QATAR UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

BOARD STRUCTURE, INTELLECTUAL CAPITAL, COST OF CAPITAL AND FIRM PERFORMANCE - A PATH ANALYSIS MODEL

BY

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ABSTRACT

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Title: Board structure, intellectual capital, cost of capital and firm performance – A path analysis model

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This study examines the indirect relationship between board structure and firm performance with the mediating effect of intellectual capital and cost of capital. In addition, the study examines the total, direct and indirect effect of board structure on firm performance through intellectual capital and cost of capital using path analysis model. Analysis was made from 2010-2019 for a sample of 41 firms comprising of NZX50 index listed on New Zealand stock exchange.

Fixed effect model revealed that only board independence is mediated by intellectual capital and the random effect model revealed that board size, CEO duality and board background and skill diversity to be negatively mediated by cost of capital and board independence, audit committee composition and gender diversity to be positively mediated by cost of capital. Finally, the path model provides support for the main research objective that the relationship between board structure (except gender diversity) and firm performance is mediated by the indirect effect of intellectual capital and cost of capital.

The study provides useful insight to the board and policy makers about the importance of enhancing intellectual capital and to the academicians to incorporate mediation effects for a complete understanding.

DEDICATION

To my family and closest person Rana Abushahla who have always provided me time, motivated and supported me during my tough times to undergo this path of success in completing my Master thesis.

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CHAPTER 1: INTRODUCTION

1.1. Overview

With the increase in technological changes, innovation, and sophisticated customers', market competition is shifted towards intellectual capital, i.e., valuable intangible capital, and resources. The study of Kamukama et al., (2010) suggested that the rapid changes in modern companies are highly dependent on the relational, human, and structural capital which are the components of intellectual capital. Such suggestion is in line with prior studies (Wang & Chang, 2005; Chen et al., 2005; Kamukama et al., 2010; Rahman, 2012; Morariu, 2014) that found a significant positive relationship between intellectual capital and firm performance. Therefore, whenever intellectual capital gets enhanced, firm performance increases.

There are two separate streams of literature: (1) examining the relationship between board structure, intellectual capital, and firm performance (Nkundabanyanga, 2014; Hamdan et al., 2017) (2) examining the relationship between board structure, cost of capital, and firm performance (Berger et al., 1997; Asbaugh-Skaife, 2006; Byun, 2007; Hajj et al., 2013). This study fills the gap by combining the two-separate streams of literature into one using agency theory, resource dependency theory, and resource-based view theory.

This study links board structure, intellectual capital, cost of capital and firm performance variables as follows: board of directors is considered as the main driver of intellectual capital as they provide the signal to externals about corporate governance quality, shareholder's rights, and help in strategy development and implementation. Thus, the board of directors provides a competitive advantage and help to improve the intellectual capital of the firm. Also, the board of directors always try to hire directors

with unique skills and knowledge that can help to improve intellectual capital efficiency (resource dependency theory). Thus, board structure and intellectual capital are related (Williams, 2000; Williams, 2003; N-P Swarts & Firer, 2005; Zamani et al., 2012; Al-Musalli & Ismail, 2012; Appuhami & Bhyan, 2015). Also, when the firm enjoys high intellectual capital efficiency, they can use the skills, knowledge, and external connections available within the firm to influence capital suppliers (resource-based view theory). Thus, an association between intellectual capital and the cost of capital is found (Richardson & Welker, 2001; Botosan & Plumlee, 2002; Boujelbene & Affes, 2013; Attig et al., 2013). Finally, the cost at which capital is received by the firms' influences the firm performance, where an association is found between the cost of capital and firm performance. Thus, we see an indirect effect of board structure on firm performance through intellectual capital and the cost of capital. Therefore, this study aims to investigate if intellectual capital and cost of capital mediate the relationship between board structure and firm performance. Also, the study tries to help policymakers in New Zealand and other OECD countries in the future development of corporate governance principles/codes to focus on the importance of enhancing intellectual capital. Therefore, the study focuses on the examination of the impact of corporate governance on firm performance through the mediating effect of intellectual capital and the cost of capital.

1.2. Background of the study

With a small economy and less developed capital market compared to the UK and US, New Zealand is among one the OECD countries. Ownership concentration is very high and large firms have a small market capitalization (Reddy et al., 2015). New Zealand has a low degree of financial development, the private capital market, and

undeveloped derivative (Capital Market Development Taskforce, 2009). Also, minority shareholders experience a low ratio of stock market capitalization. However, the regulatory framework (Companies Act 1993) and the judicial system which is based on the Anglo-Saxon system of the UK protects the minority shareholders. These features/factors show that New Zealand is like an emerging market compared to the US, UK, and Australia (Koerniadi & Tourani-Rad, 2014). As a developed economy, New Zealand has applied the best practices of corporate governance which is in line with the US, Australia, and the UK.

Issues relating to corporate governance have received major attention since 2000 when every country tried to improve corporate governance practices. OECD countries have faced various scandals, corporate collapses, and frauds such as WorldCom, Tyco International, Enron (US), HIH Insurance (Australia), Air New Zealand (NZ), Nortel (Canada), etc. These scandals have raised red flags about the ineffective practices of corporate governance and the reporting and disclosure of accounting information (Adams, 2011; Agrawal & Chadha, 2005; Shen & Chih, 2007).

Although New Zealand did not experience major collapses such as those reported in the USA, UK, and Australia there were concerns highlighted by international and local participants regarding the governance practices and poor firm performance (Healy, 2003). Air New Zealand and Bank of New Zealand faced some problems due to poor corporate governance practices. During 2001, this heightened awareness about corporate governance practices forced the regulators in New Zealand to review their practices of corporate governance. The focus of regulators in New Zealand was to keep the compliance cost low and improve transparency by balancing investor's needs. In this regard, New Zealand adopted a principle-based approach like Canada, the US, and the UK.

Corporate governance reform has been through various changes in New Zealand starting from securities law and Companies Act 1993 which included both disclosure activities and governance. Companies Act 1993 served as the foundation for a corporate governance framework for companies providing the director's duty and rights of shareholders. In 2003, due to the corporate governance awareness, New Zealand securities commission were asked to develop corporate governance principles. In 2004, nine principles were released which were introduced as "Corporate Governances Codes and Principles". These principles included that: (1) executives and directors remuneration must be fair, reasonable and transparent (2) independence and quality of external audit quality must be ensured (3) directors must have high ethical standards (4) for the effective functioning of the board there must be a balance of skills, knowledge among the directors (5) interest of stakeholders must be respected (6) integrity of reporting, timeliness, and balance of disclosure must be maintained (7) constructive relation with the shareholders must be made by the board (8) board should establish a committee to enhance effectiveness while retaining its responsibility (9) appropriate process must exist by the board to identify and manage risks (New Zealand Securities Commission, 2004). New Zealand stock exchange specifies that these codes are not mandatory, but companies must take full advantage of the code for better governance. Companies reporting corporate governance practices as per the New Zealand listing rule must cover all the set principles. Any departure/deviation from these principles must be justified to the investors (New Zealand Securities Commission, 2004). Thus, the SEC provided an environment where firms themselves can define how to define good corporate governance. Unlike, the US act-based regulation where management is monitored New Zealand's corporate governance practices are not mandatory and there is a tendency of soft regulation. A study found that

this soft tendency regulation is effective in New Zealand which reduces managerial discretionary accruals (Bhuyian et al., 2013).

