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Modelling an Information System for Good Corporate Governance and its Impact on The Capital Structure

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Abstract. Corporate governance has received a lot of attention in current studies around the world, especially after the numerous scandals and bankruptcies of some of the world's largest companies. The objective of this paper is to contribute to the existing literature on corporate governance and capital structure decisions in listed companies in Morocco. We focus on the design, modelling and implementation of a computer application dedicated to simulating the impact of corporate governance, as measured by CEO characteristics, board composition and ownership structure. An econometric analysis of data gathered from 53 Moroccan listed companies, from 2012 to 2019, allowed us to first identify the interactions between the variables related to corporate governance mechanisms and those of the capital structure. Then, we modelled these interactions using a unified modelling language to implement a financial decision support information system. Finally, we propose a standard model of corporate governance mechanisms that can define an optimal capital structure for a company. This model can be used as a basic model in our project to implement a good corporate governance information system.

Keywords: Information System, Corporate Governance, Capital Structure, Listed Companies

1. Introduction

The manager of a company must not only be able to solve problems quickly, he needs also to anticipate them at the right time, help the company find new opportunities and obtain good prospects for new development (AlRababah, 2017). The multiplication of financial or economic crises, or in other words situations that cannot be subject to traditional controls, help to better anticipate, manage and predict. Information systems (IS) are an integral part of corporate governance (CG). It matches with the establishment of means by which stakeholders can make sure that their concerns are taken into consideration in the information system operation. The term "governance" is well recognized and used in the business world. It refers to the monitoring and control of the role and behaviour of management (Evan, 2022). Worldwide interactions and globalisation are leading to greatly increased competitiveness. Multi-national companies have substantial means to mitigate its consequences by seeking strategic rather than operational alternatives (Vicard, 2020). On the other hand, companies are obliged to invest more in operational processes by looking for simple solutions to optimise physical and information flows (Jacobs, et al. 2021). The objective of the information system is to provide all decision-makers with the information they need in order to be able to decide on the implementation of the most appropriate action at the right time. Our objective is then to develop a reference model of the information system that can help companies maintain a CG that allows an optimal capital structure (debt and equity), hence the financing structure that maximises the value of the company.

To reach our objective, we conducted a study on companies listed on the Casablanca Stock Exchange – Morocco - in order to define the corporate governance mechanisms that can most likely impact their capital structure. This study allowed us to define, first, the interactions between CG and CS. Then, it helped us to conceptually define the different elements of our simulator using the Unified Modeling Language (UML). This model will present the different CG factors that can provide managers with a vision on future financial strategies. The perspectives of this work consist of realizing a computer platform which will offer to the decision-makers a set of indicators optimizing decision making.

In this direction, we are looking to answer the following question in this research:

How to simulate, via an IS, the contribution of the CG to the best company financing choice?

To rough draft the answers to this question, we will first propose the architecture of our information system, and then present our work methodology, which is divided into three stages:

- The determination of the links that may exist between CG mechanisms and CS through a statistical analysis of data based on listed companies

– The determination of the elements of our model using the UML language, which will enable using both steps to present the overall design of our WEB application.

2. Architecture of the Proposed Information System

The composition of this simulator is coherent with the global architecture of the company. The proposed model will consist of exporting data from the IS previously installed within the company to our simulator by relying on data communication interfaces to create an interconnected architecture.

This architecture will offer an optimisation of the data exploitation and will facilitate their insertion in our model.

