



The Impact of Board of Directors' Characteristics on Firm Performance through Innovation in Finnish and Swedish Corporate Sector

Ilya Nekrasov

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JAMK University of Applied Sciences

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<p>Abstract</p> <p>In the modern world, many corporations rely on innovation as the crucial component of organizational success. Companies which are unable to stay innovative enough are forced to either leave the market completely or experience a considerable downturn. The composition of the board of directors is one of the main factors which influence the level of innovations within a company. The aim of the study was to examine whether corporate innovativeness is affected by characteristics of firm directors and to investigate to what extent innovativeness has an effect on firm performance.</p> <p>Secondary quantitative data of 24 Finnish and 36 Swedish publicly traded companies were acquired from their financial statements, annual reports and NASDAQ OMX Nordic database for the period from 2012 to 2018 and analysed in terms of descriptive, correlation and multivariate OLS regression analyses with the use of IBM SPSS software. The descriptive analysis presented a general overview of the data. The level of the relationship between the variables was demonstrated by correlation analysis, whereas regression results showed the strength of the impact that independent variables had on the dependent ones. These methods along with the deliberately chosen research methodology allowed to test each hypothesis asserted and answer all research questions.</p> <p>The empirical findings revealed that firm performance is influenced by corporate innovativeness, which, in turn, is found to be affected by characteristics of the directors. The results can be used in determining the optimal board composition for Finnish and Swedish public companies. Moreover, recommendations for future studies were given and limitations of the present research were discussed.</p>		
<p>Keywords (subjects)</p> <p>Corporate governance, the board of directors, innovations, corporate innovativeness, board composition, firm performance, systematic risk, market-to-book value ratio, gross profit margin.</p>		
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1 Introduction

1.1 Background

First steps towards giving a meaning to the role of innovations in economics were made in the 1930s by Joseph Schumpeter when the term “innovation” has become associated with an economic value. Years passed, and in the second half of the 20th-century innovation emerged as an independent topic of interest for researchers – scholars began to create a structural and reliable knowledge on which influence innovation has on companies, how it can be used and evaluated. According to Lopes and colleagues, the concept of innovation has also been recognized by major and influential international institutions, such as the Organization for Economic Cooperation and Development (Lopes, Vieira, Barbosa & Parente, 2017).

In a modern world, innovation is a central topic for many organizations of different types and forms as it is a crucial issue when it comes to staying competitive on the market. It matters in the great variety of activities: attraction and retention of customers, development, and differentiation of products and services, entering new markets and dealing with competitors – all these concerns are directly related to innovation. In this regard, as just mentioned points

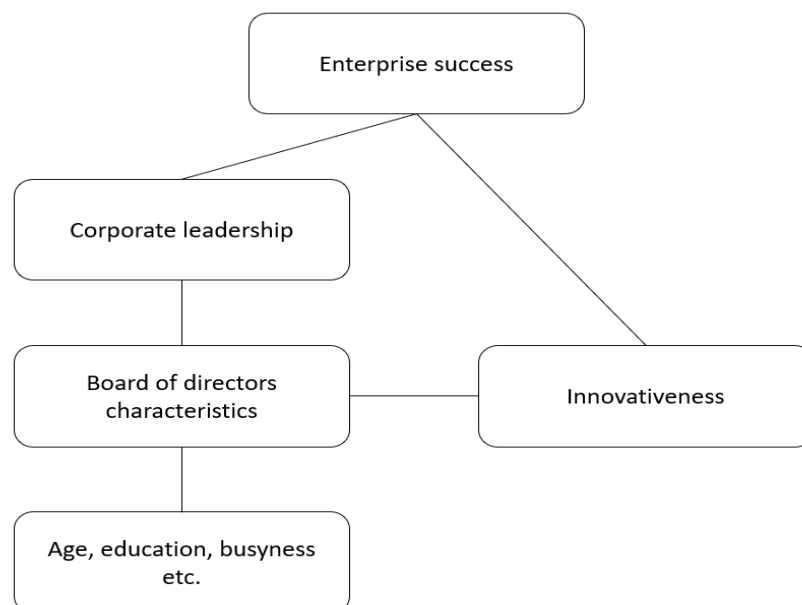


Figure 1. Components of enterprise success
(Compiled by the author)

play a crucial role in the success of an enterprise, they can be achieved through qualitative leadership.

This is the reason why the author of the present research decided to investigate the role which age, multiple directorships (also can be defined as busyness) and educational background of board directors have on innovativeness in Finnish and Swedish companies. In other words, the author strives to find out if it is possible to predict the dynamics of the innovativeness, which, in turn, affects the economic value of the firm, using above-mentioned characteristics of board members (Varadarajan, 2018).

Since the author became familiarized with the topic after studying a comprehensive number of relevant articles and peer-reviewed researches, he has found that very few published materials regarding the topic are related to the Nordic market. Additionally, it has been discovered that the majority of papers include a very limited number of board of directors' characteristics in their content. For instance, a paper might be focused on two or three attributes, such as board size, compensation, and frequency of meetings, while many others are left aside.

Thereby, the motivation to research how characteristics of directors affect firm performance through innovativeness in Finnish and Swedish corporate sectors is reasoned by the interest of the author in a given topic in the corporate sector of Finland and Sweden. Moreover, it is supposed that the findings of the thesis will provide relevant and important information on board formation which can be applied in practice. Besides, the author has a particular interest in corporate governance and plans to continue its studies during his master's degree. Considering the aforementioned matters, it seems important for the author to provide comprehensive research on the topic.

1.2 Research objectives and questions

The study is built upon two research questions:

- Do characteristics of the firm's directors affect corporate innovativeness of Finnish and Swedish public-listed companies?
- Does the innovativeness of a firm affect the firm's performance?

In order to answer these questions, 24 Finnish and 36 Swedish companies publicly listed on NASDAQ OMX Nordic have been considered and examined for the period of 7 years – from 2012 to 2018. For this reason, the data have been extracted from annual reports of these companies and from the database of NASDAQ OMX Nordic. In this respect, the relationship between the range of directors' characteristics, such as age, education, busyness, independence and gender and innovativeness of companies have been investigated. Afterward, the analysis of the relation of innovativeness to firm performance has been conducted.

Regarding the outcomes, the findings revealed that the board composition, in fact, affects the corporate innovativeness, which, in turn, influences the accounting-based and market-based performance of a firm as well as the level of systematic risk a firm has to meet. It was discovered that the innovativeness is affected by the proportion of female to total directors on the board, level of education, multiple directorships of directors and by the board size. The age of directors and proportion of independent to total directors on the board have no effect on the corporate innovativeness. Furthermore, all three aspects of a firm's performance, such as market- and accounting-based performance and level of systematic risk are found to be influenced by the innovativeness of a firm.

1.3 Structure of the thesis

The present thesis begins by providing a reader with a theoretical background on which this study is based. In this regard, a reader becomes familiarized with academic theories of the board of directors, its function and structure, theories of corporate governance, concepts of innovativeness and firm performance. Moreover, the empirical literature review is also introduced and get a reader acquainted with studies which attempted to examine how characteristics of directors of a firm affect various aspects of a firm's performance. Subsequently, the author forms and presents hypotheses he tests in his research. After the theoretical background of a research topic, a reader may find "Methodology" chapter. In this chapter, the way the author has carried out his research can be found, including descriptions of research methods and methodology he utilized and justifications concerning his research-related decisions. Afterward, in the "Research results" chapter, the analysis findings are shown as well as the results of the present research. Finally, in the chapter "Conclusion" the results revealed in the previous chapter are summarized and evaluated in regard to the research questions and hypotheses. Furthermore, in this chapter, the author presents practical and

managerial implications of the results of his study and discusses the limitations and recommendations for future research.

2 Literature review

In the present literature review, the author attempts to build a foundation which will help to determine whether certain characteristics of board members can affect innovativeness and intellectual capital of Finnish and Swedish firms. The author used diverse literature which includes peer review journals, online publications, soft and hard copies of books and various keywords and databases were used. The literature review part is considered to be of huge importance as it familiarizes a reader with the terms used in the thesis and theories which have affected the researched topic. Moreover, the data of both theoretical and empirical nature can be found in this chapter.

At first, corporate governance should be described as it is a system of mechanisms and processes with which corporations are controlled. It is necessary to understand that broad concept for the reason that it helps to investigate what role board of directors fulfills inside of the organization or how agency theory or resource dependence theory can be applicable to modern companies. After the corporate governance will be outlined, the author will go through the board of directors and managerial theories. Finally, the topic of corporate innovativeness measurement will be touched in order to have some understanding of how the intellectual capital of the firm can be measured.

2.1 Corporate governance and board of directors

In this subsection, the author will describe theories behind corporate governance and board of directors, studying the origin of the terms. Furthermore, various concepts which previous scholars have developed for these topics would be adduced.

2.1.1 Corporate governance

To begin with, we are going to define what corporate governance is at it is the term which is directly connected to all other matters mentioned in the present research. Some scholars hold the view that there can be hardly a single definition for corporate governance for the reason of

vastness of the subject. However, the term has been in usage ever since corporations became bigger and complex what further created the possibility of conflicts between investors and managers. (Cheffins 2012.)

The initial step towards defining corporate governance as a separate field was made back in 1932 by Adolf Berle and Gardiner Means in their revolutionary work called “The Modern Corporation and Private Property” (Berle & Means, 1932). It is worth to take into account, that 1930s was a time period when the world economy experienced a recession which ensued the Wall Street Crash in 1929. In the one and a half decades following World War I the world economy went through the period of prosperity and exuberance. Regular people, who had not been involved in the world of finance, began to purchase stocks as they noticed the constant growth of stock markets. This situation led, along with an increased number of minority investors, to the speculations on the stock market, what, in turn, caused the crash. At that time, the dispersion and diffusion of shareholders lead to the point where no single shareholder has enough power to execute decisions – so that managers became powerful. Moreover, because the companies became big and even complex, the need for the professional managers emerged for the reason that owners were not able to control it by themselves – so they began they hire professional and qualified managers (ibid.). In “The Modern Corporation and Private Property” the authors discuss that separation of ownership and control in modern corporations, leads to the concentration of control in hands of management, due to the aforementioned reasons (ibid.). In 1998 La Porta and colleagues stated that the concept of Berle and Means provided a stimulus to numerous scholars to further research the topic of management and develop ideas of corporate governance (La Porta, Lopez-de-Silanes, & Schleifer, 1998).

Going further, the ideas of Berle and Means also tell us that the separation of ownership and the consolidation of power in the hands of managers cause the passivity of the shareholders. This happens because managers are directly involved in processes happening within an organization while shareholders are distracted from the control. Here, the issue with ownership explains passivity, but then the question arises – what can be an explanation for the separation of ownership? Berle and Means based their findings on corporate traditions of American firms, suggesting that large organizations can draw enough financing for their activities only by attracting a large number of small-scale investors (Berle & Means, 1932). Nevertheless, according to Coffee (1999), recent comparative researches show that it might be true mainly to US and UK firms, while in other countries “shareholders activism increases in direct proportion

to ownership concentration". Thereby, it can be concluded that what happened with corporate governance practices in the United States was more due to historical circumstances rather than to the generic nature of firms. That means that in other countries, and Germany can be provided as an example, a picture of corporate governance norms and traditions can be drastically different.

In the theory of business management and administration, the board of directors term is a component of a broader concept named corporate governance. This term is popularly used when people start talking about the board of directors, shareholders meetings, voting and fights for corporate control. (Brealey & Myers, 2003.)

Despite the fact, that in an academic environment there is no single and common definition for corporate governance, still, it is possible to find a generally accepted description. Thus, corporate governance refers to legal and organizational structures which, when coupled with principles and processes predominating in a given organization, set rules by which companies are governed. Furthermore, corporate governance is able to describe other models, systems and practices which describe how corporations work and relationships between bodies of the company, its stakeholders and other matters which affect the corporative world (du Plessis, Hargovan & Bagaric, 2005.). However, we can provide the following definition, given by Parkinson (1994): "Corporate governance is the process of supervision and control intended to ensure that the company's management acts in accordance with the interests of shareholders".

In regard to practical aspects of corporate governance, some researchers highlight that it can be called the most important system when it comes to the protection of investors, which could prevent the expropriation of minority shareholders by the controlling shareholders (La Porta, Lopez-de-Silanes, Shleifer & Vishny, 1999). Moreover, other scholars suggest that effective corporate governance practices yield better results by making managers accountable and responsible, and creating greater financial results in terms of operating performance (Lawrence & Caylor, 2004).

2.1.2 Board of Directors and its functions

First of all, it is a matter of huge importance that we can understand what the board of directors is. In nowadays corporations there are plenty of establishments which have different levels of responsibility and which act in various roles. In order to make it clear, it is important to

outline in literature review section common features which are intrinsic to the body called “Board of Directors”.

To begin with, a number of roles and activities are mentioned when it comes to the description of functions which board of directors fulfills.

In fact, the board of directors’ acts as the main body of the organization setting strategic goals and defining vectors of development. The overarching goal of the corporate board of directors is to provide entrepreneurial leadership of the company ensuring that adequate controls and measures are in the act so that the risks company faces can be identified, assessed and hedged. In addition to that, the board is responsible for setting strategic goals and undertake monitoring activities at the same time ensuring that all required human and financial resources are in place so that the company is capable of meeting targets and analyzing overall performance (Calder 2008). Furthermore, it is the responsibility of directors to appoint executives, approve financial and other reporting and, where necessary, provide guidance to the management of the company (ibid.).

According to other researchers, the overall politics of the company also depend upon the board and its members as values and standards implemented in the certain stock-listed firm are created by the board of directors of that firm. (Knell 2006.)

It can be added that the importance of the board is derived from the fact that boards normally consist of diverse people, hence, companies usually inevitably benefit from having different points of view presented at the board (Moghaddam, Massihabadee, Shorvarzi & Mehrazeen 2018). What is more, Beasley and Salterio (2001), make a suggestion based on previous researches that the board’s effectiveness in monitoring management is a function of the directors’ mix. All matters mentioned above might be related to such characteristic as a size of the board, which, when increases, may lead to greater expertise and networking links of the company (Chtotouru, Bedard & Courteau, 2001).

In addition, another notable characteristic to appear further in the present thesis is multiple directorships or, in other words, busyness. This characteristic is directly related to the independence of the board and its performance as in the case when the number of directorships increases, responsibilities of directors increase as well. In regard to the agency theory, the busyness will negatively affect the firm’s performance. There is a number of reasons

for that which are valid for both inside and outside directors and part of them will be provided in this section. First reason, which is more common for inside directors, multiple directorships may cause a decline in time and attention spent on day-to-day operations. Second, the monitoring capabilities of busy directors decrease as well due to the fact that directors' knowledge and experience are firm-specific and their application in other organizations may be not beneficial. The third point to be mentioned here is the conflict of interest which arises when directors become "busy". It is important to note that multiple directorships and its effects should be considered in regard to the busyness of overall firm, not of its single members.

(Hundal 2017.)

Among the most important characteristics of the board researchers highlight board independence from the CEO. Several papers demonstrate that independent directors, in general, provide better monitoring functions for the reason that they have the "ability to act with a view of the best interest of the corporation". It is observed that the likelihood of fraud and accounting enforcements by government commission decreases as a number of non-executive directors increases. (Chtourou et al. 2001.)