Besides, issuers listed with the New Zealand stock exchange must take into consideration Corporate Governance Best Practice Code of New Zealand which focuses on four main issues i.e., independent auditors, directors, ethics, and board committee. Like the principles code of SEC, the best practice code provides perspective guidance in a more detailed manner. The best practice code does not contradict with the principles. As per New Zealand's listing rule, firms should reveal in their annual report the extent to which their practices of corporate governance differ from the best practice code with a reasonable explanation to the shareholders.

Corporate Governance Code and Principles were reformed, and the new Corporate Governance Code was released in 2017 by the New Zealand stock exchange. The new code is more comprehensive reflecting international best practices and is structured in 8 principles with recommendations under each principle. The additional nine principles, (Stakeholder interest) under the 2004 Corporate Governance Code has been folded into the eight principles of the new code (Cooney & Goddard, 2017).

1.3. Research objective

The main aim of this study is to examine the relationship between board structure, intellectual capital, cost of capital, and firm performance using path analysis model. More specifically, this study examines the (1) indirect relationship between board structure and firm performance with the mediating effect of intellectual capital (2) indirect relationship between board structure and firm performance with the mediating effect of cost of capital (3) direct, indirect and total effect of board structure on firm performance. Additionally,

the study aims to achieve six secondary research objectives, to examine the direct relationship between: (1) board structure and firm performance (2) board structure and intellectual capital (3) board structure and cost of capital (4) intellectual capital and firm performance (5) intellectual capital and cost of capital (6) cost of capital and firm performance.

1.4. Research question

Main research question: Do intellectual capital and cost of capital mediate the relationship between board structure and firm performance?

Secondary research questions are:

Question 1: What is the relationship between board structure and firm performance?

Question 2: What is the relationship between board structure and intellectual capital?

Question 3: What is the relationship between board structure and the cost of capital?

Question 4: What is the relationship between intellectual capital and firm performance?

Question 5: What is the relationship between intellectual capital and the cost of capital?

Question 6: What is the relationship between the cost of capital and firm performance?

1.5. Contribution of the study

On the academic front, this study aims to add value to the corporate governance and intellectual capital literature and address the research problem addressed in this research. For many decades, the corporate governance area has been researched. However, unlike prior studies, this study examines the indirect relationship between board structure and firm performance with the mediating effect of intellectual capital and the cost of capital. Also, the study examines the total, direct, and indirect effect of board structure on firm performance through intellectual capital and cost of capital using the

path analysis model. A review of prior literature revealed that the direct relation between board structure and firm performance is examined without any mediating variables or in some cases with either only intellectual capital or cost of capital as mediating variables. This study fills the gap by combining two separate streams of literature by studying board structure, intellectual capital, cost of capital, and firm performance variables in one model. This shows a sign of mature discipline to incorporate mediating variables in examining relationships for a meaningful conclusion. A relational study without a mediating mechanism ends with facts and incomplete understanding. Therefore, the incorporation of mediating variables should not be underestimated if more explanation for an outcome is required.

From a managerial perspective, in the 21st century all firms try to improve their performance by various means such as increased sales, marketing, seeking consultation services, etc. This may also include the efficient utilization of intellectual capital and resources by the firms' to maintain a competitive advantage. However, understanding the effective variables and controlling mechanisms of corporate governance helps in easy achievement of better performance. The result of this study can be used as a guideline by the management and board to know on what aspect of board structure to focus. This will help them to enhance intellectual capital that can reduce the cost of capital and improve firm performance. Although the board is emphasized by the Companies Act and the best corporate governance code and principles, managers and directors must keep in mind that board structure is not separate from intellectual capital. Intellectual capital can be transformed from knowledge to value (Edvinsson & Sullivan, 1996). Board of directors must aim to enhance intellectual capital as it will help to get finance at a cheaper rate improving performance. Thus, the board of directors' drive firm in the right direction and

improve firm performance benefiting major stakeholders.

Finally, from the practical implication perspective, this study findings can help policymakers and the stock market to decide on how to set corporate governance principles or codes that can help firms to enhance firm performance focusing on intellectual capital. Especially, in New Zealand where ownership concentration is very high and market capitalization low, it becomes difficult for intellectual capital to be utilized or managed efficiently and effectively due to the owners' influence and control over management. Since the finding of the results showed intellectual capital mediates positively between board structure and firm performance and lowers the cost of capital, the study guides practitioners in New Zealand on developing principles/codes on the importance of intellectual capital and encouraging dispersed ownership.

1.6. Thesis structure

This study includes the below chapters:

Chapter 1: Illustrates a brief overview of the study, background information about corporate governance in New Zealand, research problem, contributions, objectives, and research question

Chapter 2: Provides intensive literature review relating to board structure, intellectual capital and firm performance and board structure, cost of capital, and firm performance.

Chapter 3: Theoretical framework is provided in light of agency theory, resource dependency theory, and resource-based view theory. Also, the hypothesis is developed depending on the theory and conclusion of the literature review.

Chapter 4: Methodology section details the research design, sample, variables used, and measurement.

Chapter 5: Normality test, path analysis model and estimation, descriptive statistic, correlation, and robustness check is explained.

Chapter 6: Highlight of the statistical results, conclusion, and limitation of the study with future research prospects are provided.

CHAPTER 2: LITERATURE REVIEW

This chapter aims to provide a prior review of studies regarding board structure, intellectual capital, cost of capital, and firm performance. This chapter is divided into three sections. The first section provides an overview of board structure and intellectual capital. The second section provides a review of studies based on board structure, intellectual capital, and firm performance. The last section provides a review of studies based on board structure, cost of capital, and firm performance. This study focuses on seven proxies of board structure i.e., board size, board independence, CEO duality, audit committee, gender diversity, board background and skill diversity, and board meeting.

2.1. Overview

2.1.1. Board structure

Having an appropriate and skilled board is an important requirement for the ongoing operation of the organization which defines good corporate governance. Corporate governance is of interest to large groups of people such as policymakers, shareholders, and regulators who want transparency in the practices and functions of board as well as the effectiveness and accountability of directors. Board is responsible for the return of investment and protecting shareholders' interest. Board must be flexible and ready to tackle any issue faced such as cybersecurity, social responsibility, diversity, or technology. To achieve the goal, the right board structure must be set up that complies with the rules and regulation and at the same time help in generating value (Richard, 2017). One of the main internal governance mechanisms is board structure (Hermalin & Weisbach, 2003).

Two main models of board structure are the one-tier model and two-tier model (Klaus, 1998) which have been the debate in corporate governance regarding good governance. The one-tier model has been the prevailing model in New Zealand, the US, UK, Portugal, Spain, and Italy (Klaus, 1998). Two main functions are performed by the board under this board structure i.e., defining strategy of the company and monitoring management. Under this model, decisions are made jointly by the executive and non-executive directors (French, Mayson & Ryan, 2009). Corporate governance analyst has also reached out to the best practices for board of directors under the one-tier model. These practices include (Davies, Hansmann & Hopt, 2004) (1) use of the board committee (2) majority board member should be non-executive (3) optimal board size should not be more than 10 members, etc. Under this model, one of the disadvantages is that the non-executive directors' independence might be impacted due to the loyalty of colleagues.

