Formal representation of Corporate Governance Principles and Codes

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Abstract

The Corporate Governance decision making process is very complex, involving heterogeneous actors like shareholders, stakeholders, board of directors, audit committee, and managers (individuals or groups). All these are subject to a set of principles and codes that lead to effective and efficient Corporate Governance (CG). Reports on the GC, based on application of these principles and codes are very difficult to analyze and interpret. In this paper we perform a syntactic and semantic analysis of the principles and codes of Corporate Governance. We build a model of formal representation of the CG domain knowledge by syntactic and semantic analysis of CG principles and codes. We also present the implementation of the model in the decision support systems for CG effectiveness assessment based on artificial reasoning.

Keywords: Corporate Governance, semantic, knowledge representation, ontologies, decision support system;

1. Introduction

With the increasing number of financial scandals and the appearance of the crisis, Corporate Governance (CG) has become a priority subject in most countries. In general CG represents a system of regulations, processes and actions by which companies are directed and controlled [1] in order to reduce agency problems in the relationship between shareholders (principal) and managers (agent) [2, 3]. In most part, relationship problems between principal and agent are generated by the existence of information asymmetry between them. Information asymmetry [4] affects, besides the two parties, the stakeholders as well. In this context CG comes to assure a balance through a mechanism of monitoring and controlling of the managers.

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The issues within the agency relationship at a corporate level are solved by good corporate governance. Generally, good corporate governance includes:

- a balance between entrepreneurial spirit and that of control, and also between performance and the conformity with the corporate governance norms [5];
- the existence of a proper environment for performance based management, focused on a mechanism that will ensure integrity and transparency in the decision-making processes [5];
- clearly setting the company objectives, the means through which these objectives are achieved, and also the methods of evaluating performance [5];
- increasing company performance [6, 7];
- transparency in the management and the executive committees decision-making processes [8, 9];
- minimizing company risks [9, 10, 11];
- increasing investors’ trust in the company and making a higher company value [12].

In the last few years more and more companies, especially publicly traded, are required by regulations and legislation to disclose reports of Corporate Governance (CG).

A study by Ojah and Mokoaloli-Mokoteli [13] made in 2012 on a panel of 44 countries regarding the financial reports on the Internet in the context of the CG models, shows that with the development of institutional infrastructure and physical infrastructure, the interest in the adoption of the Internet financial reporting system increases too. Thus, the technological development of information technology and telecommunication from the recent years leads to the orientation of more and more companies to the disclosure of financial and CG related data over the Internet [14, 15].

We consider the companies that adopt these methods of disseminating financial and non-financial information raise their level of transparency towards shareholders and stakeholders. Also, given the role that the management has in agency relation, such an approach could increase the responsibility of management in the company.

For a better CG a number of institutions have issued a series of documents that regulate the CG system [16]. These documents are usually codes and principles of good practice on CG. This way, companies have a guideline on which CG system should comply.

CG reports are documents containing details of the ownership structure, the Board of Directors, management and the relations and interests of these participants. To see if a company has a system of CG well done, it’s required the interpretation of CG reports in the context of principles and codes of proper CG. The problem that appears in this interpretation is given by the descriptive nature of CG reports codes or principles, as texts. Thus, it is necessary that these documents to be represented as a model of concepts and rules based on syntactic and semantic representations.

To evaluate the efficiency and effectiveness of CG mechanisms, both companies and those involved in CG systems need modern information systems to process automatically machine-readable data and to allow the extraction and processing of knowledge from various fields.

In this paper we present a model of formal representation of the CG domain knowledge by syntactic and semantic analysis of CG principles and codes of good CG. We will also show how this model can be used in a decision support system for the evaluation, in an integrated manner, of the effectiveness and efficiency of CG mechanisms within companies based on artificial reasoning.

2. Research methodology

The main objective of this research is to build a model of formal representation of the CG domain knowledge by syntactic and semantic analysis of CG principles and codes of good CG. Another objective is the implementation of the model in the decision support systems for CG effectiveness assessment based on artificial reasoning.
This study is based on quantitative research of codes and principles of good practice in CG. Selected sample contains 30 principles and codes of good CG from Europe, USA, Russia, Australia, China, Japan, Brazil and Argentina. Data source was created from ECGI (European Corporate Governance Institute) website [17]. The analyzed period was 2000-2011. The sample was selected from active countries in terms of regulations and concerns about the CG. The language used was English.