Another board function is a so-called relationship investing which takes place when a major stockholder or a representative of one receives a seat on the board. When it happens, a large blockholder gets an opportunity to actively participate in a firm's economic processes, for instance, in monitoring the firm's reporting. (Klein 2006.)

2.1.3 Board structure

Going forward, there is a classification of directors – members of the board. Thus, it is common to distinguish executive directors and non-executive directors. In terms of the board of directors, an executive director fulfills the role of a chairman whose responsibility is to be a leader of the board, to ensure that non-executive directors receive timely and accurate information and that shareholders are provided with an effective communication channel (Knell 2006). Furthermore, some researches classify members of the board as outsiders, insiders or affiliated with the company. Insiders are those who are currently employed by a company. Outsiders' only connection with the company is that they serve in the board of directors – beyond this, outsiders share no common ties with the company, yet they can be owners of the company's shares. Finally, affiliates are those who either were employees of the company in

the past or are relatives to the CEO of the company or have some business relationships with the organization. (Klein 2000.)

The types of boards can vary themselves, too. The following figures are a few examples of Tricker's basic models of boards which can serve us as an example. The circle depicts a so-called "governance circle" and the triangle is a "managerial pyramid". These models are a useful tool which can help to understand the structure of the board of directors and corporate governance. Thus, it can be seen that there is a separation of governing body – circle, whose primary functions are strategic ones: to direct, govern, monitor and supervise and management – triangle, who is responsible for undertaking day-to-day operations of the company. In Figure 1 we can see a board with the majority of the members as executives whereas Figure 2 depicts the structure of the board with all members as executives. Both forms have something in similar, however, at the same time, they present us boards of different configuration. In addition to them, we can mention boards of next structures: two-tier board, where management and supervisory boards are represented by two distinctive bodies – this form is intrinsic to German companies; the all non-executive director board which is more common to non-profit entities. (du Plessis et al. 2005.)

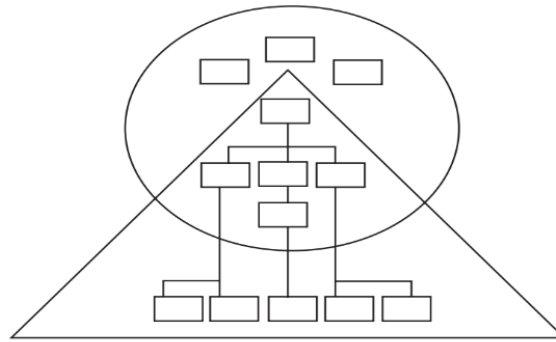


Figure 2. Majority executive board (Adapted from du Plessis et al 2005)

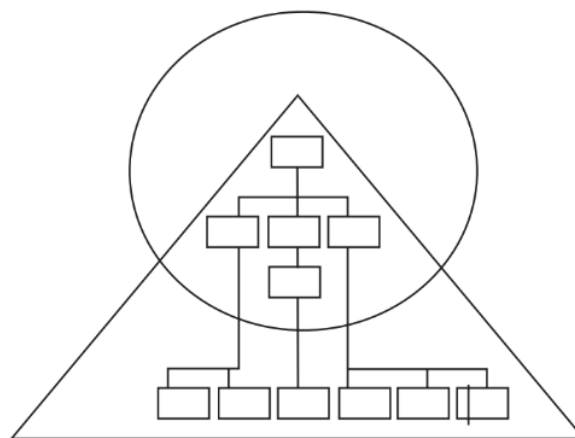


Figure 3. All-executive board (Adapted from du Plessis et al 2005)

2.1.4 German and UK board models

Mainly, there are two models of the board of directors which are commonly distinguished – German two-tier system and Anglo-Saxon one-tier board. In regard to present research, the author tends to emphasize the importance of two-tier boards as they are more common to Nordic region which is a subject of the research. Yet, it is important to include a description of one-tier boards in order to make a comparison between two systems, what, in turn, can provide us with a deeper understanding of German board model.

In two-tier German board, control and management are separated both personally and organizationally. The functions of the management board are clear – running the business, its daily operations, and routine. At the same time, the supervisory board is meant to have a much broader range of roles than it is commonly described – appointment, removal, and supervision of members of management board which also includes enforcement of actions against

members of the management board. The supervisory board is involved in networking with stakeholders and balancing the interest of the firm what is crucial when it comes to the solution of threatening issues for the company. Moreover, even though the normally supervisory board is not involved in managerial processes, partial participation can be allowed in case corporate articles so provide or board itself so decides. Furthermore, in German system member of the supervisory board is not allowed to have a seat in management board and in more than ten other supervisory board. Additionally, for companies with more than 2000 employees, half of the supervisory board should consist of labor representatives. Compared to the UK model, committees are less common in German two-tier boards, though the tendency is observed that a number of audit, remuneration and nomination committees grows. (Hopt & Leyens, 2004.)

The one-tier UK model board comprises both supervisory and managerial functions with its members having full control over the organization. In some cases, managerial power can be delegated to committees created inside the company or to specific individuals without membership on the board of directors. Distinguishes between executive directors – who are currently employed as managers in the organization – and non-executive directors – who are not involved in day-to-day operations of the company – are made. With regard to this differentiation, the distinction is made between management (executive directors) and those fulfilling controlling and strategic functions (non-executive), though latter ones can also be involved in managerial decision-making and their participation is not restricted as strictly as in two-tier boards. Independence plays an important role in one-tier board composition. Thus, half of the board should consist of independent non-executives. Chairman, whose role and duties are distinguished from ones of CEO, should meet the independence test on appointment. Moreover, all members of audit and remuneration committees must be independent non-executives and so the majority of the nomination committee. Compared to German model labor participation has not been an issue in one-tier UK boards. (Hopt & Leyens, 2004.)

2.1.5 Theories of corporate governance

2.1.6 Agency theory

Agency theory is concerned with the principal-agent problem. The segregation of ownership and management in a corporation may result in undesirable consequences when managers work insufficiently pursuing their own targets and forgetting about firm's results, what impeded the company from maximizing its value (Berger & Paiti 2003). That problem occurs between a

task-giver – the principal and the person responsible for task implementation – the agent. In other words, it is a contract where the agent is engaged in performing some services by the principal when having decision making authority (Jensen & Smith, 1985). In his later work, Jensen (1994), raises the topic of the importance of self-interests in the modern world, claiming that in those historical cases when altruistic behavior goes consistently with self-interest, it yields extremely positive results for the whole society. Hence, it can be supposed that dissemination of knowledge related to the principal-agent problem can be benefitting for the whole society.

Further expanding mechanics and components of the theory, it can be noted that the principal can reduce deviation from his or her interests either by providing relevant incentives to the agent or by establishing monitoring, what, in turn, will lead to increased expenditures (Jensen 1976). Thereby, it might become more likely that the agent will act in accordance with the principal's viewpoint, however, there is no guarantee for that.

In regard to the monitoring function of the principal, it is worth to be mentioned that some scholars relate this duty of the principal to the members of the board of directors. As the board normally undertakes monitoring and strategic functions in the organization, providing an overall assessment of the company and setting long-term objectives, it can be said that board members (specifically, members of the board which do not fulfill managerial functions in the organization), act as principals in principal-agent relationships. Thereby, managers of the organization are considered to be agents. (Hillman & Dalziel, 2003.)

2.1.7 Resource dependence theory

In general, the resource dependency theory is aimed at a description of how modern organizations manage to survive. This theory perceives corporations as open systems which are highly dependent on fluctuations happening in the external environment (Hilman, Withers, & Collins 2009). In this respect, it is required from corporate managers to be knowledgeable about how to manage the influence of factors which take place outside of a firm so that consequences of environmental unpredictability and dependence would be mitigated (ibid). Pfeffer & Salancik (2003) add, that a company should be able to acquire and maintain strategic resources, but in order to do so, a company should interact with the outer world, as no

organization is self-contained. Companies live in a society with a moving environment where others interact with them, where numerous mutually exclusive choices can be made (ibid). In this regard, Hilman et al. (2009) introduce a concept of power, wherein organizations compete over the control of important resources in an attempt to increase their power over competitors.

Scholars who are thought to be the people who first formalized resource dependence theory highlighted three important themes which form a foundation of the theory. The first theme is about the importance of the environment around the given firm. Researchers suggest that it is crucial on this point to focus on the social context of the organization in order, for instance, to understand what strategic decisions can be made or what board composition can be chosen (Pfeffer & Salancik 2003). Consequently, it might be beneficial to focus less on internal dynamics and values of company leaders but focus more on situations and pressures around the organization. The reason for that is that various resources such as information, finances, and physical resources are obtained from the external environment. The second important theme is that organizations still have opportunities to undertake various actions, such as coopting, obtaining the power to gain autonomy or to gain the ability to pursue its own interests, despite the fact that companies are limited by aforementioned situations and environments. Scholars continue: regardless of all constraints organizations have both ability and desire to negotiate their positions using a number of tactics (ibid). Hence, it leads us to the idea that organizations should be focused not only on products and customers but also on other stakeholders – governmental authorities, suppliers and other agents having an influence on the environment of the company. Finally, the importance of the social power of an organization is highlighted. It is based on ideas of dependence and interdependence and attempts of managers to mitigate existing environmental and social constraints (Pfeffer & Salancik 2003). Thus, resource dependence theory tells us that some organizations might be more powerful in some aspects of their business than its competitors due to their power on social space arena.

Coming to the applicable matters in regard to the resource-dependence theory, the board of directors can be called the main actor in the organization. The reasoning behind this statement is that the board of directors is the most important body when it comes to the provision of the resources to the firm. When a new member of the board is chosen, he or she is appointed to that position with expectations that this person will devote him or herself to support of the

organization trying to aid it (Hillman & Dalziel 2003). Thereby, the directors of a firm play an extremely significant role within the resource dependence theory. It is their responsibility to be that link to the external environment through which a firm gets a connection to resources located outside of its borders. The directors mitigate the impact of negative conditions and it is directors who usually represent firm to the outer world. Moreover, considering resource dependence theory, the more complex and the bigger an organization becomes, the bigger the need in the directors in these organizations (Daily & Dalton 1998). A number of stakeholders grows inevitably with the growth of an organization, which means it would require either a qualitative or quantitative approach to this issue (ibid). That said, a firm can either increase the number of directors or employ those who would be able to maintain a large number of these connections.

2.1.8 Stewardship theory

The stewardship theory is often considered to be the concept which confronts ideas of agency theory. On the contrary to the latter theory, former one provides a more positive perception of relationships between managers, principals, and organizations, as its authors have rethought issues of human motivation, intentions, and cooperation (Pastoriza & Arino 2008). In general, stewardship theory claims that there is no conflict of interest between managers and owners so that they all work towards the same goals and have the same interests. In that case, the goal of corporate governance would be enhancing and finding the mechanism which can facilitate coordination between parties. The underlying assumption here is that the behavior of agents is aligned with the interests of principals and the theory itself is mainly concerned with identifying situations where the interests of actors are aligned (ibid). Regarding the matters mentioned above Donaldson and Davis hold the view that, according to the stewardship theory, performance of managers, who are loyal to their firm and try to perform their best by default, depends on the structure of a firm. In practice, that means that corporate culture and formation of a company should provide managers with clear roles, objectives, and functions, with the purpose of empowering managers when needed and reassuring them that the position they occupy is unchallenged and univocal. (Donaldson & Davis 1991.)

2.1.9 Stakeholder theory

The focal point of stakeholder theory is that a firm cannot maximize profits only relying upon successful management, but a company should act with regard to the interest of stakeholders

as well. Thereby, according to the view of Jensen on this theory, managers of an organization should make decisions considering the interest of all stakeholders in a firm, including not only employees, shareholders and financial bodies, but also government officials, political groups and under some interpretations such matters as the environment and blackmailers (Jensen 2001). Because of this, the stakeholder theory creates a necessity for managers to look for various tradeoffs (ibid). What is more, as it can be hard to keep score, eventually managers can become unaccountable for their actions and, consequently, become attractive to the self-interest of managers and directors.

Furthermore, other scholars provide an important note that stakeholders' issues which an organization has to solve should be distinguished from its social affairs. Issues with stakeholder are related to one or more stakeholder groups and not necessarily to the whole society. On the contrary, social issues are the subject of legislative, and, thereby, governmental regulation, because of their importance for the society. (Kent & Chan 2003.)

2.2 Innovativeness

Major changes happening to the modern economy have led to the increased importance of knowledge economy and intellectual capital. The latter concept became vital for nowadays organizations.

Taking a step back and taking a look at where the humankind is now it can be noted that all achievements humanity has made – as an example, we can take 20th century when a big leap was made towards the globally increased quality of life – is based upon the knowledge acquired and stored during previous centuries. Continuing this idea, it can be said that the growth in obtained and available knowledge yields great benefits for the economic development of society. (Teece 2000.)

In other fields of science which, nevertheless, are related to business management, intellectual capital is something what is known by everyone in the company and what everyone brings to an organization that increases its value to others. Normally, intellectual capital is being comprised of the next three components: external capital, internal capital and human capital. External capital refers to relations with the external environment such as the stock market, customers and suppliers. Internal capital, on the contrary, is all about what happens inside the company, for instance, internal processes and management are examples of internal capital.

Finally, human capital is composed of organizational knowledge and learning, skills of employees. (Basile 2009.)

2.3 Measurement of innovativeness

Despite its importance, still, it is hard to measure intellectual capital. First of all, it is an intangible asset and it is difficult to apply accounting rules which were created a long time ago for physical objects which were the main source of wealth before the information age. Second, what is valuable for one company can be worthless for another. This point results in complicity when it comes to benchmarking, and comparative analysis of different companies and industries. Finally, it is pointed out that there are two dimensions of intellectual capital. Distinctions are made between intangible resources of the organization and its intangible activities. Intangible resources of a company can be measured at any time – they consist of, for instance, worker competencies which are related to human capital, intellectual property rights, the satisfaction of customers or agreement with suppliers. The second category, intangible activities, is associated with activities which companies undertake to internally produce intangible activities, to improve existing one and measure them. Such activities as the usage of intangible resources sometimes do not appear in financial statements of corporations for the reason that it is not expressed in financial metrics. Thus, it can be observed that individual components work as a whole – the interaction of intellectual elements creates value for the company. (CIMA report 2003.)

Yet, attempts have been made in the creation of frameworks for valuation of intellectual capital. First, the importance of connecting measurement to strategy (or to other matter needed to be measured) is highlighted. It is noted, that there should be a reasoning behind the creation of metrics, for instance, an increase in market share or reduction of production costs. Then, it is also essential to measure activities that produce intellectual wealth and that requires examining of linkages between potential components of the chain. What in turn leads to the idea of the necessity to rethink our attitudes on intangible knowledge keeping in mind underlying assumptions which have to be met during the process of building a measurement system. (van Deventer 2002.)

Moreover, it is reported that many senior executives choose customer satisfaction or customer value as the primary measure of intellectual capital development. Because in the case with

investments in human capital, for example, trainings and seminars, a big number of variables can restrain the development of a coherent formula. For that reason, many managers focus on marketplace performance improvements when it comes to the valuation of intellectual capital investments. Therefore, the next matters among others should be considered during the measurement: whether an organization became able to sell more and better, to create and to keep more and better customers or increase cost saving. (ibid)

Nevertheless, the next formula can be taken as a starting point for the measurement of intellectual capital:

$$BV + IC = MV$$

In this equation, market value is comprised of book value – physical assets and monetary capital – and intellectual capital – human capital, innovation capital, the value of relationships with customers and suppliers. Therefore, we intellectual capital can be calculated here as the difference between market value and book value. (van Deventer, 2002.)