A significant trend of board composition under the one-tier model is the increasing proportion or number of independent directors. According to Tricker (2009), an independent director is a non-management member free from any professional relation or family relation with the company. Under the continental model with concentrated ownership, independent directors try to solve the agency problem between minority-majority shareholders. At the expense of minority shareholders, controlling shareholders might enrich themselves where they can disclose less information or take decisions for their benefit (Bhaumik & Gregoriou, 2010). Thus, independent directors monitor the company in such a way that the interest of shareholders and the company as a separate legal entity coincides. On the other hand, under the Anglo-Saxon model with dispersed ownership, independent directors behave like a proxy of shareholders to monitor if the

firm acts in the shareholders' interest or not. This is because there is no personal or financial interest in keeping the management by these directors. Numerous best practice codes around the world recommend that effective monitoring by independent directors must be made available on the board (Lynne, 2003).

The second model of board structure is the two-tier model which is seen in Germany, Netherland, Austria, and Switzerland. It is mandatory to have two board i.e., management and supervisory board. Daily management is controlled by the management board whereas the supervisory board advises, nominates, dismisses, and controls the management board (Aste, 1999). Also, it is quite common to see on the supervisory board in Germany, Slovakia, and Austria representation of employees but is absent in Poland and Estonia (Rudolf, 2008). Independency of the supervisory board is one of the benefits of the two-tier model where outside directors always exist. However, the supervisory board may not have supervision in case the information flow from the management board is inappropriate or too slow.

Board structure can be examined from different dimensions such as board size, board diversity, number of independent directors, CEO duality, etc. Institutional investors and interest groups have pressurized firms to have a diversity of directors in terms of ethnicity, gender, and expertise. In this respect, companies are required to structure their board in a way that serves their need (Grady, 1999). Board composition may vary depending on various factors such as operating environment, governance, and ownership structure (Van der Walt et al., 2002). For instance, Raheja (2005) suggests that board size be small whenever the shareholders' and insiders' interest is aligned. This is because there will be less need of a non-executive director to monitor, thus reducing board independence. Similarly, Raheja (2005) suggests more non-executive directors are

necessary when the influence and bargaining power of the CEO is high. Thus, depending on various factors firms structure their board in a way that is consistent with the benefit and cost of advising and monitoring the board (Linck, Netter & Yang, 2007).

2.1.2. Intellectual capital

Atalay (2018) proposes that intellectual capital is viewed as information that can be changed into value. John Kenneth Galbraith was the first person to mention the intellectual capital concept in his statement when he wrote a letter to Michael Kalecki in 1969. John Kenneth viewed intellectual capital from an individual perspective while Tom Stewart made the concept famous for firms in his article "Brainpower: How intellectual capital is becoming America's valuable asset" published in 1991 in the Fortune Magazine (Kalkan et al., 2014). Intellectual capital includes key characteristics such as (1) it plays a key role in achieving competitive advantage (2) it is an intangible asset which cannot be retrieved from the balance sheet (3) increase/decrease in intellectual capital is regarded as the intellectual performance which can be measured and observed.

Intellectual capital does not have a specific definition as it has emerged from different academic disciplines. Some of these definitions include; intellectual capital that establishes a resource-based for firms (Bontis, 1996); the difference between market and book value (Edvinsson & Malone, 1997); total intangible resources held by a firm that provides a competitive advantage as well as future benefits (Andriesson, 2004); effective use of knowledge against information (Bontis, 1998); assets of an organization that are hidden (trademark, patents) or assets that are not included in the financial statement (Roos & Roos, 1997); knowledge that is shared by everyone in the organization and that adds value to the organization (Cantu et al., 2009).

The specific classification of intellectual capital elements has not been reached in the literature. Authors have classified intellectual capital elements differently; human, customer and structural (Bontis et al., 2000; Bontis, 1998); human, customer and relational capital and organizational (Roos & Roos, 1997), competency of the employee, internal/external structure (Sveiby, 1997). Three elements of Sveiby (1997) were adopted by Edvinsson & Malone (1997) and renamed as the human, customer, and organizational capital. Later, Pablos (2003) renamed customer capital as relational capital. Therefore, there is a partial agreement reached in the literature that intellectual capital includes three components namely, human, structural, and relational capital (Edvinsson & Malone, 1997; Mouritsen, 1998; Sveiby, 1998; Tayles et al, 2007).

The main source of competitive advantage and the main element of intellectual capital is human capital which includes individual experience, value, skill, and education (Bontis, 1998). It is suggested that human capital is improved by the organizational practices of education and training (Keenan & Aggestam, 2001). Due to the competence of employees, there will be a positive impact on the firm leading to productivity, work performance, and customer loyalty (Dave, 1998). According to Gulcemal (2016), human capital is a source of innovation and change for an organization that can be developed and improved continuously by the learning and education of employees. Similarly, Turkoglu (2016), indicated that human capital is the accumulation of information that people bring and take when they join and leave work. The second element of intellectual capital is structural capital, also known as organizational capital, which supports human capital (Mouritsen et al., 2001; Kalkan et al., 2014). In other words, structural capital is a supportive infrastructure for human capital that provides an environment where employees are motivated to create knowledge by investing in human capital (Shih et al.,

2010). Bontis (1998) argued that if firms want to achieve a goal, human capital cannot be isolated from structural capital. This is because even if the employees had the expertise and the firm had poor system and procedure, intellectual capital will not be reached to its full benefit. Structural capital deals with organizations' procedures, infrastructure, structure, and processes that include innovative capital such as trademark, patent, copyright, culture, and hardware/software system (Tayles et al., 2007). Structural capital can be traded and owned by the firm which can be legally protected unlike human capital (Edvinsson & Malone, 1997). Finally, the third component of intellectual capital is relational capital also known as capital employed (connection of firm with the external environment). It includes relationships with the market, suppliers, industrial networks, banks, and government (Tayles et al, 2007). Relational capital must be created and maintained by the organization as it can be used in the future to get help for the appropriate operation of the firm (Mention, 2012). A strong link between human and relational capital exists because it is the firms' employees who creates and maintains the relationship with externals. This significantly contributes to the firm performance (Welbourne, 2008). According to Giuliani (2013), individual intellectual capital elements are not enough for a successful organization, where all elements must be combined to create value.

According to Zerenler & Gozlu (2008), within an economy of knowledge-based, intellectual capital is viewed as a strategic resource. Intellectual capital by the exchange and creation of new knowledge, adds value to the firm, and improves the efficiency of both labor and capital market (Petty & Guthrie, 2000). A study showed that intellectual capital positively impacts the wealth and performance of the organization (Zerenler & Gozlu, 2008). However, firms' face the problem of managing and controlling the

elements of intellectual capital within the organization. Van der Meer-Kooistra & Zijlstra (2000) argued that if intellectual capital is not created, maintained, and controlled it will not add any value to the organization and will be useless. Thus, various studies have argued corporate governance plays an important role to protect, maintain, and retain intellectual capital within the organization (Keenan & Aggestam, 2001; Safieddine et al., 2009). The presence of appropriate and good corporate governance attracts and increases intellectual capital within the organization. This ensure appropriate decisions are made to enhance shareholder's value using intellectual capital (Safieddine et al., 2009).