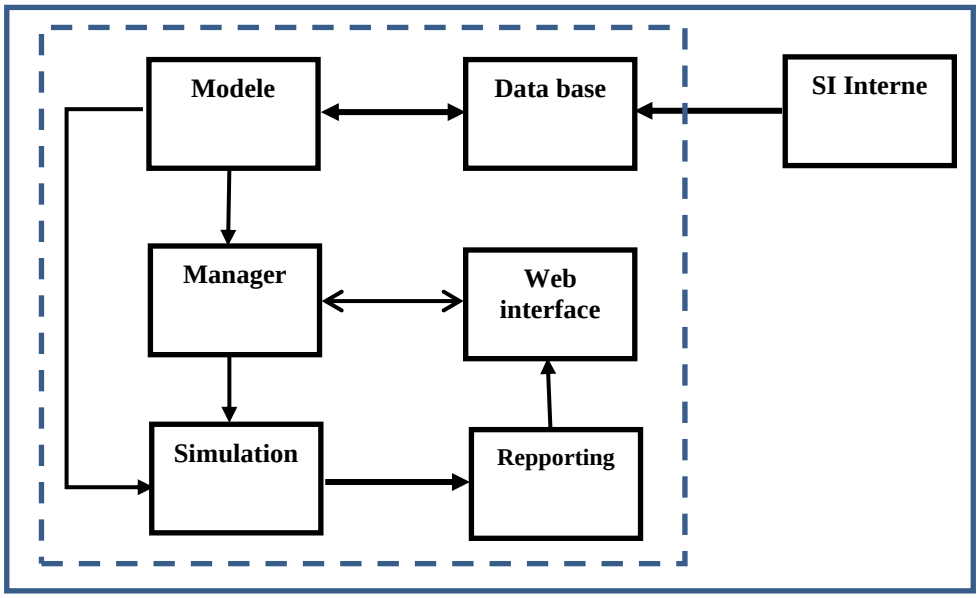

Fig. 1: Architecture of information system

3. Methodology

To answer our issue, our research methodology will be based on three critical steps. The first one is to conduct a statistical reading of the data related on the study of the impact of CG mechanisms on CS, through a statistical data analysis from listed companies in Morocco between the period of 2012 and 2019. The objectif of this step is to examine the nature of potential links between CG mechanisms and CS. The second phase consists of conceptually defining, thanks to the results of the previous step, the different elements of our system using the UML language. In the last step, we present the overall design of our web application.

For this purpose, a large amount of data including company information is

processed. For practical and confidentiality reasons, only public information on the CG and CS of the companies is used.

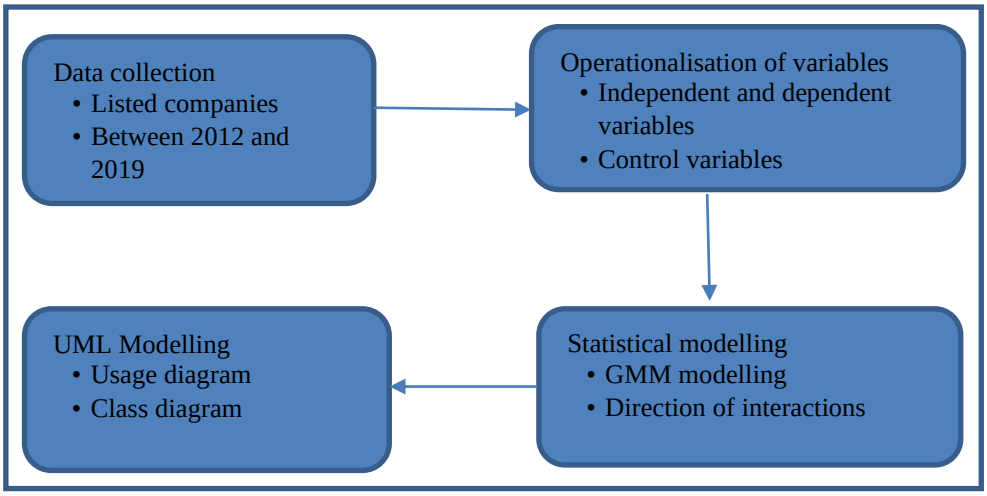

Figure 2: Interaction definition phases

4. Presentation of the Statistical Analysis Results

4.1. Definition of corporate governance mechanisms

The first step in developing our simulator is to define the CG mechanisms that have an impact on CS. According to our literature review, three mechanisms are highlighted:

- The composition of the board of directors (Naciti, 2019),
- Ownership structure (Feng et al., 202)
- CEO characteristics (Dwekat et al., 2020) (see Figure 2 above).