Going forward, it should be considered that depreciation policies may vary, and that is what affects the book value of the company. In this case, the Tobin's Q ratio (or Q ratio) can be utilized, the ratio which was developed by economist James Tobin who received the Nobel Prize in 1981. James Tobin defined q as a replacement cost, which is calculated as the market value divided by the replacement cost of an asset.

However, the use of market value in the measurement of intellectual capital is argued by a number of scholars. Presumably, this path can lead to an incompetent way of organizing resources of a firm. Several weaknesses are highlighted in equations which are based on a market-to-book ratio. The reason is that the intellectual capital demands a more complex and comprehensive approach as it consists of components which are not reflected in the market-to-book ratio. Furthermore, the intellectual capital and difference between market and book values are not equal, which also should be taken into account. Moreover, the fluctuation of stock prices can contribute towards misconstruction of intellectual capital value. (Dumay 2009.)

In this regard, another approach in the calculation of intellectual capital can be introduced. Malinoski and Perry (2011) suggest ratio based on Return on Product Development Expense

(hereafter, RoPDE). This measurement may help to track the usefulness of a given product or service innovation of a firm, acting as a performance indicator. It can be calculated as follows:

$$\text{RoPDE} = (\text{Gross Margin} - \text{PDE}) / \text{PDE}$$

The data for this ratio can be acquired from standard accounting data and the ratio itself is not complicated to use and can be applicable to a large number of cases. Moreover, it considers the whole process of innovation taking into account numerous stakeholders who may take part in that process. (Malinoski & Perry 2011.)

2.4 Firm performance

Venkatraman & Ramanujam hold the view that the concept of firm performance, which is a part of a broader theory of operational efficiency, is central in management, whether research or practice is considered (1986, 1). Importance of this concept is highlighted in a number of papers, as it helps to track the efficacy of activity of a chosen firm over time (Venkatraman & Ramanujam 1985, 3). Thereby, it can be said that the firm performance has a comparative value in corporate governance domain as it has in strategic management for the reason that it assists in observation of the firm's activity and analyze them.

Coming to the historical background of firm performance assessment, it is worth to be mentioned that, as Gentry & Shen (2010) suppose, initially, companies relied upon mainly on solely accounting indicators. As the theories of management and corporate governance progressed, companies began to take into account finance theories, the market and shareholder value so that since the late 1980s corporations adopted performance indicators based on aforementioned factors as well. Yet, the usefulness of these measures has been questioned. The main reason for this is that these indicators count on the market price of a given company only. It is argued by a number of researchers that this approach is unreliable for the reason that stock market efficiency has not been fully validated. Therefore, those who try to interpret market data are cautioned to be extremely careful because market data might not reflect the real situation in completeness, especially in the light of mentioned before the principal-agent problem. On the other hand, market-based measures provide a more complete picture than accounting-based indicators do, as former consider the greater range of relevant information. Moreover, accounting measures can become a subject for managerial

manipulations as well (ibid). At the end of the day, it can be noted that both types of measures are accepted and recognized due to the current imperfection of both approaches.

In this regard, a conceptual approach, where the multidimensional model for firm performance is created, would be a relevant point to consider. In an attempt to expand the borders of methods which evaluate the performance of the company, Selvam and colleagues (2016) reflected in their model different aspects of firm activity which, as they suppose, might have a direct impact on firm performance. In their research, scholars create different subcategories for broad term firm performance. The firm performance is divided into two subcategories: financial and strategic performance. While the first one is similar to the matters discussed in the previous paragraph and consists of profitability, market value and growth performance, the second one is based upon non-financial measures. For instance, they introduce stakeholders-related metrics such as the satisfaction of employees and customers and performance in social, corporate governance and environmental spheres. Taking all this into account, it can be claimed that in this model both classical and modern concepts of financial and managerial theories are represented: it considers profitability as well as the value a firm creates for the society. (Selvam, Jaypal, Vinayagamoorthi, Kasilingam, & Sigo 2016.)

Going forward, another approach can also be mentioned in regard to firm performance evaluation. In the case of Citibank in Los-Angeles of the 1990s, the managers faced the necessity to evaluate the non-financial performance of branches in the same breath as a financial one. For this reason, the performance scorecard was developed for the California division of the bank which included six categories of measures: financial, strategy implementation, customer satisfaction, control, people and standards. For the sake of clarity, it should be noted that control measures had purely inward nature as it was an evaluation of internal control processes by internal auditors. While sections of people and standards were considered as non-quantifiable and were evaluated by heads of specific branches. Moreover, three levels – “below par”, “par” and “above par” - were created for each of these categories in order to track the situation with each bank of the division. This system exemplifies one of the early approaches to the new model of firm performance evaluation. It can be seen that this model is flexible and adjustable so that it can be applied to a diverse variety of needs, though, of course, in the discussed case it has been limited to the requirements of banking. (Davila & Simons, 1999.)

2.5 The systematic risk of a company

Systematic risk, also known as non-specific, unavoidable or market risk, is related to the extent to which a company's shares are influenced by system-wide factors such as economic cycles, government actions or state fiscal and monetary policy (Head & Watson 2016). Thus, this risk hardly can be avoided, however, its influence can be mitigated by proper managerial action. The systematic risk might is often utilized in the estimation of the expected return a share of a company can yield (Ross, Westerfield & Jordan 2002). This type of risk is commonly measured by the level of its sensitivity to fluctuations on the market. To express the level of sensitivity, the beta, or the beta coefficient is used, which is the coefficient of volatility or sensitivity. (Vernimmen, Quiry, Dallochio, Le Fur, & Salvi 2009.)

The beta is calculated using regression analysis based on historical data of share prices and market indices. For the sake of clarity, it should be mentioned that the beta corresponds to the slope of that regression, where the deviation of share prices relative to the stock indices is expressed. (Vernimmen et al. 2009.)

The benchmark of the beta is 1, which is the beta of the market by definition. For example. when the beta equals 1 it means that the stock's returns are perfectly correlated with the market movements, so that 10 per cent rise of the market will indicate a 10 per cent growth of stock prices. Alternatively, for the share with the beta 0.5, the increase of market return by 20 per cent would mean that security's return will increase by 10 per cent. (Head & Watson 2016). The following calculation is used to find the beta (Vernimmen et al. 2009).:

$$Beta = \frac{Covariance(R_e, R_m)}{Variance(R_m)}$$

Where:

R_e – stock return

R_m - market return

Covariance – a measure of a stock's return relative to that of the market

Variance – a measure of how the market moves relative to its mean

2.6 Linkages between the board of directors, innovation and firm performance

In this section of the literature review, the relationships between the terms presented in previous parts of the present paper will be provided. The reasoning behind this is that the author strongly believes that it is important to outline matters that connect board of directors, innovation and firm performance. In this regard, connections of the board of directors and firm innovations will be demonstrated and the effect which various board features can have on innovation inside the firm will be provided and described.

A considerable number of scholars take into account various board characteristics in an attempt to analyze board influence on the innovation of a firm. One of the most common and obvious characteristics to appear is the size of a board. This characteristic has been controversial as different researches suggested a different correlation between board size and firm innovativeness and performance.

Therefore, the main advantage of a large board lies in a number of people presented there. Chen (2012) suggests that the bigger a board is the greater likelihood that a firm will get access to valuable external resources as company's networking capabilities will be broadened, what can also include connections with business partners and important figures in the industry. In addition to that, Chouaibi, Boujelbene and Affes state in their work that in large boards probability that some directors will be of scientific background is increased. Hence, it is supposed that their knowledge can positively contribute to seizing new opportunities in the field of innovations. What is more, the same authors claim that in bigger boards it is more complicated for CEO to dominate while the diversity of the board can help in achieving balanced and efficient decisions, especially when directors possess industry-specific experience. (Chouaibi, Boujelbene & Affes 2009.)

Yet, there is another side of the coin. Size and diversity of the board can lead to arguments and hostile relations among board members, which can have a negative impact on the productivity of the meetings. In turn, this situation can lead to the fragmentation of a board into small factions, which will impede progress and create a conflict of interest. Furthermore, boards of

the big size normally do not meet as often as small boards do, what leads to the board which is unable to coordinate its actions and successfully deliver beneficial results. (Chen 2012.)

Aforementioned theoretical findings are supported by empirical evidence. Three separate research papers by Chouaibi and colleagues (2009), Chen (2012) and Chouaibi and Jarboui (2012) show that large size of the board is negatively associated with the innovativeness of the firm and its R&D investments.

Going forward, the frequency of board meetings and educational level of board members are also taken into account when board influence on innovation is analyzed. It is mentioned, that, in addition to its basic functions like allowing board members to invest time and efforts in the general firm development, meetings ease understanding of R&D processes and assessment of innovation-related projects within the firm. As for the educational level of directors, it is supposed that a high level of education positively contributes towards innovativeness of the firm. The reasoning behind this statement is that R&D processes can be quite complicated and might require considerable intellectual investments. It is assumed that for directors with a greater level of education it would be easier and will require less time to process a huge amount of specific information and analyze it. According to empirical results from Taiwanese market, the relationship between board meetings and innovativeness of the firm is positive, albeit not significant while the educational level of board members has a significant and positive impact on R&D activities of a firm. Thereby, it can be concluded that boards with a high average level of education have a great influence on innovations within the firm. (Chen 2012.)

Other researchers investigated the matters of compensation, inside directors and CEO duality in regard to board impact on firm innovation. The assumption related to inside directors is that they are generally more motivated to invest their resources in the success of a firm. Moreover, they obtain firm-specific knowledge and usually, their actions have inward nature when compared with outside directors focused on external activities. Therefore, it can be said that boards dominated by inside directors tend to focus on innovation. Coming to the topic of compensation, it is expected that in those cases when compensation policy of the firm aimed at long-term goals and considers the development of specific skills among the top management, innovation activities are likely to be influenced in a positive way. As for CEO duality parameter, scholars assume that it will positively affect innovations due to the consolidation of chairman and CEO functions in one hand. It is supposed that this combination can eliminate the problem

of mistrust and conflict of interest and will help to align the interests of directors and shareholders what, in turn, mitigates the principal-agent problem. Empirical results from the Tunisian market show that inside directors and CEO duality have a positive significant impact on and positively correlate with innovation activities. Talking about compensation policy, empirical results show that it has a positive relationship to innovative activities of a firm, but not significant what means that probably short term goals prevail over the long term. (Chouaibi et al. 2009.)

It is worth to be mentioned that in studies which took place three years after the research of 2009 was finished, the empirical results concerning CEO duality and inside directors were supported and confirmed. (Chouaibi & Jarboui 2012.)

Buchwald and Thorwad (2015) researched the influence of outside directors and the level of competitiveness on innovation activities of German companies. They assumed that outside directors will have a negative relationship with R&D investments as they lack incentives to innovate and do not have specific knowledge required for innovation. Nevertheless, they suppose that due to competition this negative impact can disappear for the reason that competition itself has a positive contribution to innovation. Their suggestions were proven by empirical findings: outside directors have a significant and negative influence on firm innovation. Yet, when the competition is fierce, the situation requires management to innovate and eliminates the negative impact of outside directors. (ibid.)

2.7 Finnish and Swedish corporate sectors

In this part of the literature review, the author will compare corporate sectors of Finland and Sweden for the reason that the present research deals with Finnish and Swedish stock-listed companies. (Therefore, the author strongly believes that it is necessary to provide an overview of these sectors so that the ideas expressed in the conclusion part of the thesis would be justified.)

To begin with, both the Swedish and Finnish corporate sectors belong to the Scandinavian model of corporate governance. This model is distinguished from the Anglo-American model and is quite different from the German model, despite in some cases similarities might be

found between Scandinavian and German models. A major reason for this differentiation is, as Ojok and Koeman (2016) suppose, the distinctness of Nordic culture which can be characterized by a high level of trustworthiness, individualism and specific managerial and leadership approach in Scandinavia. Moreover, that system is also notable for the increased level of investor protection and for the emphasis put on the interests of shareholders in general, when compared to the outer world where profit maximization is the top priority. Furthermore, in spite of the fact that more and more foreign firms invest in the Nordic region, the ownership of a company, normally, is consolidated in the hands of local individuals or families (ibid).

In the research aimed at comparison of the economic performance of Finland and Sweden, Korkman and Suvanto (2013) came up with the idea that economic policies and strategies of these two countries can be generalized due to commonalities in approach. First, the policies, according to researchers, can be characterized by responsiveness in regard to the crisis in the 1990s which affected both Swedish and Finnish economics. In addition, it is mentioned that Finland and Sweden, as countries having a Nordic model of corporate governance, seem to outperform other countries in terms of a number of social and economic indicators. When monetary units of countries are concerned, the scholars claim that the difference in currencies of the two countries may have less importance than it is supposed to have (ibid).

2.8 Hypotheses

Kumar (2010) provides, among others, next definition of a hypothesis: “a proposition, condition, or principle which is assumed, perhaps without belief, in order to draw out its logical consequences and by this method to test its accord with facts which are known or may be determined”. The same author adds that clarity, direction, and focus come to a research problem with hypotheses, and that is why the hypothesis is considered to be an important part of the research. Another explanation of the term is given by Robson & McCartan (2016), who describe a hypothesis as the predicted answer to the research question, which is supported by the theoretical framework.

This study comprises 8 hypotheses which the author has developed after a profound study of related literature. The hypotheses are related to various managerial theories and their views on corporate governance and have been investigated through observing and analysis of numerical data.

Hypotheses are as follows:

- *H1*: According to the agency theory, there is no effect on innovativeness by busyness.
- *H2*: According to the stewardship theory, the size of a board will affect a firm's innovativeness.
- *H3*: According to the resource dependence theory, the education level of a board will positively affect a firm's innovativeness.
- *H4*: According to the stakeholder theory, the even proportion of genders on board will positively affect a firm's innovativeness.
- *H5*: According to the stakeholder theory, the median age of board directors will affect a firm's innovativeness.
- *H6*: The beta of a company is affected by its innovativeness.
- *H7*: The market-based performance of a company is affected by its innovativeness.
- *H8*: The accounting-based performance of a company is negatively affected by its innovativeness.

3 Methodology

The research methodology is one of the fundamental aspects of any research. Saunders and colleagues state that quite often it happens that terms “research method” and “research methodology” are being referred to as interchangeable terms. However, authors stress the fact that “method” and “methodology”, despite looking similar, represent different ideas. According to them, methods are considered in regard to techniques and procedures used to obtain data, such as questionnaires, interviews, quantitative and qualitative analysis techniques. On the contrary, methodology refers to the theoretical background of research, for instance, its philosophical nature (Saunders, Lewis & Thornhill 2009.). Adams and colleagues support the view of the aforementioned scholars and add that methodology assists in understanding what limitations a researcher will have when he or she adopts a certain way of conducting research (Adams, Khan, Raeside, & White 2007). Thereby, it can be summarized that research methodology is a philosophy behind research which describes how the knowledge has been

obtained. In this chapter, the author will describe the way research has been carried out and provide reasoning for the decisions he has made concerning methods chosen. Moreover, the implementation process and specific attributes of methodology will be discussed.