2.2. Board structure, intellectual capital, and firm performance

Prior research studying the relationship between all the three variables i.e., board structure, intellectual capital and firm performance (Nkundabanyanga, 2014; Hamdan et al., 2017) is less compared to the research made on examining the relationship between two variables separately i.e., board structure and intellectual capital (Williams, 2000; Williams, 2003; N-P Swarts & Firer, 2005; Zamani et al., 2012; Al-Musalli & Ismail, 2012; Appuhami & Bhyan, 2015) and intellectual capital and firm performance (Wang & Chang, 2005; Chen et al., 2005; Kamukama et al., 2010; Rahman, 2012; Morariu, 2014).

Various studies have studied the relationship between attributes of the board (CEO duality, board size, independence, board committee) and firm performance. A meta-analytic study by Garcia-Meca & Sanchez-Ballesta (2009) examining corporate governance and earnings management suggested that audit committee independence, board size and independence constraints the earnings of management thereby improve investors' confidence. Similarly, it is argued that the corporate governance scandal is very costly for which it must be controlled (Knapp et al., 2011). However, the control

approach to governance does not improve firm performance directly. Kula (2005) found firm performance is positively related whenever the board acquires resources. Consistently, Okpara (2011) argues that an effective board is significantly related to performance in developing countries. Thus, a good composition or governance of the board influences firm performance. Mishra & Mohanty (2014) argues that investors prefer to deal with companies that have a good board governance practice. Similarly, Agrawal et al. (1996) argue that funds at lower cost can be obtained with good board governance, that can positively impact firm performance (Mishra & Mohanty, 2014).

Board governance establishes the rules for creating, sharing value, establishes relationships with employees, and provides guidelines on how to control and manage resources (Safieddine et al., 2009). Firms control resources such as information and knowledge, assets organizational processes, and firm attributes. These resources provide a competitive advantage when they are rare, non-substitutable, and valuable (Barney, 1991). These resources are collectively called intellectual capital. Sullivan (2000) argues that an appropriate board will be able to identify the content of intellectual capital within its firm. According to Keenam & Aggestam (2001), managerial decision making improves the value of shareholders by capital while corporate governance uses intellectual capital to leverage and create value. If the board does not focus on intellectual capital it would be a failure of board governance that can affect firm performance.

According to the traditional approach, company's employees create and enhance intellectual capital (Edvinsson & Malone, 1997). However, Berezinets et al. (2016) argued that apart from company's employees various other parties like suppliers, stakeholders, governing bodies contribute to intellectual capital. However, the main contributors of intellectual capital are members of the board. Directors have intellectual

capital (skills, knowledge, expertise) which helps to monitor management and at the same time contribute to increase intellectual capital, thereby improve firm performance (Hillman, 2005).

Main function of the board of directors is the development and implementation of company strategy. They participate in the strategic planning process and active leadership to develop goals and objectives. A well-designed board structure shapes the firm's leadership leading to a well-performing team that can help to improve firm performance. The board of director is the main governing body that provides direction to the company through its activities, meetings, and communication (Nkundabanyanga, 2013). However, the board of directors are the main contributors for intellectual capital for two reasons: (1) since the board of directors are internal governance mechanism, they provide the signal to externals regarding corporate governance quality, shareholder's rights, etc. which impacts performance and attracts investment., (2) because the board of director's function is strategy development and implementation, they provide competitive advantage which improves intellectual capital. Thus, the board of directors is considered as the main driver of intellectual capital, and therefore, this study links board structure and intellectual capital.

Nkundabanyanga (2016) conducted a study of the combined effect of intellectual capital and board governance on firm performance using various theories (resource-based, resource-dependency, and agency theory). With a sample of 128 service firms, it was found that board structure (effective communication, board activity, control, and meetings) and intellectual capital positively impacted firm performance. A positive impact on performance was seen with the interaction of intellectual capital and board structure. Similarly, Nkundabanyanga et al. (2014) examined the association between

board structure and performance with the mediating effect of intellectual capital. It was found that intellectual capital mediates the relationship and act as a conduit. Similarly, in KSA, Hamdan et al. (2017) found a similar result, who examined firm performance relation with intellectual capital and corporate governance as a mediating variable.

Literature has provided inconsistent results in examining the relationship between board structure and intellectual capital. N-P. Swartz & Firer (2005) examined the relationship between South African listed firms. They used stakeholder-agency theory arguing that stakeholders can enhance control over managements action. Using the VAIC model and two characteristics of board i.e., gender and ethnic diversity, they found a significant positive association between ethnic diversity and intellectual capital. In the Australian context, more attributes of the board were used; CEO duality, board size, subcommittee, and board composition to examine the relationship with intellectual capital (Appuhami & Bhuyan, 2015). They used agency theory enforcing that managerial decision-making can leverage and create value for shareholders. Value creation is not only depended on how financial and physical capital is used by the managers but also on how they manage organizational intellectual capital. Also, it is depended on how managers develop practices to efficiently use intellectual capital and motivate organizational behavior in achieving goals. Using multiple regression analysis, they found CEO duality, remuneration committee composition, and board composition positively related to VAIC and no relation found with board size and audit committee. The study of Zamani et al. (2012) in Tehran, Williams (2000) in South Africa was in line with Appuhami & Bhuyan (2015) where CEO duality resulted in positive relation with intellectual capital. In contrary to these studies, Williams (2003) found no relationship between VAIC and independent directors, CEO duality, and board size in the context of

Sweden, UK, and South African firms. Similarly, in the context of GCC, Al-Musalli & Ismail (2012) used resource-dependency theory and did not find any association between intellectual capital and board size, nationality, and educational level diversity. Indeed, they found a significant negative association between VAIC and non-executive directors. However, this study focuses on seven characteristics of board structure i.e., board size, board independence, CEO duality, audit committee, gender diversity, board background and skill diversity, and board meeting. These proxies of board structure are selected as they are considered the main measures for board structure as verified by literature. Besides, to provide a structural connection between board structure with intellectual capital, cost of capital and firm performance, these characteristics of board structure have been used to prove that good corporate governance with a good board structure can influence the intellectual capital efficiency. Prior literature of these board characteristics relationship with firm performance incorporating the effect of intellectual capital are examined below:

Board size: The number of members on the board of directors is referred to as board size. Studies suggested that the main component to define good corporate governance is the number of members on the board (Jensen, 1993; Lorsch & Lipton, 1992). However, it is not easy to examine for each company the right number of directors on the board. Linck, Netter & Yang (2007) argued that companies should consider the skills of directors along with the skill required. Also, the best size depends on the nature and situation of the firm. However, literature argued that an effective board should comprise less than eight members (Jensen, 1993), while others argued that the maximum should be 10 but is more appropriate to have members between eight and nine (Lorsch & Lipton, 1992). Supporting small boards, communication gets better (Ozkan, 2011); faster

decisions can be made (Lorsch & Liption, 1992) and coordination gets easier (Hudaib & Haniffa, 2006). On the other hand, supporting large board, more time, experience (Uadiale, 2010) and division of work can exist with the directors which can improve monitoring role (Reddy et al, 2010).