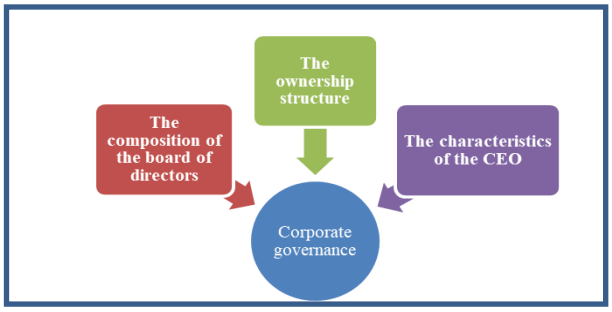

Fig. 3: Corporate governance mechanisms

Table 1 below presents the measures for each component of the EG mechanisms that will help us conceptualise our model.

Independent variables:

The influence of the board of directors (BoD) will be measured through four data: The presence of independent directors on the BoD, the frequency of BoD meetings, the number of directors on the BoD, and the number of women on the BoD

The influence of the ownership structure will be measured through four traits: Capital concentration, the presence of institutional investors, the presence of foreign investors and the managerial ownership.

We analyse the impact of CEO characteristics through four pieces of information: CEO tenure, CEO age, separation of CEO and chairman of the board of directors (PCA) roles and CEO nationality. This table also presents a summary of the different governance mechanisms used in this study.

Dependent variables:

Debt

Control variables:

- Profitability: Net income/Total assets;
- Tangibility: Tangible assets/Total assets;
- Size of the company: Ln (Total assets);
- Growth = [Turnover in year N] - CAN-1)/ CAN-1.

Table 1: Definition of variables

Mechanism	Variables	Acronym
Composition of the Board of Directors	The presence of independent directors on the Board of Directors	INDI
	Frequency of Board meetings	RAG
	Number of directors on the Board of Directors	TACA
	Number of women on the Board of Directors	FACA
The ownership structure	Capital concentration	CONP
	The presence of institutional investors	PROI
	Presence of foreign investors	INVET
	Managerial ownership	PROM
Characteristics of the CEO	The length of the CEO's term of office	PDGMAND
	The age of the CEO	PDGAGE
	Separation of the roles of the CEO and PCA (Chairman of the Board)	PDGDUAL
	Nationality of the CEO	PADGNATI
Dependent variable	Total debt	REDT

Control variables	Profitability: Net earnings / Total assets; Tangibility: Property, plant and equipment/Total assets; Size of the company: Ln (Total assets) ; Growth = [Turnover of year N] - CAN-1)/ CAN-1 ;	RENT TANG TAIL CROIS

In order to identify the interactions between CG mechanisms and CS, we used panel data econometrics. In this paper, we used the generalized method of moments (GMM) on our sample firm data under the following three econometric models:

Model « Characteristics of the CEO»: $REDT_{i,t} = \beta_1(REDT_{i,t-1}) + \beta_2 PDGAge_{i,t} + \beta_3 PDGNati_{i,t} + \beta_4 PDGDUAL_{i,t} + \beta_5 PDGMand_{i,t} + \beta_6 RENT_{i,t} + \beta_7 TANG_{i,t} + \beta_8 TAIL_{i,t} + \beta_9 CROIS_{i,t} + \varepsilon_{i,t}$

Model « Composition of the Board of Directors » : $REDT_{,t} = \beta_1(REDT_{i,t-1}) + \beta_2 FCA_{i,t} + \beta_3 TACA_{i,t} + \beta_4 INDI_{i,t} + \beta_5 RAG_{i,t} + \beta_6 RENT_{i,t} + \beta_7 TANG_{i,t} + \beta_8 TAIL_{i,t} + \beta_9 CROIS_{i,t} + \varepsilon_{i,t}$