3.1 Research design and approach

In order to maintain a good quality of research, it is recommended to select a correct research design (Kumar 2010). As the research design explains how one is planning to find answers to research questions, its role, therefore, crucial for the reason that incorrect design generates misleading results so that a researcher becomes unable to produce accurate comparisons and conclusions (Kumar 2010). In regard to the research approach, when Saunders et al (2009) discuss it they provide three reasons as proof of its importance for research. First of all, it enables a researcher to make more knowledgeable decisions about his or her research design, which leads to a better quality of research questions and, in turn, answers to them. Furthermore, it makes a researcher more informed about available research strategies, so that he or she eventually understand which approach will bring the best results. Finally, with the knowledge of possible approaches, a researcher is less sensitive to potential limitations such as, for example, limited access to data (ibid).

The basic idea of this research was to find whether the relationship between the characteristics of members of the board of directors of a firm and the performance of this firm exists. In the case it does exist, then to which extent characteristics affect performance. Thus, as there was a need to apply statistical analysis, the quantitative approach has been chosen, which, as noted by Robson & McCartan (2016), is characterized by accurate measurement and quantification of data.

Furthermore, it is a matter of huge importance to define and describe the philosophy adopted by the author of the present research. In this regard, the philosophical stance of positivism has been chosen, which is historically linked to a quantitative approach (Robson & McCartan 2016). The reasoning behind this is that positivism helps to create generalizations similar to those produced by natural scientists and it allows a researcher to take a view on matters from a value-free perspective what can contribute towards realistic results (Saunders, et al. 2009.). It is worth to be added, that through positivistic stance objective facts are being observed and afterward hypotheses are tested against these facts. (Robson & McCartan 2016).

In regard to research approaches, the deductive approach has been chosen over inductive one. This choice has been made for the reason that deduction is related to scientific research and it leads to a generalization. While applying a deduction, a researcher develops a theory and tests a hypothesis. Finally, this approach enables facts to be measured quantitatively, which links it to the quantitative approach. (Saunders et al. 2009.)

Furthermore, as the research aims to describe relationships between variables, it can be called descriptive research, which, according to Adams and colleagues (2007), aims to describe phenomena, setting baselines about and providing background for an explanation of social nature and processes.

Moreover, it is a longitudinal study, as seven-years data were obtained and processes, with mono-method used because the analysis is comprised only of interactions with numerical data. (Saunders et al. 2009.)

3.2 Data collection

The data used for the present research is characterized as secondary, which is described as either raw data or published summaries that have been already collected for some other purposes (Saunders, Philip & Mark 2009). In this regard, the author worked with published annual reports of companies in order to extract required data for his research, financial statements, and sections where characteristics of directors of a firm are listed. Additionally, the author has utilized the NASDAQ OMX Nordic stock exchange database in order to extract the data about the market performance of firms over the years. The researcher has collected the data of 24 companies listed at NASDAQ OMX Helsinki and 36 companies listed at NASDAQ OMX Sweden. Annual reports published in the period from the 1st January 2013 to 15th March 2019 have been utilized, what in total comprises the timespan of 7 years, covering financial and corporate activities of companies for the period 2012-2018. By considering 7 years of companies' activities, the author intended to acquire enough data to provide consistent findings. As a result, panel data were created and used in the present research as it helps to create a numerical summarization of years of activity of a given organization. The reasoning behind the choice of panel data is concluded in the fact that it will provide us with the desired snapshot of firms' characteristics over time so that it will be possible to track the changes (Buck 2015).

The author accumulated both numerical and non-numerical data for his research. In regard to numerical data of the present study, it consists of financial data available in annual reports of companies and at NASDAQ OMX Nordic. In annual reports, the data the author collected was found mostly in the balance sheet and income statement sections. In some cases, when required information, such as market capitalization of a company or research and development expenditures, was not located in these sections of an annual report, the author referred to other parts of a report where the information was written. Moreover, NASDAQ OMX Nordic database was used to retrieve companies' historical share prices in order to calculate the beta. Concerning non-numerical data, for the research, the author needed to know personal characteristics of the board of directors' members, such as age, education, gender, busyness, independence, and size of a board, which were found in companies' annual reports in those sections where board members' condensed biography was provided.

The figure below represents the main variables which were used in the analysis as well as their relationships.

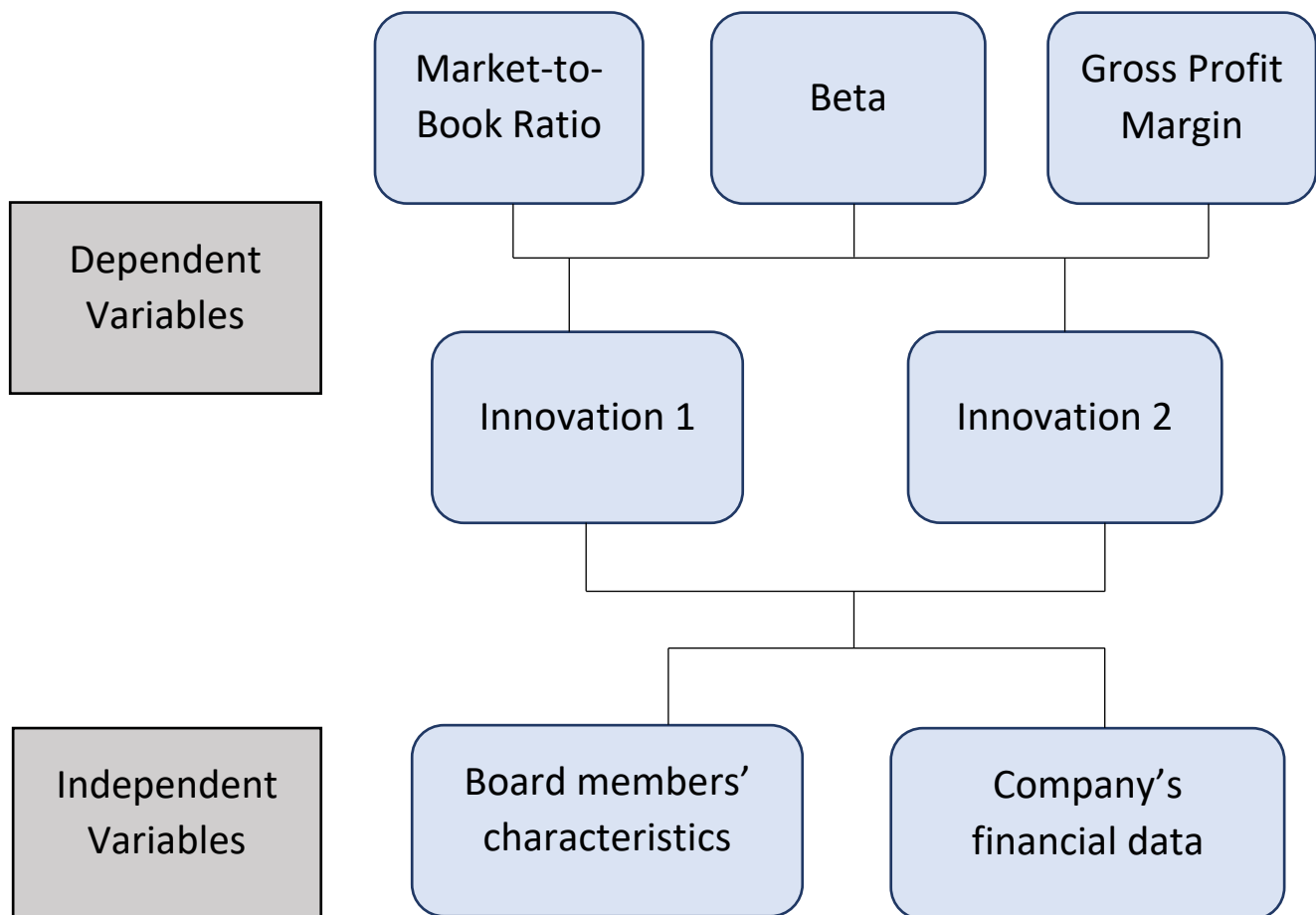


Figure 4. Variables utilized in the analysis (Created by the author)

Board members' characteristics is a combined set of attributes of each company's board of directors. The characteristics include the size of a board, its independence, gender proportion, cumulative educational background of its members, age of directors and their busyness (described in sub-chapters 2.1 and 2.6). More explanation for each of the characteristics mentioned will be given further in the research.

Company's financial data were collected from the company's annual reports. Namely, it consists of the next variables: research and development expenditures, sales, gross profit, total and intangible assets and market capitalization of a company. The more profound descriptions will be provided in the sub-chapter 3.3.

Gross profit margin is a measure that identifies the amount of money which the company will have after the cost of goods sold is deducted from the company's sales. This metric is used as a measure of accounting performance of a firm by the author. The formula used to calculate the gross profit margin is next:

$$\begin{aligned} \text{Gross Profit Margin} &= \frac{\text{Net Sales} - \text{Cost of Goods Sold}}{\text{Net Sales}} = \\ &= \frac{\text{Gross Profit}}{\text{Net Sales}} \end{aligned}$$

Market-to-Book ratio is a typical instrument of investors which help to identify how the market perceives a stock price of a particular company. The high ratio might indicate that a firm is overvalued by investors so that in future its stock price will decline. Thus, in the present research, this ratio was utilized as a measure of market performance of a company. In order to calculate it, one will need to know the value of a company's total assets with liabilities deducted and market capitalization of a company. The author used the next formula to calculate the market-to-book ratio:

$$\text{Market} - \text{to} - \text{Book Value} = \frac{\text{Market Capitalization}}{\text{Total Book Value}}$$

Beta – described in chapter 2. 5. To measure the beta of a company, the author first calculated the stock return of a particular company. Afterward, the return of the NASDAQ OMX 40 index was found. Finally, the author used Microsoft Excel function “SLOPE” which returns the slope of a linear regression line of two variables. Beta was used as a measure of the riskiness of a company, which provides information regarding the volatility of the company’s stock prices in relation to the volatility of market prices. The beta smaller than 1 reveals that a given stock fluctuates less than the market. When the beta is greater than 1, it means the opposite. High beta mostly signifies high risks but greater returns on investment, while small beta means fewer risks for an investor together with lower returns. The formula exploited for calculation of a stock and market return was the following:

$$\text{Stock (Market) Return} = \frac{\text{Closing Price of Current Day} - \text{Closing Price of Previous Day}}{\text{Closing Price of Previous Day}}$$

After stock and market returns were calculated, the next equation was used in order to calculate the beta:

$$\text{Beta} = \frac{\text{Covariance}(R_e, R_m)}{\text{Variance}(R_m)}$$

Where:

R_e – stock return

R_m – market return

Covariance – a measure of a stock’s return relative to that of the market

Variance – a measure of how the market moves relative to its mean

Moreover, two ratios related to innovation were employed by the author for the sake of determining the role of innovation in a company. The first ratio demonstrates how much a given company spends on research and development activities. The formula used for it is as follows:

$$\text{Innovation 1} = \frac{\text{Research \& Development Expenditures}}{\text{Total Sales}}$$

The second ratio calculates the proportion of intangible assets of a company in regard to its total assets. This ratio was introduced also for a reason that some companies do not have research and development expenses but still, possess intangible assets. The formula for the second ratio is next:

$$\text{Innovation 2} = \frac{\text{Intangible Assets}}{\text{Total Assets}}$$

3.3 Definition of key variables

Table 1 given below represents variables used in the analysis, their descriptions, operational names, and source.

Table 1. Definition and description of variables

Variable	The label of a variable	Description	Source	Hypotheses	Predicted effect
Age	Age	The median age of a firm's directors	Annual reports		-
	Agesq	Squared value of the age variable	Annual reports		
	AgeNL	Natural logarithm of the age variable	Annual reports		
Board Size	BoardS	Number of a firm's directors	Annual reports	H2	+
	BoardSsq	Squared value of the board size variable	Annual reports		
	BoardSNL	Natural logarithm of the board size variable	Annual reports		
Education	Edu	This variable is responsible for reflecting the cumulative educational capital of a firm's directors. For each level of education starting from a bachelor's degree, a variable rose by one point. For instance, if a director held two bachelor's degrees, one master's degree and a Doctor of Philosophy degree, it would yield in total in two points for two bachelor's degrees, two points for one master's degree and three points for a Ph.D. In total, it will add seven points for the variable.	Annual reports	H3	+
	EduSq	Squared value of the education variable	Annual reports		
	EduNL	Natural logarithm of the education variable	Annual reports		
Gender	Gender	The gender variable was calculated as a proportion of female directors on the board. The calculation is	Annual reports	H4	+

		as follows: $Gender = \frac{Female\ Board\ Members}{Size\ of\ a\ Board}$			
Busyness	Busyness	The busyness, also known as multiple directorships, reflects the median busyness of a firm's board members. The busyness, described in sub-chapter 2.1.2, indicates how many positions a board member occupies.	Annual reports	H1	-
Board Independence	BoardInd	The board independence variable is a proportion of independent members of a board. The calculation is as follows: $Board\ Independence = \frac{Independent\ Board\ Members}{Board\ Size}$	Annual reports		+
Research and Development	RD	Is the amount of money a company invests in research and development of new products and services.	Annual reports		
Total Sales	Sales	A total of all sale transactions of a company reported for a year.	Annual reports		
Gross Profit	GrossProfit	Gross profit is a firm's profit with costs related to making and selling its products deducted.	Annual reports		

Total Assets	TotalA	It is the total amount of resources a company possesses.	Annual reports		
	TotalAlog	Natural logarithm of the total assets variable.	Annual reports		
Intangible Assets	IntA	Intangible assets considered for the research include intellectual property such as patents, trademarks, and copyrights.	Annual reports		
Market Capitalization	MarketCap	The market capitalization of a company refers to its total value in denominated currency. Data for this variable were obtained primarily from companies' annual reports. If they did not state their market capitalization there, the author retrieved needed data from Nasdaq database.	Annual reports, Nasdaq		
	MarketCapLog	Natural logarithm of the market capitalization variable.	Annual reports		
Book Value	BV	It is a value representing the worth of a company after it paid all its liabilities.	Annual reports		
Innovation 1	Inno1	A dependent variable. Described in sub-chapter 3.2.	Annual reports		
Innovation 2	Inno2	A dependent variable. Described in sub-chapter 3.2.	Annual reports		

Beta	Beta	A dependent variable. Described in sub-chapter 3.2.	Nasdaq	H6	+
Gross Profit Margin	GPmargin	A dependent variable. Described in sub-chapter 3.2.	Annual reports	H8	+
Market-to-Book value ratio	MVBV	A dependent variable. Described in sub-chapter 3.2.	Annual reports	H7	+
Instrumental variable 1	InstrumentalIV1	A predicted variable used to improve the quality of analysis	Annual reports		
Instrumental variable 2	InstrumentalIV2	A predicted variable used to improve the quality of analysis	Annual reports		

For some absolute values, natural logarithms values have been utilized so that linearity in the analysis would be avoided. The squared values have been of other variables have been taken in order to improve the quality of the analysis.

3.4 Methods of data analysis

The author has included several types of analysis in the present research. First of all, descriptive statistics have been applied. It is a useful, convenient and widespread technique which helps to understand data through its summarization. The results of descriptive statistics analysis which were considered in this study are next: maximum and minimum of a variable; range for the variable, which represents the gap between its minimum and maximum values; mean, also known as central tendency, is an arithmetic average for the variable; median, the “middle value”, which shows the value which is located in the center of array of values for a variable; mode, a set of values which appears more often; standard deviation, which measures the dispersion of values in relation to their mean.