As per the New Zealand requirement, there should be at least three directors on board. In New Zealand, the size of the board has reduced from 7.5 in 1985 to 6.23 in 2010 (Fox et al., 2013; Bhuiyan et al., 2013). With a decrease in directors, the board has less access to expertise compromising firm performance. Also, Bhuiyan & Roudaki (2013) argue with the presence of board interlocking, firms in New Zealand suffer to find a suitable independent expert director.

Empirical findings have been inconsistent about board size. In the context of the UK, Malaysia, and USA negative associations exist between firm performance and size of the board (Donnelly & Kelly, 2005; Mak & Kusnadi, 2005). This indicated that large boards are not effective in monitoring and controlling management. Thus, organizations are not using intellectual capital efficiently and making less investment in intellectual capital. Similarly, in North America and Western Europe (De Andres et al., 2005) negative relation was found by examining 450 samples of non-financial companies. Supporting prior studies, Bharathi (2019) also found using panel regression analysis that intellectual capital performance decline with larger board size for Indian firms listed on National stock exchange. A possible explanation was given that despite larger boards having varied skills and knowledge they focus more on financial performance, unlike smaller boards who take decisions regarding intellectual capital policy more efficiently. On the other hand, in New Zealand, board size did not affect firm performance (Reddy et al., 2010). Also, Pi & Timme, (1993); Belkhir, (2006); and Connelly & Limpaphyom,

(2004); did not find an association between the size of the board and firm performance. Coles et al. (2007) argued firm type is one of the factors which can be considered to decide the size of the board. A positive relation was found for complex firms and negative relations for single-product firms. Goodstein, Gautam & Boeker (1994) examined board size from a different angle compared to the study of Coles et al. (2007). They viewed board size from the perspective of strategic-decision making and resource dependency theory. Results showed that large board size is effective only from the view of resource-dependency theory. Thus, they concluded that firms having a small board are more productive.

Jackling & Johl (2009) examined Indian companies and found a large number of board members increase firm performance. This may be due to the expertise and skills directors bring with them that positively affect the performance of the organization and make an effective investment in intellectual capital. Supporters of large boards argued that whenever the monitoring mechanism gets enhanced the ability of the CEO to dominate board decreases (Zahra, 1989). Singh & Harianto (1989) supported the argument of Zahra (1989) where they argued that the unification of ideas of an important decision by the CEO becomes difficult. Thus, shareholders' value will be increased efficiently and effectively. Supporters of the large board also argued based on resource-dependency theory that it allows firms to have a greater pool of expertise that helps in growth (Zahra, 1989; Jackling & Johl, 2009).

Board independence: Proportion/number of independent directors on board is referred to as board independence. According to Tricker (2009), an independent director is a non-management member free from any professional relation or family relation with the company. Independent directors provide contacts, prestige, and expertise needed by

the managers to make decisions regarding intellectual capital (Haniffa and Cooke, 2002). Also, non-executive directors play a wide range of roles that help in the execution of firms' strategy affecting firm performance (Kroll et al., 2007).

Mixed results about the proportion/number of independent directors on board are found in the literature. Studying 348 Australian firms, Kiel & Nicholson (2003) found a negative association between independent directors and Tobin-q. Similarly, 321 US firms studied by Barhart & Rosenstein (1998) showed non-executive directors are weakly positively related to performance. Supporting the study of Kiel & Nicholson (2003) and Barhart & Rosenstein (1998), Agrawal & Knoeber (1996) also found negative relation arguing that independent directors in the board may represent politicians or environmental activists due to which they do not add value to the firm.

In contrast, using panel data regression Haslindar & Fazilah (2011) found no association between the independence of the board and Tobin-q, ROE and ROA for Malaysian listed companies from 1999 to 2005. Consistently, Hermalin & Weisbach (2003) found no relationship arguing that there is an optimal weight between the dependent and independent directors. In the Australian market, no relation was found between performance and non-executive directors arguing that those directors do not have enough expertise (Lawrence & Stapledon, 1999). Thus, inside directors have the knowledge which affects firm performance positively.

Compared to the above studies, Dey (2008) found a positive association between ROA and independence of the board. The study of Rosenstein & Wyatt (1990) showed a positive excess return with the announcement by the firm in appointing an independent director. Consistent with the study of Rosenstein & Wyatt (1990), intellectual capital and independent directors showed a positive relation under the study of Ho & Williams

(2003) using a sample of 94 Swedish firms. Similarly, in China, independent directors helped to reduce the usage of firms' resources for personal use by increasing investment efficiency and inter-company loans (Liu et al., 2015). Also, the study of Duchin et al. (2010) showed there was a reduction of management earning by independent directors that positively affected firm value. Wan & Ong (2005) supports all the above studies (Rosenstein & Wyatt, 1990; Ho & Williams, 2003; Liu et al., 2015; Duchin et al; 2010) by arguing that independent directors prefer to show to the board that they are performing well so they more conducive towards the goal, mission, and strategy of the organization. Wan & Ong (2005) also argued that independent directors come with a different background from different organizations bringing more knowledge and skill compared to the inside directors who are vested only within their working place. Thus, Wan & Ong (2005) argued the presence of independent directors enhances intellectual capital.

In New Zealand, small-medium sized firms dominate the market where there is only a small pool of directors. Directors serve on different boards due to the lack of director's availability. Keown (2009) highlighted that some directors at the same time are involved in four to ten different boards. However, according to listing rule 3.3.1 of New Zealand, a minimum of two directors must be independent and if eight or more directors exist then one-third of directors must be independent. Consistent with this listing rule, independent directors in New Zealand positively impacted Tobin Q (Hossain et al., 2001; Reddy et al., 2010). Hossain et al. (2001) examined the Companies 1993 Act's effect on performance and board composition. It was found that the outside board representation increased significantly with the introduction of the Act. Examining the effect from 2004 to 2006 Koerniadi & Tourani-Rad (2012) found firm value in New Zealand decreases with the presence of independent directors on the board.

CEO duality: CEO duality takes place when a person is the board chairman and at the same time holds CEO position (Finkelstein & D'Aveni, 1994). CEO duality has great power which affects board independence. CEO as chairperson can take decisions and control board and meetings for personal interest (Boivie et al., 2011). Thus, organizational resources gets diverted for personal interest where no investment is made in intellectual capital and shareholder's value does not get enhanced. CEO duality in New Zealand dropped from 11.4 percent in 1984 to less than 1 percent in 2010 (Fox et al., 2013; Bhuiyan et al., 2013).

Supporters of CEO duality argue that non-duality creates competition between CEO and chairman, creates confusion, limits innovation, and creates a lack of effective leadership (Andersen et al., 2004). In contrast, opponents argue that CEO duality affects board independence that prevents monitoring and performing effective governance (Fama et al, 1983).