Model « The ownership structure» : $REDT_{,t} = \beta_1(REDT_{i,t-1}) + \beta_2 CONP_{i,t} + \beta_3 INVET_{i,t} + \beta_4 PROM_{i,t} + \beta_5 PROI_{i,t} + \beta_6 RENT_{i,t} + \beta_7 TANG_{i,t} + \beta_8 TAIL_{i,t} + \beta_9 CROIS_{i,t} + \varepsilon_{i,t}$

The above statistical regression models, which we tested in Stata software, allowed us to have the links between corporate governance mechanisms as independent variables and capital structure as dependent variable. The results of this regression are presented in the next subsection.

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4.2. The Results Obtained from the First Step

The results obtained are summarized in Table 2 above

Table 2 : Regression result

(-): Negative impact; (+): Positive impact

	Variable indépendante	IMPACT
Characteristics of the CEO	PDGAGE	-
	PDGDUAL	-
	PDGMAND	-
	PDGNATI	+
Composition of the Board of Directors	INDI	-
	FACA	-
	RAG	+
	TACA	-
	BIG4	-
The ownership structure	CONP	+
	INVET	+
	PROM	-
	PROI	+

We notice through this first step that the components of the CEO's characteristics have almost all a negative impact on the debt except the CEO's nationality.

As far as the determinants of the board composition are concerned, only the frequency of meetings has a positive impact on our dependent variable.

Finally, for the ownership structure apart from managerial ownership which has a negative impact on debt, all the other determinants have a positive impact on our dependent variable.

4. Information System Modelling Phase

The IS is defined as an organised set of resources (human, software, hardware, procedures and data) that enable the collection, sorting, classification, processing and transmission of information on the work environment (Aouhassi and Hanoune, 2018). This system capitalises on collective knowledge and strongly influences the organisation, decisions and management. It must make relevant information available in the right place at the right time. Poor management requirements leads to a greater chance of failure for the entire company's projects (Rahat et al 2018). A dedicated IS helps companies to automate and integrate all factors of CG. The automation and integration of these factors allows the organisation to have a great control (Rahat et al 2018). In other words, information becomes quickly accessible and simulatable which makes financial decisions easier to make. The aim of our paper is to set up a simulator that will help the manager have the best GE composition that guarantees an optimal CS.

4.1. Selected Modelling Approach: Object Oriented Modelling (UML)

UML is a method using a graphical representation. The use of that type of representation is an excellent complement to textual representations (Ahmad et al., 2019). Indeed, both are ambiguous but their simultaneous use reduces the ambiguities of each. The choice of the UML language for the modelling of our application is due to these different advantages.

- SCENARIO OF USE OF OUR SYSTEM BY THE MAIN ACTORS

Initially, we will describe the scenario that can be used from the point of view of the decision maker, the main user of the system. This scenario consists of describing the actions and reactions between the system and the decision maker. The system starts by identifying the decision maker(s). If it is a new user, a questionnaire is given to him/her. It consists of a set of personal questions which purpose is to define the characteristics of the manager that are among the mechanisms of CG. The set of answers will allow the system to calculate the values for the length of time in office and the age of the manager. When a manager is already registered, the system will propose to the decision-maker to have a global view on one or all of the values of the CG mechanisms. Based on these indicators, the decision-maker can generate the CS situation of his/her company. Finally, the system will also offer the decision-maker the possibility to simulate the CS of his company by modifying the different GE values.

The second stakeholder in our system is the one in charge of inserting the values related to the two remaining CG mechanisms, namely, the composition of the Board and the ownership structure as well as those of the CS (Debt and Equity) and which can be summarised as follows:

- The number of independent directors on the Board ;
- The number of meetings held during a financial year;
- The number of meetings held during a financial year;
- The number of women on the board;
- The number of directors on the board;
- The percentage of capital held by the majority shareholder;
- The Institutional investors holding a share of the company's capital;
- The foreign investors holding a share of the company's capital;
- The mangers with a stake in the company's capital;
- Is the CEO a PCA?
- The amount of long-term debt ;
- The amount of short term debt ;
- The turnover in year N (and N-1 if not available) ;
- The amount of tangible assets ;

- The amount of total assets;
- The result for the year.