Furthermore, the author has used inferential analysis in his research in order to find whether there is a relationship between variables and how strong it is. This type of analysis encompasses the correlation and regression analysis techniques. In order to perform the aforementioned analyses, the author utilized IBM SPSS Statistics application.

The correlation was measured through Pearson’s Product Moment Correlation Coefficient or r , which determines the relationship between variables. The range of r is between -1 and 1. When r equals -1 it indicates a strong negative linear association whereas the value of 1 demonstrates a strong positive association. When $r=\pm 1$ this will mean that the two variables are perfectly correlated (Adams et al. 2007). The formula used for calculation of Pearson’s Product Moment Correlation Coefficient is the following:

$$r_{xy} = \frac{cov(x,y)}{S_x S_y} = \frac{\Sigma(X_1 - \bar{X})(Y_1 - \bar{Y}) / (n-1)}{S_x S_y}$$

Where:

cov - the covariance

S_x and S_y – the standard deviation of X and Y

\bar{X} – the mean of the X-variable

\bar{Y} – the mean of the Y-variable

n – the number of data points

Afterward, when the author identified dependent and independent variables, the regression analysis, represented in multivariate ordinary least square (or OLS) estimation model, was implemented. The multiple regression analysis itself is a study of functional relationships between variables where the dependent variable is supposed to be a function of two or more independent variables (Kothari 2009). In regard to ordinary least square technique, Dougherty notes that OLS, through differentiating effects of certain variables, allows the researcher to achieve an unbiased result (Dougherty 2007). Due to the possibility of including more than one independent variable in the analysis, which positively affects the outcome of results, this technique is recognized by many researchers who implemented it in similar studies, as the author could notice while reviewing them.

In addition to the basic panel data, the research output also includes the coefficient of determination denoted as R squared. This coefficient serves as another measure to verify the results of an analysis. The value of the coefficient is a percentage. If, for instance, R squared has a value of 90 percent, it will mean that 90 percent of the variation is explained by the model (Adams et al. 2007). The formula of the coefficient of determination is as follows:

$$R = \frac{\text{Sum of Squares Explained by Regression}}{\text{Total Sum of Squares (before Regression)}} = \frac{\sum(\hat{y}_i - \bar{y})^2}{\sum(y_i - \bar{y})^2}$$

In regard to the OLS regression analysis, the next equation has been applied:

$$y_{it} = a_{it} + \sum_{k=1}^p \beta_k x_{it} + \varepsilon_{it}$$

Where:

y_{it} – the dependent variable of firm i in the period t

a_{it} – the intercept of the model

x_{it} – corresponding to the i , explanatory variable of the model

ε – the random error with expectation 0 and variance σ^2

In addition to the coefficient of determination, Durbin-Watson test has been applied and considered for the sake of further verification of results and ensuring their quality. This test is utilized for measurement of autocorrelation in the residuals. Durbin-Watson test has a value from 0 to 4. A value from 0 to 2 means positive autocorrelation, whereas a value from 2 to 4 means negative autocorrelation. Moreover, the value of 2 means that there is no autocorrelation at all.

The following functional relationships of models have been measured using the aforementioned OLS regression analysis technique:

Innovation 1

$$\begin{aligned}
 = & a_{it} + \beta_1(Age)_{it} + \beta_2(Agesq)_{it} + \beta_3(AgeNL)_{it} + \beta_4(BoardS)_{it} \\
 & + \beta_5(BoardSsq)_{it} + \beta_6(BoardSNL)_{it} + \beta_7(Edu)_{it} + \beta_8(EduSq)_{it} \\
 & + \beta_9(EduNL)_{it} + \beta_{10}(Gender)_{it} + \beta_{11}(Busyness)_{it} \\
 & + \beta_{12}(BoardInd)_{it} + \beta_{13}(RD)_{it} + \beta_{14}(Sales)_{it} + \beta_{15}(GrossP)_{it} \\
 & + \beta_{16}(Inno2)_{it} + \beta_{17}(GPmargin)_{it} + \beta_{18}(MVBV)_{it} \\
 & + \beta_{19}(MarktCapLog)_{it} + \beta_{20}(TotalALog)_{it} \\
 & + \beta_{21}(InstrumentalIV2)_{it} + \beta_{22}(Beta)_{it} + \varepsilon_i
 \end{aligned}$$

Innovation 2

$$\begin{aligned}
&= a_{it} + \beta_1(Age)_{it} + \beta_2(Agesq)_{it} + \beta_3(AgeNL)_{it} + \beta_4(BoardS)_{it} \\
&+ \beta_5(BoardSsq)_{it} + \beta_6(BoardSNL)_{it} + \beta_7(Edu)_{it} + \beta_8(EduSq)_{it} \\
&+ \beta_9(EduNL)_{it} + \beta_{10}(Gender)_{it} + \beta_{11}(Busyness)_{it} \\
&+ \beta_{12}(BoardInd)_{it} + \beta_{13}(RD)_{it} + \beta_{14}(Sales)_{it} + \beta_{15}(GrossP)_{it} \\
&+ \beta_{16}(Inno1)_{it} + \beta_{17}(GPmargin)_{it} + \beta_{18}(MVBV)_{it} \\
&+ \beta_{19}(MarktCapLog)_{it} + \beta_{20}(TotalALog)_{it} \\
&+ \beta_{21}(InstrumentalIV1)_{it} + \beta_{22}(Beta)_{it} + \varepsilon_i
\end{aligned}$$

$$\begin{aligned}
GPmargin &= a_{it} + \beta_1(Age)_{it} + \beta_2(Agesq)_{it} + \beta_3(AgeNL)_{it} + \beta_4(BoardS)_{it} \\
&+ \beta_5(BoardSsq)_{it} + \beta_6(BoardSNL)_{it} + \beta_7(Edu)_{it} + \beta_8(EduSq)_{it} \\
&+ \beta_9(EduNL)_{it} + \beta_{10}(Gender)_{it} + \beta_{11}(Busyness)_{it} \\
&+ \beta_{12}(BoardInd)_{it} + \beta_{13}(RD)_{it} + \beta_{14}(Sales)_{it} + \beta_{15}(GrossP)_{it} \\
&+ \beta_{16}(Inno1)_{it} + \beta_{17}(Inno2)_{it} + \beta_{18}(MVBV)_{it} \\
&+ \beta_{19}(MarktCapLog)_{it} + \beta_{20}(TotalALog)_{it} \\
&+ \beta_{21}(InstrumentalIV1)_{it} \\
&+ \beta_{22}(InstrumentalIV2)_{it} + \beta_{23}(Beta)_{it} + \varepsilon_i
\end{aligned}$$

$$\begin{aligned}
Beta &= a_{it} + \beta_1(Age)_{it} + \beta_2(Agesq)_{it} + \beta_3(AgeNL)_{it} + \beta_4(BoardS)_{it} \\
&+ \beta_5(BoardSsq)_{it} + \beta_6(BoardSNL)_{it} + \beta_7(Edu)_{it} + \beta_8(EduSq)_{it} \\
&+ \beta_9(EduNL)_{it} + \beta_{10}(Gender)_{it} + \beta_{11}(Busyness)_{it} \\
&+ \beta_{12}(BoardInd)_{it} + \beta_{13}(RD)_{it} + \beta_{14}(Sales)_{it} + \beta_{15}(GrossP)_{it} \\
&+ \beta_{16}(Inno1)_{it} + \beta_{17}(Inno2)_{it} + \beta_{18}(MVBV)_{it} \\
&+ \beta_{19}(MarktCapLog)_{it} + \beta_{20}(TotalALog)_{it} \\
&+ \beta_{21}(InstrumentalIV1)_{it} + \beta_{22}(InstrumentalIV2)_{it} \\
&+ \beta_{23}(GPmargin)_{it} + \varepsilon_i
\end{aligned}$$

$$\begin{aligned}
MVBV = & a_{it} + \beta_1(Age)_{it} + \beta_2(Agesq)_{it} + \beta_3(AgeNL)_{it} + \beta_4(BoardS)_{it} \\
& + \beta_5(BoardSsq)_{it} + \beta_6(BoardSNL)_{it} + \beta_7(Edu)_{it} + \beta_8(EduSq)_{it} \\
& + \beta_9(EduNL)_{it} + \beta_{10}(Gender)_{it} + \beta_{11}(Busyness)_{it} \\
& + \beta_{12}(BoardInd)_{it} + \beta_{13}(RD)_{it} + \beta_{14}(Sales)_{it} + \beta_{15}(GrossP)_{it} \\
& + \beta_{16}(Inno1)_{it} + \beta_{17}(Inno2)_{it} + \beta_{18}(GPmargin)_{it} \\
& + \beta_{19}(MarktCapLog)_{it} + \beta_{20}(TotalALog)_{it} \\
& + \beta_{21}(InstrumentalIV1)_{it} + \beta_{22}(InstrumentalIV2)_{it} \\
& + \beta_{23}(Beta)_{it} + \varepsilon_i
\end{aligned}$$

The output of ordinary least square regression analysis included several statistical results which allowed allocating significant variables and contributed positively towards the quality of the research. Out of all statistical coefficients provided in the output of OLS analysis, four were considered and reviewed as those which are important for the present research: unstandardized coefficient beta, the standard error for the unstandardized beta, significance level, and t-test.

The beta coefficients represent the amount of change in the dependent variable associated with a change in the independent variable. Beta coefficient is unstandardized, meaning that the size and importance of its values are relative to the means and standard deviations of the independent and dependent variables used in the analysis. The standard error value shows the standard deviation of observed values around predicted values. (Janda 2018). Significance level, also known as the size of the test, regulates the area where the null hypothesis under test will be accepted or rejected (Brooks 2008). In the research, the author chose a significance level for the regression coefficients to be 10%. In practice, this means that results as extreme as this or more extreme would be expected only 10% of the time (ibid). Finally, the t-test was used in order to determine whether there are statistically significant differences between the means of two groups. (Cohen, Manion, & Morrison 2007.)

3.5 Reliability and validity

According to Saunders and colleagues, reliability implies the extent to which the data collection and analysis procedures will yield consistent findings. Moreover, they highlight that the next three points should be considered when the reliability of research is tested: measure should have same results on other occasions, other observers might be able to reach same observations, and, finally, it should the logic of processing raw data should be transparent (Saunders et al. 2009). In other words, reliability means consistency of measurement and its reproducibility. At the same time, it is stated by scholars that reliability is necessary for the validity of research, however not a sufficient condition on its own. (Adams et al. 2007.)

Furthermore, following threats to the reliability of research should be mentioned: participant error and bias and observer error and bias (Saunders et al. 2008). In regard to the first threat, it should be said that the research is based on annual reports of case companies published on their official websites and NASDAQ OMX Nordic database, so both participant error and participant bias were avoided. Besides, the author prevented the research to be affected by observer error and bias, as his methods of research and the procedures he utilized to process information are similar to those which were used in analogous researches from finance and corporate governance fields. For this reason, the author believes that the variables chosen for this study as well as the regression model used can be applied for different sample companies. All interpretations of data and findings presented in this paper have been made in a precise manner only on the information which was stated in this research. Thus, the author worked towards transparency and clarity of his paper and its results. Therefore, research is considered to be reliable.

Validity can be defined as the strength of conclusions, inferences, and propositions which involves the accuracy of a measurement. There are several types of validity which are distinguished by researchers. For this research, the next two types have been considered and examined as important requirements for the study – internal and external validity (Adams et al. 2007). Internal validity means the ability to specify the causal relationship between variables so that any explanation given can be sustained by the data. In other words, internal validity would mean the completion of research goals. (Smith, 2003; Cohen et al., 2007). External validity, in turn, indicates the degree to which the results can be generalized to the wider cases or situations (Cohen et al. 2007).

In order to ensure validity, the author has followed a set of recommended strategies. In regard to the external validity, the author has chosen and prepared a sample of 60 companies listed on two different stock exchanges. Moreover, the chosen companies operate in 11 different business segments. Representing different industries and location of origin, the diversity of sample companies makes the research consistent and allows generalizability and applicability of the research to other, non-sampled companies from Sweden and Finland. The figures below visualize the aforementioned matters related to external validity and diversity.

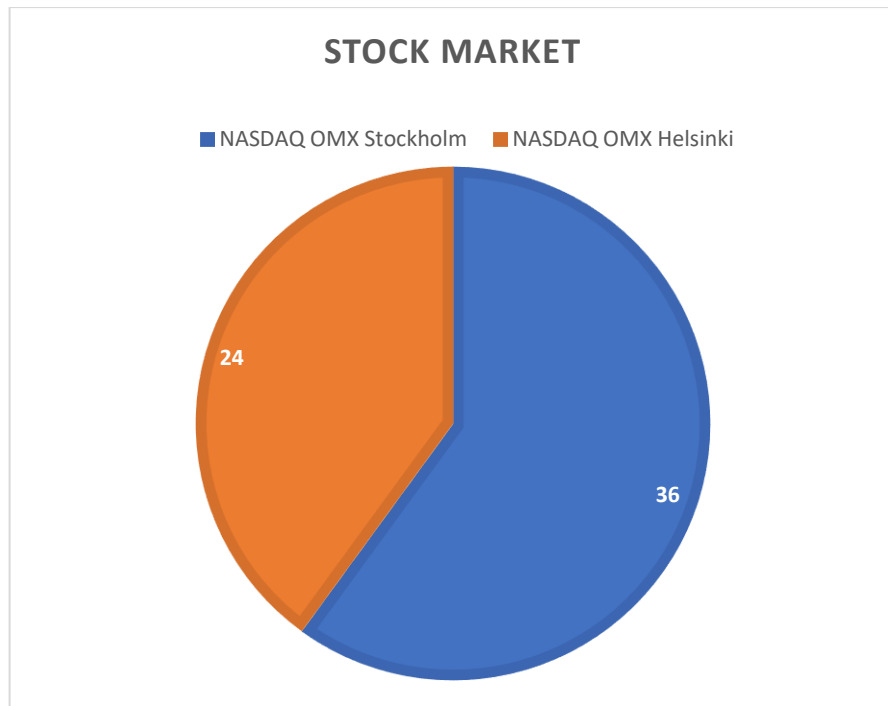


Figure 5. Companies divided by the location of the listing (Created by the author)

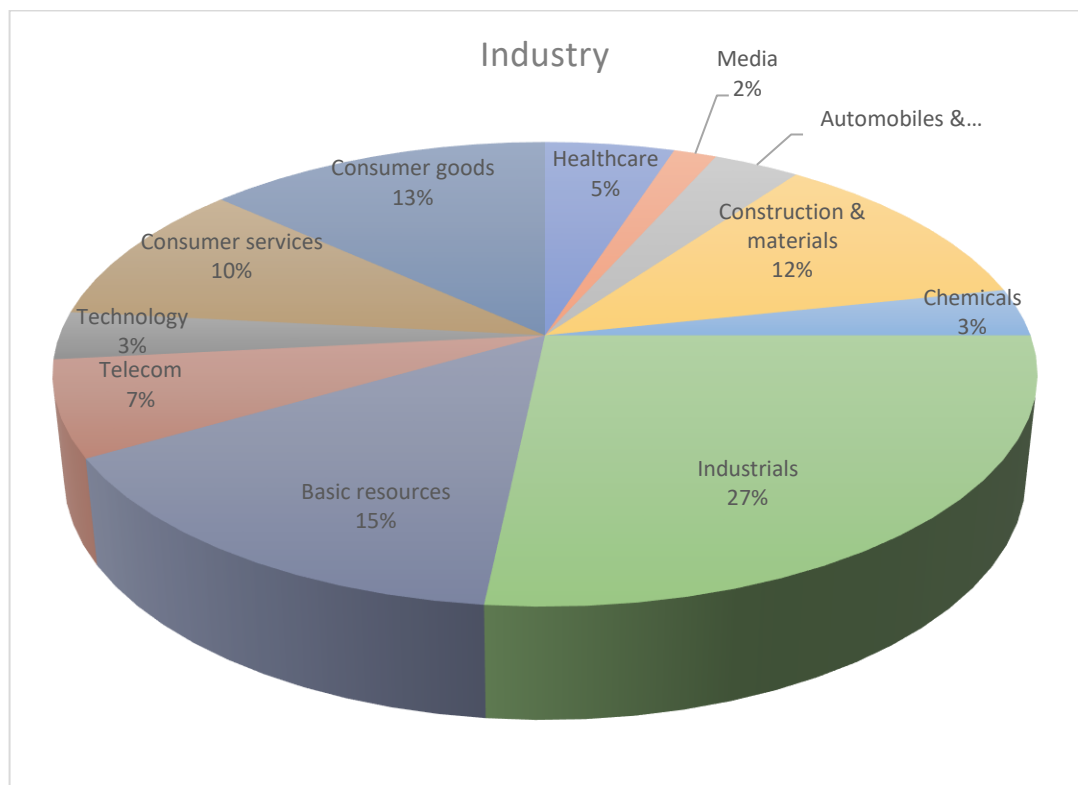


Figure 6. Companies divided by industry of operation (Created by the author)

Moreover, the author has considered previous studies of similar nature in the fields of corporate governance and finance for the sake of ensuring the external validity of the research and to prevent ambiguous notation of variables.