Empirical studies have shown mixed results between firm performance and CEO duality. In Australia with a sample of 799 firms, CEO duality negatively affected the board functioning (Bliss, 2011). Consistently, analyzing 146 firms, Rechner & Dalton (1991) found independent CEO outperformed CEO duality structure. Contrary to the above studies, Elsayed (2007) analyzed 361 firms and found CEO duality positively affected firm performance whenever there is low performance. Similarly, Appuhami & Bhuyan (2015) found a positive relation between CEO and intellectual capital showing the efficient use of intellectual capital by the firm. Power concentration motivates a person to increase firm value through intellectual capital.

Vafeas & Theodorou (1998) found CEO duality has no association with performance as it depends on the personal characteristics of the person. Vafeas &

Theordorou's (1998) study is supported by Kesner (1988), Chen et al. (2008) & Iyengar & Zampelli (2009). Chen et al. (2008) showed that leadership structure changes do not affect performance. Similarly, Iyengar & Zampelli (2009) argued CEO duality only optimizes performance and found no association between CEO duality and performance.

Audit committee: Listing rules and governance code of New Zealand, requires issuers on the stock exchange to have an audit committee with minimum three directors, where majority should be independent and at least one with accounting/finance background (New Zealand Corporate Governance, 2019). The independent subcommittee improves the functioning and internal control process of the organization (Jing et al., 2008). In this light, the existence of an independent subcommittee can make sure organizational resources (intellectual capital) are used efficiently by the insiders, and investment in intellectual capital is made that can enhance shareholder's value (Keenan & Aggestam, 2001).

There have been a growing number of studies focusing on the association between performance and audit committee. A study of 200 fortune companies by Chan & Li (2008) found firm value increased with the presence of non-executive directors in the audit committee. Similarly, a positive association between performance and audit committee was found for Indian companies Saibaba & Ansari (2013). 63% of 142 UK-based large companies have independent directors in the audit committee to minimize information asymmetry (Collier, 2001). To summarize, the presence of a subcommittee with independent directors improves the effectiveness of the control process, thereby increases the efficiency of intellectual capital. Also, helps organizations to invest in intellectual capital. Studies showed that the audit committee has no relation or influence on intellectual capital. In Australia, Appuhami & Bhuyan (2015) found no relation

arguing that members in the audit committee may not be independent or there is a failure in applying appropriate governance in the organization by the directors due to conflicting roles of control and management (Ezzamel & Watson, 1997).

Gender diversity: There is an increasing proportion/number of females on board and growing literature examining their impact on firm performance. Graves & Powell (1988) found female directors more concerned than male directors in the firm's responsibility towards the community. Female directors incorporate community issues within the organization's development and growth, thus, broaden the scope of the board in the decision-making process. Relational capital is one of the components of intellectual capital i.e., connection with the external environment where female directors invest efficiently in intellectual capital compared to male directors. Also, the presence of females on board enforces firms to look for more talented employees within the labor market because females can attract and communicate with larger employees increasing competitive abilities within the firm (Graves & Powell, 1988). Wiersema & Bantel (1992) argues the presence of female increases performance, provides innovation and generation of ideas that help in strategic change. Thus, females on board efficiently invest in intellectual capital and improve overall firm performance. According to Hambrick (2007), females have different cognitive frames compared to men, for instance, information seeking and information evaluation process which enhances firm performance.

The relationship between female presence on board and firm performance have shown mixed findings in prior literature. Studies by Kesner (1988), Provan (1980), and Mitchell Williams (2000) have shown a positive impact of intellectual capital performance with the female presence on board. With the data of 47 countries and

examining European firms' consistent results were found (Terjesen et al.,2015; Christiansen et al., 2016). Zahoor (2016) measured performance using accounting and market-based measures and found gender diversity positively influences firm performance. Similarly, Williams (2003) examined the relationship between charitable activities and gender diversity. He found that board with a higher proportion of women involve more in charitable activity compared to board with a high proportion of men. Thus, women on board invest in intellectual capital i.e., relational capital enhancing firm performance.

Effectiveness and efficiency of gender diversity in New Zealand were examined from 2005-2015 by Duppati et al. (2017) where it was found that gender diversity does not affect performance. Bilimoria & Piderit (1994) argue that because of the small number of females on board no relation exists between performance and gender diversity. Besides, examining the ownership effect on performance in New Zealand, Fauzi and Locke (2012) also concluded that gender diversity on board had a low impact. Finally, Kagzi & Guha (2018), studied the linear relationship between board demographic diversity and firm performance for Indian firms. They found gender diversity had no significant association with TOBINQ similar to the study of Duppati et al. (2017). They concluded that one possible explanation would be because of fewer females on board they do not have the power to influence decisions. Only 4.6% of the females sit on the board compared to 36% of females who are employed in the firm.

Board background and skill diversity: Varying degree of knowledge and skills among board members is reflected by their educational level. This influences the capacity of the board to either take a high- or low-quality creative solution to solve problems and provide the scope of inputs for long-term success (Ruigrok et al., 2006). The educational

level signals the board members' skills and knowledge. Accumulation of knowledge helps board members to learn and develop problem-solving skills more effectively (Dahlin et al., 2005). Individual board members may not have all the knowledge and skill but as a group (board) they can gather connection, effort, and perspectives. Wincent et al. (2010) argue high-level board skills tend to be more flexible, have better ability to accept innovation, and adopt new ideas and have greater capabilities to process information. These characteristics of board members help them to create policies and strategies on how to best use, obtain, and enhance intellectual capital resources.

Board members with higher qualifications, skills, and industry knowledge ensure the board to be more productive in terms of high integrity level, judgment, experience, and intellectual ability (Hilmer, 1998). They provide a combination of competencies and capabilities for the firm that help to make decisions from different perspectives (Carver, 2002). A qualified board member provides a knowledge base environment that can enhance the thought to solve problems and provide innovative ideas to develop policies. From an agency theory perspective, high qualified boards are more effective in monitoring which reduces agency cost. From the resource dependency theory perspective, high qualified boards act as a strategic resource for the firm that provides a strategic connection with the external environment (Ingley & Van der Walt, 2001).

With an inappropriate educational level of directors, firms may not be successful and may collapse (Argenti, 1976). For instance, engineers dominating the Rolls-Royce board drove the company downwards (Argenti, 1976). Therefore, the varying level of background and skill diversity of board members is an important factor for the success of a firm. Similarly, Bantel (1993) whose study was based on the financial industry found board members with different educational levels helped the firm to make an effective and

better decision in the long run. He added a qualified board makes a faster and in-depth assessment of decisions reducing the information asymmetry between board and management. The positive impact of industry-specific knowledge on firm performance was found in the study of Mahadeo et al. (2012). Similarly, the university degree of board chairman was associated positively with seven performance measures (change in earning per share, MBV ratio, abnormal return, change in return on asset, cumulative return, return on asset and earning per share) (Cheng et al., 2010). Supporting the above arguments, Darmadi (2013) studied the effect of board member skills and education on 160 Indonesian firms' performance. He used four proxies of board skills and knowledge namely, postgraduate degree, a degree from a developed country, a degree in financial discipline and a degree from a prestigious university. Using Tobin-Q and ROA as firm performance, he found that board members with a postgraduate degree and degree from a prestigious university to be positively associated with ROA. Similarly, Girbina et al. (2012), examined listed firms on Bucharest stock exchange and positive relation was found between Tobin-Q and board members with higher financial education and board members with a postgraduate degree in the financial field.