The diagram used by the webmaster is highlighted in Figure 3 :

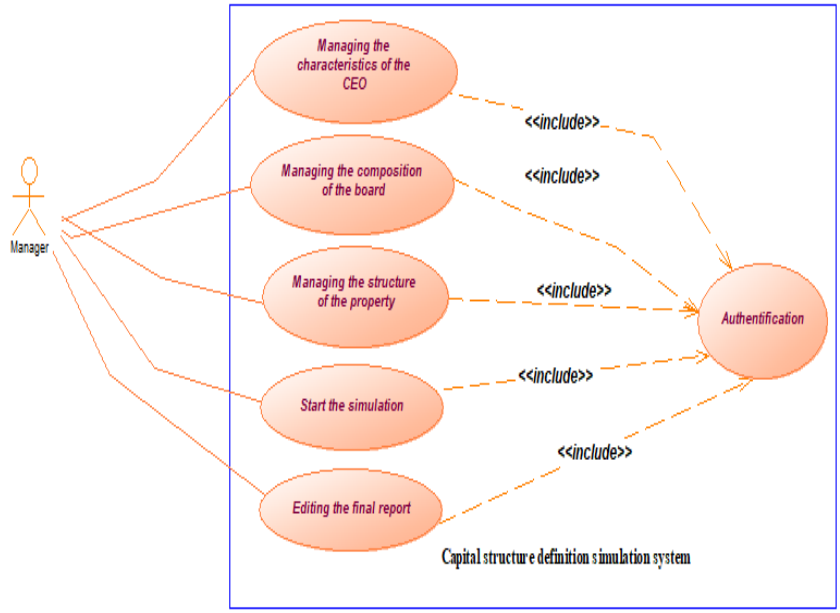

Fig. 4: Executive usage diagram

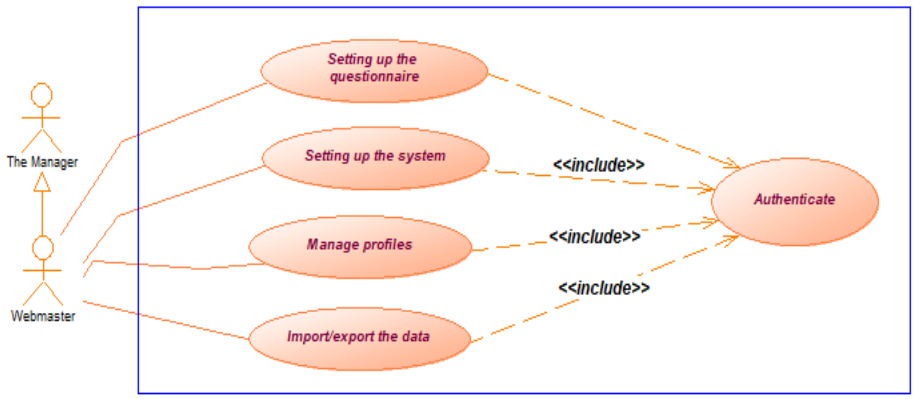

Fig. 5 : Webmaster usage diagram

5. The global Model

The next step is to set up a UML model of the results obtained. We present in figure 4 above the class diagram of our model. The Company class will be identified by its corporate name and characterised by the share capital, the equity capital and the debts (long term and short term). Theses will be retrieved directly from the

company's IS. A shareholder is defined by its type, the percentage of ownership and its function in the company. The attributes of the CEO are the information related to these characteristics, namely, age, duality, nationality in addiction to other general information concerning him/her. The board of directors' class has as properties the identifier, the members and the number of meetings. These last two properties are retrieved, respectively, from the two classes Member and Meeting. This class diagram clearly explains our approach to designing the model of our EG simulator.