The author paid careful attention to the quality and source of the data he utilized for the research. For this reason, all data collected were derived from official and reliable sources, such as annual reports of companies published on official websites and NASDAQ OMX Nordic database. The author didn't change the measurement instruments and sample during the research. Additionally, hypotheses produced findings in accordance with anticipated results. Hence, the validity of the is ensured.

4 Research results

In the following chapter, the author of the research will provide and interpret the results of the analysis. The chapter contains three separate sections. The first one familiarizes a reader with the results of descriptive statistics analysis and offers a general overview of the variables. The second chapter depicts the relationships between variables through the correlation analysis. In the last, third section, the author presents the results of the OLS regression analysis.

4.1 Descriptive Statistics results

Table 2, which is presented below, comprises the results of the descriptive statistics analysis of all variables used in the research. The minimum and the maximum values of variables, the range between them, their mean, standard deviation, and variance are represented in the table.

In regard to the board composition, as can be seen from the Table 2, the mean age of directors of Stockholm- and Helsinki-listed companies is, using the rounded amount, 57 years with the standard deviation of 4, meaning 4 years. At the same time, the average age of directors worldwide, and, particularly, in Europe and the USA is over 60 years (Brown 2017; KPMG 2017). The minimum value of age variable – 44, shows that in some boards directors are considerably younger than directors of other boards. However, taking into account that standard deviation for the age variable is 4, it can be said that such “young” boards are a rare occasion on the

researched markets. Going forward, the mean for the board size variable is 9,2, which means that on average there are 9 directors on the board, the common value for the board size worldwide. According to the study conducted by The Wall Street Journal, small boards (8-10 directors) outperform their larger peers, thus the size of 9 directors can be considered as a positive factor (Lublin, 2014). Nevertheless, the standard deviation for the board size is 2, which is a considerable deviation.

In regard to the education variable, it should be mentioned that very big range can be observed – 55 points, with a minimum of 2 and maximum of 57 points, which means that there are large companies which are operated by directors almost without academic education. Furthermore, it can be assumed that gender equality, for some reason, is not achieved in companies of Sweden in Finland. The mean value for the gender variable is 0,30 or 30%, which means that the average board of sample companies has 3 female directors for every 7 male directors. At the same time, a minimum of 0 shows that some companies do not have female directors at all. However, the standard deviation for this variable is big – 0,11 which fact makes it difficult to make a certain conclusion about the gender composition of sample companies. Nevertheless, it still can be claimed that there are fewer female directors than male. In regard to the busyness of directors, from the table, it can be observed that on average, a director holds about 3.5 positions. The standard deviation for the busyness variable is large – 1,499. Thereby, this result is inconsistent, as the deviation allows 40% change from the mean. Furthermore, as can be seen from the results for the board independence variable, in the average board there are about 71% independent directors and 29% non-independent directors. The standard deviation for this variable is about 0,10, thus the results for the board independence variable are reliable and it can be claimed that the board of an average company in Sweden and Finland is independent.

Talking about the systematic risk of a company, or the beta, out of Table 2 it can be observed that the mean for this variable is 0,10. This value is significantly below 1, which indicates a low level of risk among companies. However, the standard deviation is quite high – 0,22, which makes a result inconsistent. Nevertheless, taking into account this deviation, it still can be stated that the overall level of risks among Finnish and Swedish companies is low. Moreover, it is worth to be mentioned that the range of the beta is significantly big – 3,1. The minimum beta observed is -0,269, the negative value meaning that there is at least one company whose stock

prices rise while the market goes down. Additionally, the maximum beta is 2,833, which highlights that there are companies with a high level of systematic risk.

As for the indicators which refer to the innovativeness of a company, from the table below it can be seen that the mean for Inno1 is 0,02, which can indicate that an average company invests 2% of its sales in R&D. However, the standard deviation for this value is considerably large – 0,05, so that these results are inconsistent. The minimum for Inno1 is 0, which means that some companies in Finland and Sweden do not invest in research and development at all. In regard to the Inno2 variable, we can observe the mean of 0,11, which tells us that on average intangible assets constitute 11% of total assets of a company. At the same time, the standard deviation is significantly big – 0,15, so that this result cannot be called consistent as well. Nevertheless, attention should be paid to the minimum of Inno2 variable - 0,0016, which highlights that all companies possess at least some amount of intangible assets and there are no companies without any intangible assets.

Talking about accounting and market performance indicators, we can first address the analysis results for the gross profit margin. The mean for the gross profits margin is pretty high – 0,37, which indicates that the gross profit of an average company would be 37% of its revenue. But for the reason that the standard deviation for the gross profit margin is high – 0,21, so this result cannot be consistent. Notwithstanding, attention should be paid to the range – 0,88, minimum – 0,017 and maximum – 0,86. The value of the range is significantly big, and, as it can be observed from the minimum and maximum values, some companies in Finland and Sweden operate at a deficit while some maintain an extraordinary high gross profit margin, about 88%. In regard to the market-to-book value ratio, the mean of 1,41 represents that the market value of an average company is 40% than its book value. Yet, due to the high standard deviation, this result is unreliable. Moreover, the maximum extreme of market-to-book value ratio is significantly high – 23,77, which indicates that there is at least one company whose stocks are traded at an exceptionally higher price when compared to the book value of a company and mean of all companies. The minimum – 0, came from the fact that some companies considered in the present research were not listed at some periods, thereby market-to-book ratio for them equaled 0.

Table 2. Descriptive statistics results

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Standard deviation	Variance
Age	393	25,5	44,0000	69,5	56,82697201	4,080264252	16,64855637
Agesq	393	3984016,00	1936,000	3984016,00000	12787,2579075	196365,678303	38559479615,770
AgeNL	393	3,81471	3,78419	7,59890	4,0461500	0,19374675	0,038
BoardS	393	9,00000	5,00000	14,00000	9,2391858	2,16507325	4,688
BoardSsq	393	196,00000	25,00000	196,00000	86,0948905	43,70827067	1910,413
BoardSNL	393	1,02962	1,60944	2,63906	2,1946655	0,24394108	0,060
Edu	393	55,00000	2,00000	57,00000	18,7353700	6,785804205	46,0471387
EduSq	393	3245,00000	4,00000	3249,00000	396,9440000	338,467196	114560,0428
EducationNL	393	3,349904	0,693147	4,043051	2,86518679	0,377303886	0,142
Gender	393	0,66667	0,00000	0,66667	0,3068609	0,11757771	0,014
Busyness	393	7,00000	1,00000	7,00000	3,5644309	1,49936544	2,248
BoardInd	393	7,05000	0,20000	0,928571429	0,7150070	0,10143200	0,010288522
RD (MEUR)	393	4997	0,00000	4997	167,3371786	566,3262095	320725,37562
Sales (MEUR)	393	37947,70898	48,00000	37995,70898	5792,4620449	6469,75524925	41857732,985
GrossP (MEUR)	393	16501	-120,00000	16381,00000	1761,4132371	2350,55166730	5525093,141
TotalA (MEUR)	393	46114,31287	31,00000	46145,31287	6371,3959098	8586,94366762	73735601,551
IntA (MEUR)	393	18241,14636	6,50000	18247,64636	649,7319483	1588,47362232	2523248,449
MarketCap (MEUR)	387	47465,20457	15,01201	47480,21658	6419,4357764	7993,65151547	63898464,551
BV (MEUR)	393	35377,0086	-543,9291	35920,9377	2932,67598	4639,658854	21526434,28
Beta	393	3,10248	-0,26900	2,83348	0,1040527	0,22815816	0,052
Inno1	393	0,47668635	0,00000	0,47668635	0,024942555	0,051078398	0,002609003

Inno2	393	0,717234574	0,00160	0,718839201	0,117266354	0,159842094	0,025549495
GPmargin	393	0,885811261	-0,01779	0,868020305	0,372863547	0,212268139	0,045057763
MVBV	393	23,77277	0,00000	23,77277	1,4170647	1,85492985	3,441
MarktCapLog	387	8,05922	2,70885	10,76807	8,1822980	1,09610776	1,201
TotalALog	393	7,30556	3,43399	10,73955	8,1130211	0,05883615	1,364
InstrumentalIV1	393	3,00771	-0,26069	2,74703	0,0333266	0,00816801	0,026
InstrumentalIV2	393	1,76324	0,00160	1,76484	0,1218708	0,00932926	0,033

Note: Age: median age of board members, Agesq: the square of age, AgeNL: natural log of age, BoardS: the size of a board, BoardSq: the square of BoardS, BoardSNL: natural log of BoardS, Edu: education level of board members, EduSq: the square of Edu, EducationNL: the square of Edu, Gender: proportion of female directors, Busyness: the median busyness of board members, BoardInd: proportion of independent directors, RD: investments in research and development, Sales: sales of a firm, GrossP: gross profit of a firm, TotalA: total assets of a firm, IntA: intangible assets of a firm, MarketCap: market capitalization of a firm, BV: book value of a firm, Beta: Systematic risk, Inno1: R&D to sales ratio, Inno2: intangible assets to total assets ratio, GPmargin: gross profit margin, MarktCapLog: natural log of MarketCa, TotalALog: natural log of TotalA, InstrumentalIV1: first instrumental variable, InstrumentalIV2: second instrumental variable.

4.2 Correlation results

On the tables below a reader can find results of correlation analysis between all the variables utilized in this research highlighted. The tables comprise dependent, independent, and instrumental variables. The author considered only those correlations which have 0.05% and 0.01% significance levels.

From the results of the analysis on the tables below it can be observed that the board size is significantly correlated with a wide range of other variables. First of all, there is a significant positive correlation between the board size and education level of a board, which means that directors of a firm will have, cumulatively, a more solid academic background the bigger board is. Furthermore, there the board size is significantly and positively correlated with research and development expenditures, sales, gross profit, total and intangible assets, market capitalization and a book value of a firm. This fact means that the bigger is a board, the bigger the aforementioned metrics. Thereby, it can be assumed that firms with bigger boards tend to

spend more on research and development, have larger revenues and gross profits. Market capitalization and a book value of such firms are larger, and they tend to accumulate more assets. A positive correlation between the board size and variable *inno2* suggests that firms with more members on the board have a greater share of intangible assets relative to total assets. In addition, there is a significant negative correlation between board size and the beta. That indicates that firms with bigger boards have a lower level of systematic risk, and vice versa – the smaller board of a firm, the bigger the level of systematic risk for that firm. Moreover, it can be seen that the board size is negatively correlated with gross profit margin and market-to-book value ratio. This fact indicates that companies with large boards will have a less gross profit margin and market-to-book ratio than companies with small boards. Overall, it can be noticed that bigger boards of directors contribute towards the better overall performance of a firm, however, the firm's accounting and marketing performance indicators are likely to be less in such cases. The positive influence is backed by theoretical findings which imply that larger boards have more resources to support the firm and contribute towards its success.

In regard to the education, from the tables below one can observe that education of a board is significantly positively correlated with busyness. This means that the more educated board is, the more directorship positions each director of a firm occupies in addition to the position in this firm. Furthermore, there is a positive correlation between education and research and development expenditures, sales, gross profits, total and intangible assets, market capitalization, book value and the beta of a firm. Thus, the more educated a board is the bigger all the aforementioned metrics, which in most cases is beneficial for a firm. Out of these results, it can be said that the more educated boards have a positive impact on a company, which is in line with theory. However, the positive correlation between education and beta means that the level of systematic risk will be higher in those firms where directors have earned more degrees. It can be interpreted as the fact that more educated directors are more likely to explore new strategies and approaches when managing a company which increases the systematic risk for a company. Additionally, education of a board is significantly negatively correlated with market-to-book value ratio., meaning that the more educated the board is, the closer the firm's market value to its book value.

Going forward, gender is significantly negatively correlated with the education of a board, which means that the larger the proportion of female directors on the board, the less educated the board is. Moreover, there is a significant positive correlation between gender and busyness,

which indicates that the larger the proportion of female directors on a board is, the more directorships an average director holds. Also, gender is significantly negatively correlated with research and development expenditures, sales, total and intangible assets, and book value. Thus, it can be assumed that a large share of female directors has a negative influence on the aforementioned metrics. In addition, there is a negative correlation between gender and R&D-to-sales ratio, which indicates that companies where on boards there are more female directors invest less in research and development. These results contradict with theoretical findings which perceive female directors as a factor contributing to the diversity on a board which, in turn, theoretically allows a firm to benefit from more balanced and thoughtful board decisions.

From the table 4, it can be seen that the beta is significantly negatively correlated with a market capitalization of a company, intangible-to-total assets ratio and market-to-book value ratio, which highlights that the bigger these variables are, the less systematic risk for the company. Additionally, the busyness of a board is significantly positively correlated with the beta of a company, meaning that the more directorships a director holds, the higher the level of systematic risk for the company.

Furthermore, research and development expenditures-to-sales ratio is significantly positively correlated with total and intangible assets, market capitalization and a book value of a company, which can be interpreted as a fact that bigger companies tend to invest more in research and development. In regard to the second ratio related to innovativeness, intangible-to-total assets ratio, it can be observed that it is negatively correlated with sales and has a positive correlation with beta and market-to-book value ratio. This fact indicates that companies with bigger sales tend to have smaller share intangible assets, but on the other hand, a bigger share of intangible assets decreases the level of systematic risk and increases their market value relative to their book value.