Studies have also found an insignificant relation between firm performance and background diversity skills (Murray, 1989). Murray (1989) found that even though improvement in communication skills is needed to improve firms' profit and growth, there is an indirect effect on performance. On the contrary, a negative relationship between performance and board educational level was found (Bathula, 2008; Molenkamp, 2015). Molenkamp (2015) examined 95 listed firms on the Euronext of Amsterdam and found no association between educational, nationality diversity, and performance. In New Zealand, Bathula (2008), examined board characteristics impact on

performance. He found a negative association between performance and educational level, board meeting, and positive relation between CEO duality, size of the board, and female directors. Therefore, we say that board members' skills, knowledge and educational level affects the intellectual capital of a firm.

Board meeting: Firms that conduct regular board meetings are in a better position to manage themselves during the tough time. Managers can take effective decisions as they get supported by the board meeting where problems are understood and discussed in a better way (Mangena & Tauringana, 2008).

Board meetings and performance have shown a mixed association in literature. In Europe, businesses run by the family showed positive relations (Garcia-Ramos, 2011) while in India no relationship was found (Jackling & Johl, 2009). When the board conducts many meeting they perform better (Ntiem & Osei, 2011) and experience higher firm performance. In Spain, listed firms showed a negative relationship (Rodriguez-Fernandez, 2014). Supporting prior studies, Brick & Chidambaran (2010) added that board meeting shows its effect in the next year and that is why the negative association is seen in the current year. Also, Ilaboya and Obaretin (2015), added negative association maybe because the board diverts firms' energy and time into activities that are not productive which negatively affects performance.

Simon et al. (1999) argued that a board meeting can overcome board communication and coordination problems. Board meetings help to develop intellectual capital because it provides counseling to management and provides extensive strategic advice. Thus, firms are in a better position to formulate policies and strategies to get resources related to intellectual capital (Marques et al., 2006).

From the perspective of agency theory, management is monitored by the board that reduces agency costs. The effectiveness of the board increases when they meet regularly and show greater work diligence. As a monitoring mechanism, it is easier to get better governance by more board meetings to discuss issues (Vafeas, 1999). The resource dependency theory perspective argues that board meetings help to convey up-to-date information among the directors. This positively contributes to get relevant resources and improve intellectual capital. Also, knowledge shared in the board meeting helps to generate innovative ideas, policy, and strategy that enhances intellectual capital.

On the other hand, focusing on the association between intellectual capital and firm performance various studies took place. In Ugandan microfinance firms, intellectual capital elements were positively related to firm performance (Kamukama et al., 2010). Consistently, intellectual capital elements in Taiwan's information technology industry directly affected performance. Only an indirect effect was found between human capital and performance, which confirmed that intellectual capital elements must be incorporated jointly (Wang & Chang, 2005). Similarly, following resource-based theory and using regression analysis Chen et al. (2005) found a positive effect between MBV ratio and intellectual capital. Alipour (2012) using the VAIC model examined the relationship with ROA in the Iranian insurance companies and found a positive relation. His study was supported in Thailand by Phusavat et al. (2011) who also found a positive association among intellectual capital, ROA, and ROE. According to Rahman (2012), higher intellectual capital efficiency implies higher firm performance. By using the VAIC model, Rahman (2012) found a positive relation for 100 UK firms. Thus, the profit-making capacity of the firm depends on their ability to how they use intellectual capital (Safieddine et al., 2009). An important element for the sustainability of firm growth is

assumed to be intellectual capital (Safieddine et al., 2009). Finally, Nimtrakoon (2015) measured intellectual capital using MVAIC to examine the association between market value and firm performance for Asian countries and found firms tend to have higher market value and performance (ROA) with higher intellectual capital. Contrary results were found where performance was not affected by all components of intellectual capital (Huang and Liu, 2005). It was argued that studies showing a positive association between intellectual capital and performance were made in the context of developed countries. Morariu (2014) found similar results as Huang and Liu (2005) where negative relation was found between VAIC - ROE and VAIC -MBV.

To summarize board structure, intellectual capital, and firm performance literature, only three studies were found that was conducted in Uganda and KSA to examine the impact of board structure on firm performance through intellectual capital (Nkundabanyanga, 2014; Nkundabanyanga, 2016; Hamdan et al., 2017) and found a positive result. This motivates the study to examine the relationship in the context of OCED countries (New Zealand). Also, in the context of New Zealand, the literature showed only board independence and CEO duality to be positively associated with firm performance (Reddy et al., 2010; Appuhami & Bhuyan, 2015); board background and skill diversity and board meeting to be negatively associated with firm performance (Bathula, 2008; Molenkamp, 2015; Ilaboya & Obaretin, 2015); board size, audit committee composition, and gender diversity to have no relationship with firm performance (Reddy et al., 2010; Appuhami & Bhuyan, 2015; Duppati et al., 2017). This provides additional motivation to the study to find reasons why some variables had no relation and negative relation with firm performance. We assume in this study that the cost of capital plays an important role.

2.3. Board structure, cost of capital, and firm performance

Debt and equity (cost of capital) is the return required by the finance suppliers as compensation for their contribution of capital to the firm. It can be calculated either by the cost of debt/equity or using the weighted average cost of capital (WACC). According to Armadeep (2013), debt is cheaper than equity because of tax-deductible but it is risky because debt must be re-paid regardless of profit. When the firm is highly leveraged debt becomes expensive because the high-interest rate will be charged by the lenders. The major role of the cost of capital is played in capital budgeting decisions. An improper management of capital and its cost impact capital budgeting decisions, and thereby, the firm performance. Therefore, effective corporate governance is needed to monitor managers' actions and at the same time to keep the cost of capital as low as possible.

A good composition of board of directors is considered good corporate governance that helps to reduce the cost of debt/equity (La Porta et al., 1997; Merton, 1987). Creditors are interested in the cost of debt. When they find firms with a good board of directors it signals that the firm can be managed properly, tempting them to lower the required rate of return. To protect shareholder's wealth, firms must control their capital cost because the operation of a firm depends on the accessibility of the money and the cost at which they get money. Good corporate governance monitors managers' actions reducing the risk of expropriation (Chen et al., 2009). In the context of New Zealand, where the market is small, the cost of capital becomes the main issue. Thus, this study links board structure, cost of capital, and firm performance.

Empirical studies (Pfeffer & Salancick, 1978; Wen et al., 2002) have examined board structure and cost of debt depending on the argument that debt holder prefers monitoring mechanism that controls managers action. They view board composition as a

reliable source that can authenticate the integrity of accounting numbers. Therefore, good governance reduces the finance supplier's risk and thereby the risk premium. Fields, Fraser & Subrahmanyam (2012) analyzed the quality of the board and debt cost in terms of banks loan. They showed that a good board with the availability of more advisory is more likely to borrow at a low cost. Even after considering control variables like the characteristics of borrower, firm size, CEO compensation policy the relationship existed. Also, when the direct and indirect cost of bank loans was combined, firms with lower institutional ownership, largely independent, and diverse boards borrowed at a cheaper rate. Similarly, constructing an index with 24 governance provisions, Asbaugh-Skaife et al. (2006) found that corporate governance affects credit rating. They concluded that weak corporate governance implies a high cost of capital. Byun (2007) supported Asbaugh-Skaife et al. (2006) study where the negative association was shown between debt cost and practices of corporate governance. Indeed, a negative relationship was clearer for firms having assets of more than two billion US dollars.