The selected sample of principles and codes where syntactic and semantic analyzed and represented. The instruments used in the syntactic analysis and representation was GATE from University of Sheffield and at the level of semantic analysis and representation was used Protégé from Stanford University.

3. Construction and description of the model

The main result of this research is the model of a formal representation of the Corporate Governance principles and codes for defining a CG domain knowledge.

CG field is governed by codes and principles of proper practice. These codes and principles are developed by public authorities and governmental or non-governmental institutions. The codes and the principles of good CG can take the form of a set of concepts and rules (or recommendations). These sets can be modeled from both syntactically and semantically point of view so they can be used in analysis tools of CG reports published by companies.

For building a model and getting proper and full domain formalism we chose the sources codes and principles published on the ECGI website. In the selected sample were included codes and principles from: Europe, USA, Russia, Australia, China, Japan, Brazil and Argentina. The analyzed period was 2000-2011.

Having as a starting pattern the document collection represented in English we started developing the model in components shown in figure 1.

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![Diagram](image-url)

Fig. 1. Structure of the model.
The general principle for the construction of the model is the fact that any document that represents a code or principle can be modeled syntactically and semantically so based on it to be generated a field of knowledge in CG.

The purpose of the syntactic formalization component of the model is to identify and determine the structure and hierarchy of language objects specific to each code and principle. Given the structure of concepts in a document (codes or principles) we selected description logic for the syntactic formalize. The logic description is a formal language for representing knowledge. Overall description logic is used to model the structure and relationships of concepts, roles and actors. Such terminology (TBox) on concepts and principles code can be represented as follows:

\[ \text{Principles} \equiv \text{Actors} \cap \text{Recommendations.Rules} \]

\[ \text{Codes} \equiv \text{Principles} \]

In Figure 2 is shown the identification of the set of actors in syntactic analysis using GATE application.

![Fig. 2. Structure determination of CG set of actors.](image-url)

The role of syntactic component of the model is to create the structure and hierarchy of concepts in the CG domain. These concepts and relationships between them will be further formalized by the semantic component.

Semantic component of the model describes the meaning of the concepts used. Component implementation was achieved by developing an ontology for the representation of CG domain knowledge through the overall concepts and relationships between these. According with Gruber, 1993, ontology is "explicit formal specifications of the terms in the domain and relations among them" [18]. Generally ontology can also be defined as a representation of shared conceptualization, from a field. The basic elements of ontology are: classes (concepts), properties (slots or roles) of concepts that describe concepts, restrictions slots, called "facets" or
restrictions roles. Ontology development was conducted within the Protégé application from Stanford University. In Figure 3 it’s shown part of the hierarchy of concepts in the ontology built in Protégé.

![Figure 3. Concepts in the ontology hierarchy built in Protégé.](image)

The facts and rules are specific instances of concepts, of relations between concepts and restrictions on concepts.

CG domain knowledge is represented by the structure of concepts, meanings and relationships between them. Also ontology together with instances of classes represents the knowledge base of the domain.

Integrating this model within a decision support system based on domain knowledge defined by ontology allows the analysis of GC reports by interpretation of rules and concepts instances. Having as input the codes and principles of good practice and applying our CG model, it can easily be generate the knowledge needed to evaluate the reports of CG. In Figure no. 4 we present a DSS workflow that uses our model.
4. Conclusion

The main result of this research is to build a formal representation model of CG codes and principles for defining a CG field of knowledge. This model can be integrated in decision support systems for analyzing the effectiveness and efficiency of CG mechanisms. In the same time the model can contribute to the representation of information from CG domain so that companies can optimize their CG processes. In this way CG mechanism can achieve their goals more easily and more precisely in terms of reducing information asymmetries and balancing agency relationships.

Another significant contribution of this research is the construction of an ontology of concepts, properties and relations of CG domain.

The limits of this research are given by: the language used focusing only on English; codes and principles allow changes so that the model has to be updated with new rules or concepts.

In the future we intend to optimize this model by testing it on a significant set of reports of publicly listed companies.
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