Going forward, it can be mentioned that the gross profit margin is significantly negatively correlated with total assets and the book value of a company. However, there is a significant positive correlation between gross profit margin and the market-to-book value ratio. It can be interpreted in a way that, although high gross profit margin tends to decrease the level of total assets and a book value of a firm, the market will perceive high gross profit margins as a positive factor.

Table 3. Corelation analysis results

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16
X1	1	,993**	-0,05	0,008	-0,048	0,06	0,021	0,051	0,043	0,018	-0,006	-0,015	-0,019	-0,015	-0,011	-0,029
X2	,993**	1	-0,052	-0,04	-0,051	-0,004	-0,012	0,052	-0,017	0,018	-0,009	-0,022	-0,023	-0,02	-0,013	-0,032
X3	-0,05	-0,052	1	,993**	,992**	,259**	,211**	-0,024	0,017	-0,034	,134**	,334**	,179**	,326**	,302**	,263**
X4	0,008	-0,04	,993**	1	,972**	,393**	,273**	-0,035	,203**	-0,038	,131**	,338**	,171**	,325**	,318**	,254**
X5	-0,048	-0,051	,992**	,972**	1	,277**	,225**	-0,012	0,035	-0,027	,136**	,330**	,188**	,320**	,283**	,270**
X6	0,06	-0,004	,259**	,393**	,277**	1	,918**	-,100*	,366**	0,015	,184**	,249**	,243**	,268**	,185**	,262**
X7	0,021	-0,012	,211**	,273**	,225**	,918**	1	-0,083	,257**	-0,003	,160**	,216**	,232**	,217**	,140**	,267**
X8	0,051	0,052	-0,024	-0,035	-0,012	-,100*	-0,083	1	,111*	-0,027	-,147**	-,109*	-0,027	-,168**	-,100*	-0,092
X9	0,043	-0,017	0,017	,203**	0,035	,366**	,257**	,111*	1	-0,066	-0,076	0,038	0,017	-0,038	-0,055	-0,001
X10	0,018	0,018	-0,034	-0,038	-0,027	0,015	-0,003	-0,027	-0,066	1	-0,03	-0,059	-0,038	-0,056	-0,019	-0,053
X11	-0,006	-0,009	,134**	,131**	,136**	,184**	,160**	-,147**	-0,076	-0,03	1	,446**	,532**	,655**	,483**	,507**
X12	-0,015	-0,022	,334**	,338**	,330**	,249**	,216**	-,109*	0,038	-0,059	,446**	1	,793**	,856**	,471**	,724**
X13	-0,019	-0,023	,179**	,171**	,188**	,243**	,232**	-0,027	0,017	-0,038	,532**	,793**	1	,770**	,516**	,805**
X14	-0,015	-0,02	,326**	,325**	,320**	,268**	,217**	-,168**	-0,038	-0,056	,655**	,856**	,770**	1	,587**	,787**
X15	-0,011	-0,013	,302**	,318**	,283**	,185**	,140**	-,100*	-0,055	-0,019	,483**	,471**	,516**	,587**	1	,440**
X16	-0,029	-0,032	,263**	,254**	,270**	,262**	,267**	-0,092	-0,001	-0,053	,507**	,724**	,805**	,787**	,440**	1
X17	-0,01	-0,014	,152**	,147**	,156**	,154**	,121*	-,106*	-0,035	-0,01	,313**	,386**	,328**	,475**	,224**	,377**
X18	0,007	-0,003	-,211**	-,189**	-,203**	,185**	,182**	0,021	,103*	-0,013	-0,047	-0,044	-0,079	-0,063	-0,075	-,134**
X19	-0,003	-0,003	0,047	0,039	0,054	0,005	0,001	-,102*	-0,023	-0,021	,709**	0	0,041	,230**	,110*	,257**
X20	-0,016	-0,012	,141**	,160**	,121*	-0,023	-0,033	-0,031	0,044	0,045	0,011	-,154**	-0,091	-0,079	,467**	-0,036
X21	-0,045	-0,035	-,292**	-,296**	-,293**	-0,038	0,004	0,048	-0,056	0,044	0,023	-,292**	,142**	-,156**	-0,021	-0,015
X22	-0,029	-0,026	-,125*	-,120*	-,126*	-,120*	-0,043	0,028	0,036	0,015	-0,073	-,138**	-0,044	-,171**	-0,072	,103*
X23	-0,04	-0,046	,367**	,359**	,372**	,286**	,278**	-0,048	0,053	-0,043	,357**	,658**	,640**	,662**	,394**	,834**
X24	0,002	-0,006	,451**	,437**	,453**	,338**	,274**	-0,064	0,047	-0,07	,404**	,770**	,637**	,794**	,423**	,687**
X25	,942**	,928**	-0,022	-0,026	-0,015	0,077	0,053	0,043	0,013	0,011	0,018	0,036	0,013	0,037	0,002	0,006
X26	0,007	-0,004	,271**	,252**	,290**	,930**	,785**	-0,081	,133**	0,025	,167**	,239**	,225**	,279**	,189**	,231**
X27	-0,003	-0,003	0,036	0,031	0,04	0,005	-0,002	-,118*	-0,027	-0,021	,784**	-0,01	0,042	,251**	,120*	,282**
X28	-0,017	-0,012	,149**	,165**	,130*	-0,029	-0,036	-0,028	0,042	0,047	0,01	-,157**	-0,093	-0,081	,467**	-0,041

Table 4. Correlation analysis results – cont.

	X17	X18	X19	X20	X21	X22	X23	X24	X25	X26	X27	X28
X1	-0,01	0,007	-0,003	-0,016	-0,045	-0,029	-0,04	0,002	,942**	0,007	-0,003	-0,017
X2	-0,014	-0,003	-0,003	-0,012	-0,035	-0,026	-0,046	-0,006	,928**	-0,004	-0,003	-0,012
X3	,152**	-,211**	0,047	,141**	-,292**	-,125*	,367**	,451**	-0,022	,271**	0,036	,149**
X4	,147**	-,189**	0,039	,160**	-,296**	-,120*	,359**	,437**	-0,026	,252**	0,031	,165**
X5	,156**	-,203**	0,054	,121*	-,293**	-,126*	,372**	,453**	-0,015	,290**	0,04	,130*
X6	,154**	,185**	0,005	-0,023	-0,038	-,120*	,286**	,338**	0,077	,930**	0,005	-0,029
X7	,121*	,182**	0,001	-0,033	0,004	-0,043	,278**	,274**	0,053	,785**	-0,002	-0,036
X8	-,106*	0,021	-,102*	-0,031	0,048	0,028	-0,048	-0,064	0,043	-0,081	-,118*	-0,028
X9	-0,035	,103*	-0,023	0,044	-0,056	0,036	0,053	0,047	0,013	,133**	-0,027	0,042
X10	-0,01	-0,013	-0,021	0,045	0,044	0,015	-0,043	-0,07	0,011	0,025	-0,021	0,047
X11	,313**	-0,047	,709**	0,011	0,023	-0,073	,357**	,404**	0,018	,167**	,784**	0,01
X12	,386**	-0,044	0	-,154**	-,292**	-,138**	,658**	,770**	0,036	,239**	-0,01	-,157**
X13	,328**	-0,079	0,041	-0,091	,142**	-0,044	,640**	,637**	0,013	,225**	0,042	-0,093
X14	,475**	-0,063	,230**	-0,079	-,156**	-,171**	,662**	,794**	0,037	,279**	,251**	-0,081
X15	,224**	-0,075	,110*	,467**	-0,021	-0,072	,394**	,423**	0,002	,189**	,120*	,467**
X16	,377**	-,134**	,257**	-0,036	-0,015	,103*	,834**	,687**	0,006	,231**	,282**	-0,041
X17	1	0,045	,178**	-0,064	-,100*	-0,084	,345**	,406**	0,023	,161**	,159**	-0,065
X18	0,045	1	-0,043	-,114*	-0,06	-,132**	-,112*	0,032	0,054	,161**	-0,056	-,116*
X19	,178**	-0,043	1	0,076	0,032	-0,007	,130*	,111*	0	0,002	,903**	0,075
X20	-0,064	-,114*	0,076	1	0,03	,124*	-0,001	-,168**	-0,06	-0,026	0,083	1,000**
X21	-,100*	-0,06	0,032	0,03	1	,185**	-,153**	-,341**	-0,096	-0,043	0,042	0,038
X22	-0,084	-,132**	-0,007	,124*	,185**	1	0,095	-,353**	-0,064	-,191**	-0,012	,125*
X23	,345**	-,112*	,130*	-0,001	-,153**	0,095	1	,742**	0,013	,262**	,138**	-0,013
X24	,406**	0,032	,111*	-,168**	-,341**	-,353**	,742**	1	0,08	,373**	,119*	-,174**
X25	0,023	0,054	0	-0,06	-0,096	-0,064	0,013	0,08	1	,102*	-0,005	-0,061
X26	,161**	,161**	0,002	-0,026	-0,043	-,191**	,262**	,373**	,102*	1	0,004	-0,025
X27	,159**	-0,056	,903**	0,083	0,042	-0,012	,138**	,119*	-0,005	0,004	1	0,083
X28	-0,065	-,116*	0,075	1,000**	0,038	,125*	-0,013	-,174**	-0,061	-0,025	0,083	1

Note: ** p < 0.01; * p < 0.05;

X1 – Age; X2 – Agesq ; X3 – BoardS ; X4 – BoardSsq; X5 – BoardSNL; X6 – Edu; X7 – EduSq; X8 – Gender; X9 – Busyness; X10 – BoardInd; X11 – RD; X12 – Sales; X13 – GrossP; X14 – TotalA; X15 – IntA ; X16 – MarketCap ; X17 – BV; X18 – Beta; X19 – Inno1; X20 – Inno2; X21 – Gpmargin; X22 – MVBV ; X23 – MarktCapLog ; X24 – TotalALog ; X25 – AgeNL ; X26 – EducationNL ; X27 – InstrumentalIv1 ; X28 – InstrumentalIv2 . Number of observations: 393

4.3 OLS regression analysis results

This section of the research familiarizes a reader with the results of multivariate ordinary least squares regression analysis. Tables 5, 6, 7 and 8 represent the results for accounting-based performance, market-based performance, and systematic risk level, respectively. In the tables, the author provided the value of estimated coefficients in the columns named "Beta". This coefficient shows the strength of the effect of an independent variable on a dependent variable. In the case when the figure is negative, the variables are negatively correlated, whereas positive figure means a positive correlation. In the columns "t", the t-test value for each variable is given, which is the indicator of the significance. The columns "Significance" represent the significance level for each variable. The author considered and provided only those variables which had a significance level of 90% or higher.

The author utilized the method of instrumental variables, which are used in regression analysis when a researcher has some variables which are influenced by other variables. The reasoning behind this decision was that instrumental variables help to remove the problem of reverse causation and bring clarity to the correlation results. In order to apply this method, the author has calculated the estimated variable and subsequently used it in the analysis. Besides, the weighted average was calculated for independent variables in order to apply weighted least squares (WLS) regression, which results were also considered. It was done for the sake of attempt to provide each data point with its appropriate amount of influence by maximizing the efficiency of parameter estimations.

According to the results of OLS regression analysis in table 5, it can be said that only a few board characteristics somehow affect the innovativeness of a firm. The only board characteristic to influence research and development-to-sales ratio is busyness. There is a positive correlation between busyness and Inno1 with a significance level of nearly 99%. Thus, it can be stated that the more directorships directors of a firm hold, the higher the innovativeness of a firm. However, this correlation is counterbalanced by the fact, that intangible-to-total assets ratio is negatively dependent on busyness with a significance level of 100%, which means that the less multiple directorships an average director of a firm has, the more innovative would be that firm. Nevertheless, the following observations can be made. First, as the busyness is positively correlated with Inno1 variable, it can be said that the firms

where directors normally hold multiple directorships in various companies invest a bigger share of their sales in R&D. At the same time, they have a smaller share of intangible assets relative to their total assets.

Moreover, intangible-to-total assets ratio is significantly negatively correlated with the size of a board, which means that firms with smaller boards tend to have more intangible assets than firms with bigger boards. In addition, the positive correlation is found between education and Inno2 variable, with a significance level of 100%. Thus, it can be noticed that the education level of the board increases the innovativeness of a firm. On the contrary, bigger boards have only a negative effect on innovativeness.

Table 4. OLS regression results for the innovation-related variables

Dependent Variable	Independent Variable	Beta	t-value	Significance level
Inno1	Busyness	0,062	2,682	0,008
Inno2	BoardS	-,432°	-2,491	0,013
Inno2	BoardSNL	-,228°	-2,674	0,008
Inno2	EduSq	0,710	22,663	0,000
Inno2	Busyness	-0,337	-14,050	0,000

Note: Number of observations: 393;

Inno1 – research and development expenditures-to-sales ratio; Inno2 – intangible-to-total sales ratio; Busyness – median busyness of board members; BoardS – the size of a board; BoardSNL – natural log of BoardS; EduSq - the square of education.

Out of table 6, it can be seen that the gross profit-to-sales ratio, or gross profit margin, is highly positively dependent on the board size, with a significance level of almost 99%. This fact means that the bigger a board is, the more profits the company will keep after deducting of cost of goods sold. That positive correlation can be explained by a number of reasons. First of all, it can be assumed that while there are more directors on board, more time and efforts are invested in monitoring and auditing functions of a board, so that more attention is paid to accounting-related metrics as well. Moreover, it can be supposed that by having more directors, a board

better performs its managerial functions, so that a firm's departments act more effectively so that greater results are achieved. Furthermore, it can be observed that the gross profit margin is also highly positively dependent on the median age of directors, and the significance level for this is close to 100%. Probably, it can be explained by the assumption that older directors have gained more experience throughout the years, which, in turn, allows them to better perform their managerial and supervisory duties, and that affects the positively accounting-based performance of a firm. In regard to the dependence of the gross profit margin on the education level of a board, it can be said this dependence is significant and positive, and the significance level for this is 90%. Thereby, education level does affect accounting-based performance at all, albeit unremarkable. Furthermore, the gross profit margin is negatively dependent on the busyness of directors, with the significance level close to 100%. Thus, it can be stated that the fewer directorship positions directors on a board hold on average, the better results accounting-based performance of firm yields.

Going forward, the gross profit margin of a firm is positively dependent on the market capitalization of a company, its innovativeness (namely research and development expenditures-to-sales ratio) and market-to-book value ratio. The significance levels for these dependencies are 100%, 99%, and 90% respectively. It can be supposed, that in the case of market capitalization and market-to-book value ratio the positive effect high gross profit margin has on the market evaluation of a company can be observed and serve as an explanation for these relationships between variables. Regarding the innovativeness of a company, the assumption can be made that more innovative companies are able to retain more profits.

Furthermore, the accounting-based performance of a company is significantly negatively correlated with the beta of a company. That means that when the systematic risk for a given company is lower, it has a higher gross profit margin. In turn, it can indicate that companies have better accounting-related results in an environment where levels of risk and uncertainty are lower. Moreover, the gross profit margin is significantly negatively dependent on total assets of a company. It can be explained by the assumption that in the situation when a firm has more assets under its control, it becomes more challenging to yield better accounting results.

The R square for the gross profit margin is 0,561, which is high. High R square value indicates that the changes in dependent variables are mostly explained by the independent variable. In addition, the Durbin-Watson test value equals 1,960, which is very high and signifies that there is almost no autocorrelation in the sample. This factor serves as an additional verification of the results of the model.

