argumentation, compare e.g. [3].

Now we consider the corresponding rule from C-TPAT:

**rule:** A high security seal must be affixed to all loaded containers and trailers bound for the US. All seals must meet or exceed the current PAS ISO 17712 standard.

**context:** PCC is sending shipment TX4312 to customers in Texas. Texas is in the US.

**conclude:** A high security seal must be affixed to shipment TX4312, which meets or exceeds PAS ISO 17712.

The example shows that principles and rules in the safety and security domain are used in fundamentally different way. Rules are applied mechanically whereas principles require the weighing of alternatives. Principles need to be interpreted in a certain context. Rules should take all contextual facts into account. Furthermore, different conclusions can be drawn on the basis of the same facts. The example also identifies a limitation of rules. What if a rule is not really necessary, but only required for compliance ‘on paper’? Should one still apply such a rule, which may lead to a fake sense of security?

### 5. Conclusions

This paper revives the debate about rule-based and principle-based regulation. Given the attention the debate has been given, one would expect that there are crucial differences between the two styles of reasoning. However, researchers in law and accounting have argued that there is no fundamental difference, but that regulatory systems composed of rules and principles can be seen as extremes on a continuum, e.g. [18,8]. The actual differences between rules and principles are treated as dimensions by which a set of regulations can be localized on the continuum. This position coincides with that of Verheij et al [21], who claim that there is no difference in logical structure.

In our case study we demonstrate that there are clear differences between safety and security regulations from the EU (AEO) and from the US (C-TPAT). Using the dimensions, these regulation systems can indeed be located on the continuum: AEO is principle-based and C-TPAT is largely rule-based. The dimensions may help to explain why in practice applying for an AEO certificate is considered hard; the number of successful applications stays below what was to be expected. In many cases companies have been asked to withdraw their applications.

We have re-applied the Reason-Based Logic approach to an example which is typical for the trade-offs found in applying principle-based regulations. The example shows that many modeling decisions needs to be made: what counts as a reason, and which set of reasons outweigh which other set of reasons? Such decisions can be made by a risk assessment, or by value-based argumentation techniques [3]. In the examples of Verheij et al these decisions have already been made in the political process. In our case, both companies and auditors are struggling to reach consensus on these issues.

So the answer to our research question depends on the task and the domain. For the adoption and auditing tasks, the empirical differences can be explained by the need to select and weigh relevant principles based on contextually relevant facts. This requires special expertise. In standard settings, and also during implementation in a computer system, we expect little differences.
For each new regulation, consensus has to be reached about what counts as acceptable [16]. We call this social negotiation process norm emergence. Our future research investigates which factors determine norm emergence. For instance, what is the impact of the communication between subject and regulator? We start from Australian experiences with responsive regulation [4]. Regarding practice, our findings suggest that regulators should collaborate with branch organizations to provide sector-specific guidelines, which may help companies to implement the necessary control measures.

Acknowledgements We would like to thank Dutch Tax and Customs Administration.

References