CG is about ensuring the proper conduct of a business (Nalukenge et al., 2018), to best guarantee its survival. This model represents the mechanism that, based on the CG-related content stored in the database, builds a financial decision support simulator tailored to a particular firm. The decision-maker is then responsible for manipulating the CG data in order to have the combination that will provide an optimal CS for the company. In general, the decision maker can customize the composition of the board and the ownership structure to have the combination that either increases or decreases the firm's debt ratio based on the results obtained from the econometric modelling. The manager's simulation history will be saved for possible use by the system. This that always gives the manager the possibility to reload previous simulations in order to update preferences.

The shaping of the results on a web page will be done using a CSS style sheet. The simulation generator is responsible for dynamically building the financial orientation from the data implemented by the webmaster and/or the decision-maker.

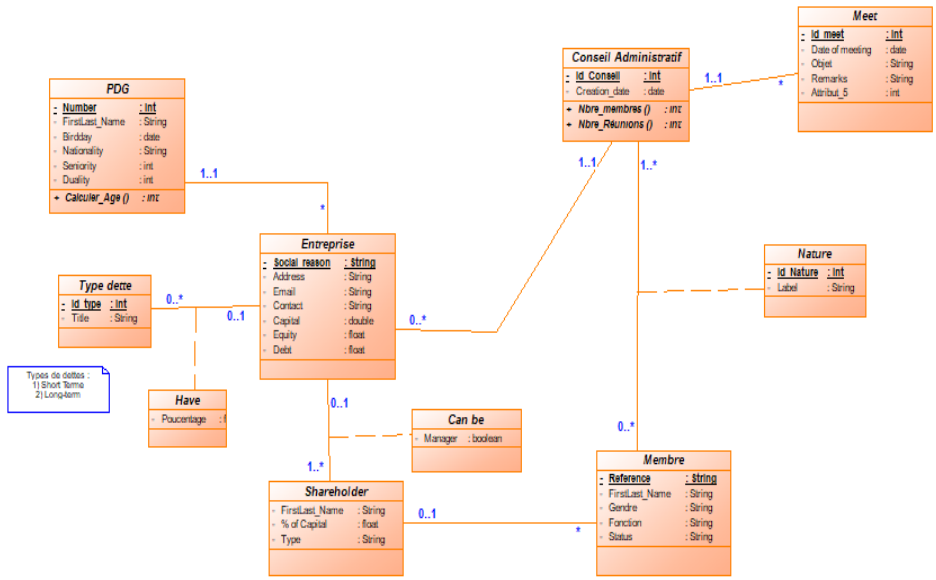

Figure 6: Class diagram of the simulator

The figure 7 further below summarizes the interactions of the main actors with the system.

6. Conclusion

CG on the one hand, is an area that has attracted the interest of the scientific community for many years. The results of the impact of CG on the CS of companies are mixed. On the other hand, several factors, internal and external, intervene in the financing choice of the company, between debt and equity, which makes this decision very delicate for the leaders. The objective of the present work is to provide managers with a decision support tool that takes into consideration the impact of governance mechanisms on the capital structure. In the Moroccan context, and based on the statistical study of panel data relating to listed companies over the period 2012-2019, our study reveals negative and positive relationships, depending on the governance mechanism chosen. In order to provide decision-makers with a tool to help them make financial decisions, we are interested in the UML modelling of a specific information system for Moroccan companies, in particular the static component of our system (class diagrams). This tool will allow the decision-maker to simulate the optimal capital structure of the company based on a set of CG information and to plan its future improvement in a continuous process. The deployment of this model is based on the results obtained through statistical analysis. These results gave us a contextual view of the different interactions between the CG mechanisms and the CS. The IT implementation of our system will be based on object-oriented programming with JEE (Java Enterprise Edition) technology. Nevertheless, our information system reflects some particular characteristics of GE of each entity and offers an adaptability of indicators towards the CS optimal for decision-maker. A second version of our IS is being developed to overcome the limitations of the first version in terms of security, speed and adaptive techniques.

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