Table 5. OLS regression results for accounting-based performance (Gross profit margin)

Dependent variables	Beta	t	Significance
BoardSsq	-0,002	-3,224	0,001
BoardS	42,979	2,671	0,008
EduSq	0,000	-1,642	0,100
Edu	0,020	1,853	0,065
Gender	0,109	1,535	0,100
Busyness	0,026	-5,038	0,000
Beta	-0,086	-2,765	0,006
MarktCapLog	0,108	5,790	0,000
TotalALog	-0,132	-6,873	0,000
AgeNL	-0,034	-5,001	0,000
Age	13,522	4,117	0,000
Agesq	12,229	4,125	0,000
Inno1	0,135	2,522	0,012
MVBV	,073 ⁱ	1,578	0,100

Note: Number of observations: 393;

BoardSsq – the square of board size; EduSq – the square of education; Gender – proportion of female directors on a board; Busyness – median busyness of board members; Beta – systematic risk; MarktCapLog – natural log of market capitalization; TotalALog – natural log of total assets; AgeNL – natural log of age; Age – median age of directors; Agesq – the square of age; BoardS – the size of a board; Edu – education level of board members; Inno1 – R&D to sales ratio; MVBV – market-to-book value ratio; AgeNL – natural log of age.

In regard to the market-based performance of a firm, the following correlations can be highlighted. First of all, it can be noted that the market-to-book value ratio is negatively dependent on the median age of directors, with a significance level of 90%. It means that the market negatively reacts on the age of directors on a board so that when it gets higher, the market value of a company declines. Probably, it can indicate a tendency of Swedish and Finnish markets' willingness to see younger directors on boards. The reasoning behind this might be a belief that in modern times of changes and high-technologies younger directors can manage firms better. Moreover, there is a negative correlation between the education level of directors and market-based performance, with significance level close to 100%. Thus, considering the high level of significance, it can be assumed that either educated board directors might be perceived by the market in a negative way or their actions lead to the decline of the market price of a company. Another explanation might be that while a company is under the control of the more educated board, the book value of a company grows much faster than its market value, which leads to the lower market-to-book value ratio. Moreover, a significant positive correlation between busyness and market-to-book value ratio can be observed. Thereby, it can be concluded that multiple directorships of directors positively contribute towards the perception of a firm by the market, either due to their increased networking capabilities or because of another factor.

The ambiguous results have been received for variables related to the innovativeness of a firm. The market-based performance of a firm is negatively dependent on R&D expenses-to-sales ratio, with a significance level of 90%. However, the correlation between intangible-to-total assets ratio and market-to-book value ratio is positive with a significance level of 100%. An assumption can be made that firms which invest more in R&D have worse market-based performance, while those firms, which maintain a bigger share of intangible assets are perceived by the market in a better light and, thereby, their market value is higher.

Furthermore, no correlation is observed between gross profit and market-to-book value ratio, and the significance level for this statement is 90%. Additionally, one can notice a significant positive correlation between market capitalization and market-based performance. The author does not take this correlation into account as he utilized the value of market capitalization while calculating the market-to-book value ratio. For this reason, that correlation has not been considered. Moreover, market-based performance is negatively dependent on total assets of a company, with a significance level of 100%. Thus, the more assets a company possesses, the

less favorable opinion of a company the market has. It can be supposed, that the markets of Finland and Sweden associate a large number of company's assets with higher risks or slower growth, which leads to the lower market value. In addition, the assumption can be made that total assets are positively correlated with the book value of a company, which, in turn, is negatively correlated with market-to-book value ratio.

The R square test for market-based performance analysis equals 0,499, which is quite high. Moreover, the result of the Durbin-Watson test is 1,914, which is very high. The results for two aforementioned tests allow the author to state that the results for market-based performance are reliable and can be manipulated with the given set of variables.

Table 6. OLS regression results for market-based performance (market-to-book value ratio)

Dependent variables	Beta	t	Significance
TotalALog	-1,831	-16,826	0,000
MarktCapLog	1,004	7,670	0,000
MarketCap	8,422E-05	4,151	0,000
Sales	5,907E-05	2,807	0,005
GrossP	0,000	-2,197	0,029
Busyness	,055 ^f	1,497	0,100
Age	-2,861	-1,354	0,100
Agesq	-2,586	-1,358	0,100
EduSq	0,001	5,276	0,000
EducationNL	-0,761	-4,095	0,000
Inno2	0,800	6,942	0,000
Inno1	-,061 ^f	-1,494	0,100

Note: Number of observations: 393;

TotalALog – natural log of total assets; MarktCapLog – natural log of market cap; MarketCap – market capitalization of a company; Sales – sales of a firm; GrossP – gross profit of a firm; Inno1 – R&D to sales ratio; Busyness – median busyness of board members; Age – median age of directors of a firm; Agesq – the square of age; EduSq – the square of education; Inno2 – intangible-to-total assets ratio; EducationNL – natural log of education.

Talking about the beta, from table 8 it can be seen it is negatively dependent on the board size of a company, with a significance level of 100%. Thus, big boards have a positive impact on a firm's risk level, as the bigger a board is, the lower the beta for that firm. The reason behind this relationship might be that bigger boards have more resources and abilities to mitigate various risk factors due to the combination of skills each director possesses. Moreover, the median age of board directors is significantly negatively correlated with the beta. Thereby, firms which have older directors on the board manage to have lower risk, which probably can be explained by higher levels of experience and competency of older directors. Going forward, the systematic risk for a firm is positively dependent on the gender variable, which indicates the proportion of female directors on a board, with a significance level of 95%. Thus, it can be said that the more female directors a board has, a higher level of systematic risk it has to face. The similar positive correlation is found between the education level of board and systematic risk, with a significance level of 100%. It might be explained by the assumption that by having more different opinions expressed during board meetings due to a variety of genders and a higher level of academic education among directors, a firm can choose to try less traditional ways of operating. In turn, it can lead to greater variations in its market price which affects the level of systematic risk. Furthermore, the busyness of directors is significantly positively correlated with the beta. Taking this into account, in this regard, multiple directorships of the firm's directors have a negative impact on a firm, as they increase the level of systematic risk for a company.

Furthermore, market capitalization and gross profit margin of a firm are significantly negatively correlated with the systematic risk. This means the higher these parameters are, the lower the level of systematic risk for a company. Thereby, it can be stated that market capitalization and gross profit margin of a company positively contribute towards the stable position of a company on a market. Moreover, the systematic risk is positively dependent on the total assets of a firm, with a significance level of 100%. Thus, it can be stated that having a big amount of total assets means a higher level of systematic risk of a company, as it might be more challenging to manage and mitigate risks for a firm with a billion dollars in assets rather than one with 100 million dollars.

The R square value for the systematic risk is 0,176, which is low, but acceptable. It means that the beta might be under the control of the provided dependent variables, however, not fully as

there can be other factors affecting it. Additionally, the result of the Durbin-Watson test is 1,752, which is high. It shows that the level of autocorrelation in the sample is low.

Table 7. OLS regression results for the systematic risk (the beta)

Dependent variables	Beta	t	Significance
BoardSsq	-0,002	-6,340	0,000
BoardSNL	-0,825	-6,396	0,000
Edu	0,008	4,945	0,000
EducationNL	0,331	1,773	0,077
MarketCap	-9,646E-06	-5,206	0,000
TotalALog	0,064	4,529	0,000
Gender	0,109	1,971	0,049
Busyness	0,017	2,722	0,007
GPmargin	-0,074	-1,800	0,073
AgeNL	-0,024	-3,289	0,001

Note: Number of observations: 393

BoardSsq – the square of board size; Edu – education level of board size; MarketCap – market capitalization of a company; TotalALog – natural log of total assets; BoardSNL – natural log of board size; Gender – proportion of female directors on board; busyness – median busyness of board members; GPmargin – gross profit margin; AgeNL – natural log of age; EducationNL – natural log of education.

5 Conclusion

In this section of the research, the author intends to clarify and summarize the results of the analysis performed in order to answer the research questions and test hypotheses provided earlier. In addition, the practical implications of the research are explained in this section as well as the limitations of this study. Finally, recommendations and suggestions for future research have been provided.

5.1 Discussion about the findings

The main objective of the research was to investigate whether board characteristics affect the innovativeness of a company and whether innovativeness, in turn, might influence a firm's performance. The results of empirical and theoretical analysis helped the author to answer all research questions stated previously in the thesis and test the hypotheses created.

1. Do characteristics of the firm's directors affect corporate innovativeness of Finnish and Swedish public-listed companies?

H1: According to the agency theory, there is no effect on innovativeness by busyness.

H2: According to the resource dependence theory, the size of a board will affect a firm's innovativeness.

H3: According to the resource dependence theory, the education level of a board will positively affect a firm's innovativeness.

H4: According to the stakeholder theory, the even proportion of genders on board will positively affect a firm's innovativeness.

H5: According to the stakeholder theory, the median age of board directors will affect a firm's innovativeness.

The results of correlation and OLS regression analyses provided the proofs that corporate innovativeness is affected by characteristics of directors. However, not all of them have any influence on innovativeness and not all of them are correlated positively with corporate innovations.

The first hypothesis was not supported by the results of the OLS regression analysis. It was found that different aspects of corporate innovativeness are influenced by the busyness either in a positive or negative way, but it is not left untouched. The findings revealed, the first metric of innovativeness, which is represented by R&D expenses-to-sales ratio, is positively correlated with the busyness, whereas the second metric, intangible-to-total assets ratio, is negatively dependent on the busyness.

In regard to the second hypothesis, it can be stated that it was accepted by the results of OLS regression analysis, which showed a negative correlation between the board size and

corporate innovativeness. The third hypothesis has proven to be correct, as the results of OLS regression analysis demonstrated a significant positive correlation between the education level of board and intangible-to-total assets ratio of a firm.

Concerning the fourth hypothesis, it was rejected by the results of correlation analysis, where the negative relationship between the proportion of female directors on board and intangible-to-total assets was found.

Regarding the fifth hypothesis, the last one related to the influence of board characteristics on corporate innovativeness, the results of the empirical analysis did not find any relationship between the median age of directors and corporate innovativeness. Hence the fifth hypothesis was rejected.

2. Does the innovativeness of a firm affect the firm's performance?

H6: The beta of a company is affected by its innovativeness.

H7: The market-based performance of a company is affected by its innovativeness.

H8: The accounting-based performance of a company is negatively affected by its innovativeness.

The results of the empirical analysis demonstrated a correlation between the innovativeness of a firm and firm's performance. Thus, the author can state that a firm's performance is influenced by corporate innovativeness of a firm.

Regarding the hypothesis related to the systematic risk or the beta of a company, the results of OLS regression analysis did not reveal that there is a relationship between the beta and innovativeness of a company. However, according to the results of correlation analysis, the negative correlation between the beta and intangible-to-total assets ratio can be observed. Hence, this hypothesis is accepted.

The seventh hypothesis was supported by the findings of OLS regression and correlation analyses. It was revealed that the market-based performance of a firm is positively correlated with intangible-to-total assets ratio. On the other hand, the negative correlation was found between research and development expenditures-to-sales ratio and performance of a firm on the market. Thereby, this hypothesis was accepted.

The last hypothesis on the list was rejected due to the results of OLS regression analysis which showed that the innovativeness of a firm is significantly positively correlated with the accounting-based performance of a firm.

To conclude, the performance of a firm is dependent on both corporate innovativeness and characteristics of individual directors of a firm. The findings suggest that the correct strategic decisions concerning the board composition and investments in innovations might drastically improve various aspects of a firm's performance. Moreover, the analysis revealed that the characteristics of a board can have a different impact on corporate innovativeness, positively influencing one aspect related to innovations and negatively affecting the other.

5.2 Practical implications of the results

The topic of innovativeness has become extremely relevant and widely discussed in public in recent years with the rise of high-technology companies on the market. However, tracing back the history of economics and entrepreneurship, innovations have always been the main factor moving the progress and economic wellbeing forward. In this regard, it is also vital to examine which impact innovativeness might have on various sides of a firm's performance and to which extend board characteristics might influence corporate innovation and, in turn, the performance of a company. This study can become a valuable addition to the already existing researches on the topic, specifically for the reason that currently there were only a few studies which concerned the markets of Sweden and Finland. Moreover, in this study the author investigated the impact of the broad combination of characteristics on a firm's activity, introducing 6 different metrics characterizing the board, which is a unique attribute of the thesis for the reason that in the previous researches on similar topic authors limited themselves with a maximum of 4 board attributes.

First of all, researchers working in the fields of corporate governance, finance and management might be interested in the present study, as it is related to the broad range of business-related topics and concerns board of directors composition, financial, managerial, and innovative aspects of a firm which influences its performance.

Furthermore, corporate bodies and investors can consider the results of the research while undertaking strategic decisions concerning, primarily, the board composition and corporate

innovativeness, since the study provides clues to the optimal board composition in terms of innovativeness and effectiveness of a firm.

In addition to scholars, corporates, and investors, in certain situations, the officials can use findings of the research as well. The work might be beneficial for them as states nowadays actively participating in the economic sphere through state-owned enterprises. Thereby, for some officials, the study might be helpful when the topic of either director's appointment or corporate innovativeness and performance will arise.

5.3 Limitations and recommendations for further research

In this subchapter, the author will discuss the limitations which the study has and provide recommendations for future research. First of all, only 60 Swedish and Finnish companies have been considered in the present study which cannot provide the full and detailed picture of these market, as the full number of companies operating there is considerably bigger. Besides, as the research covers only two similar adjacent markets, the implication of the study results to other geographical areas is limited. However, as the two markets are commonly referred to as a part of the Nordic area, the usability of the study can be extended to the Danish, Norwegian and Icelandic markets. Furthermore, the author did not consider banks and financial institutions in the study, so that its results cannot be applied to them.

Considering the sampling limitations, the author would recommend expanding the research to other countries, primarily to the countries of the Nordic area, due to similarities in the business practices. Moreover, the increase in the sample size is recommended, whether further research will be concerned with the same or new countries. In this regard, it seems to be interesting to compare results between countries and to discover whether, for instance, the busyness of Danish directors will affect corporate innovativeness in the same way as the busyness of Swedish and Finnish directors does.

Another limitation is related to the reversed association problem, the phenomenon which negatively affects the relationship between variables. It arises when a variable x is affected by the variable y , while variable y is influenced by variable x . Reversed association problem can question the validity and preciseness of the research results, making them unreliable. This problem can be avoided by choosing another set of variables and improving its quality.

Moreover, the author would suggest expanding the set of independent and dependent variables, introducing new metrics for firm's performance and innovativeness, as in the current study the author used only 2 ratios to measure innovativeness and one metric for each area of firm's performance. In addition, it is recommended to try new approaches in the calculation of characteristics of directors, while at the same time new attributes of a board can be added.

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Appendices

Appendix 1. Model summary for Inno1 variable.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
,904 ^l	0,816	0,810	0,077	2,015

Appendix 2. Model summary for Inno2 variable.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
,930 ⁿ	0,865	0,860	0,06814363	1,450

Appendix 3. Model summary for GPmargin variable.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
,749 ⁱ	0,561	0,550	0,14293830	1,960

Appendix 4. Model summary for MVBV variable.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
,706 ^e	0,499	0,492	1,333553	1,914

Appendix 5. Model summary for Beta variable.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
,418 ^f	0,175	0,166	0,210764	1,752