An important mechanism of corporate governance that ensures firms are operating efficiently and competitively are directors (Jensen, 1993). Concerning agency theory, Pfeffer & Salancick (1978) found the size of the board and capital structure significantly related. Consistent with the study of Pfeffer & Salancick (1978), Wen et al. (2002) found capital structure and size of board positively associated. Anderson et al. (2004) added there is high monitoring on the financial processes of the organization with the existence of a large board due to which cost of debt gets lower.

A negative association between the cost of capital and board size is supported by the resource dependency theory. A large board provides access to various resources which signals stakeholder's representation on board (Goodstein et al., 1994). A large

board with qualified experience and knowledge increases communication with various stakeholders. This helps to enhance firm value, lower debt/equity cost by shifting risk between investors, and lower the asymmetry of information.

Various studies showed the size of board and capital cost negatively related (Butt & Hasan, 2009; Bozec & Bozec, 2011; Hajjha et al., 2013; Lorca et al., 2011). Butt & Hasan (2009) studied 114 firms in Pakistan from 2003 to 2007 to examine the impact of the size of the board on equity cost. Empirical evidence suggested larger boards lower equity costs. In line with Butt & Hasan's (2009) study, Bozec & Bozec (2011) studied from 2002-2005, 155 Canadian firms to see the impact of corporate governance index on capital cost. They used fixed-effect regression in the 2SLS framework and found the cost of debt/equity decreases whenever the corporate governance practice increases. Lorca et al. (2011) found the rate of interest paid is low whenever the board size is large. They concluded that creditors consider board attributes when they estimate the default risk. Like the results of Butt & Hasan (2009) in Pakistan, Hajiha et al. (2013) also found the size of the board and cost of equity to be negatively related in Iran. Finally, Showkat et al. (2019), for a sample of 270 Indian firms found board size and independence to be negatively associated with the cost of debt, the overall cost of capital, and ineffective with the cost of equity. The study concluded that board size and independence severe as safety measures for debt lenders.

By increasing board independence, investors trust the financial information which reduces investor cost to seek reliable information. This makes the creditors to demand a lower rate of return. Anderson et al. (2004) found independent directors are more effective in monitoring the financial accounting process due to which cost of debt decreases. Board independence was measured using a dummy variable which was

negatively associated with the cost of debt. When the number/proportion of independent directors on board is known by debt holders, they get trusted with the monitoring mechanism of the firm. Consistently, in France, Piot & Missonier-Piera (2007) showed higher the non-executive director lower is the cost of debt. They argued independent directors control managers better than other directors which ensures the proper functioning of the organization. Pham, Suschard, Zein (2011) studied corporate governance mechanisms to explain the cost of capital for Australian firms. Results revealed that independent directors and institutional block holders help to reduce firm risk, thus, finance suppliers demand low returns. In the Asian context, Anwar et al., (2019) supported the study of Piot & Missonier-Piera (2007) in France and found a negative association by analyzing 26 Asian countries' data.

Contradicting with the study of Anderson et al. (2004), studies showed a positive association between cost of capital and non-executive directors (Hajiha et al., 2013; Khemakhem & Naciri, 2013) and others found no relation (Lorca et al., 2011; Setiany et al., 2017). A positive association was found by Hajiha et al. (2013) who argued that independent directors lacked financial and strategic knowledge due to which they were unable to create value for creditors increasing debt cost. Contrary, Lorca et al. (2011) found no relationship between debt cost and non-executive directors. Consistently, Setiany et al. (2017) also did not find any association.

Ramly (2011) focused on equity cost and examined corporate governance impact on 101 Malaysian firms from 2003 to 2007. Corporate governance was operationalized using a corporate governance index including quality measures divided into six categories. Results revealed that good corporate governance practices reduce the cost of equity. Board structure and practices that enhanced audit process, accountability and

shareholder right had a significant impact on reducing equity cost. Anderson et al. (2004) supported Ramly, (2011) result, where it was found monitoring of the financial accounting process in Australian firms was improved by the audit committee. This helped to reduce the cost of debt. A audit committee looks after the financial reporting process and keep close relations with external auditors regarding financial statements and internal controls. Independent members play an important role in the audit committee.

Studies reported that female directors avoid managers from earning management (Gull et al., 2017), enhance the independence of board (Lucas-Perez et al., 2015), be more responsible (Gull et al., 2017) and reduce the cost of agency problem (Reguera-Alvarado et al., 2017). These studies support the argument that finance suppliers reduce cost with the presence of female directors due to their effective monitoring and advising capability. Usman, Farooq, Zhang, Makki & Khan (2019) support the argument made where A-share listed firms on Shanghai stock exchange was studied to examine if gender diversity matters to the suppliers of finance or not. They used various kinds of regression and found that by the presence of females on board, information asymmetry and opportunistic behavior reduces. This lowers debt cost and creditor's assumption of loan default. Interestingly, they also found that suppliers of finance charge four percent less with the presence of at least one female compared to zero females on board.

On the other hand, studies showed female directors have negative consequences. Smith et al. (2005) & Petrovic (2008) highlighted factors such as time-consuming in decision making, different objectives, lack of quick response in case of market shock, increase disagreement within the board and interpersonal conflicts to affect the efficient and effective working of the board with the presence of a female. These factors affect cooperation and communication reducing board monitoring mechanisms. Thus, finance

suppliers charge higher risk premiums.

Focusing on the relationship between intellectual capital and cost of capital, several studies examined the association between disclosure of intellectual capital and cost of capital (Botosan & Plumlee, 2002; Orens et al., 2010; Attig et al., 2013). Better information helps investors to make an accurate estimation about future returns, decrease the uncertainty, and risk about future profit and flow of cash. This helps to increase investors' confidence, liquidity of trading, and decrease capital cost (Easley & O'Hara, 2004). Orens et al. (2010) examined continental European firms (Netherlands, Belgium, France, and Germany) and found that the non-financial disclosure of web-based tends to lower information asymmetry due to which those firms enjoy a lower cost of capital. Similar results were found in the study of Boujelbene & Affes (2013) where higher intellectual capital disclosure tends to lower equity cost. However, Attig et al. (2013) added not all intellectual capital disclosure components/elements impact cost of capital. They found disclosure relating to the environment, diversity, community relation and employee relation affected credit rating of firms while the dimensions of human rights had no impact on the cost of capital. Contradicting with the study of Orens et al. (2010) and Attig et al. (2013), disclosure of intellectual capital showed a positive relation with equity cost (Richardson & Welker, 2001; Botosan & Plumlee, 2002), whereas, no relation was found for North American firms.

To summarize board structure, cost of capital and firm performance literature review, most of the studies concluded that creditors focus on board composition when lending money, i.e., whenever they find a female director or the presence of independent directors they demand less rate of return (Fields, Fraser & Subrahmanyam, 2012; Showkat et al., 2019; Usman, Farooq, Zhang, Makki & Khan, 2019). Also, there was no

study found that examined board structure impact on firm performance through the cost of capital. This adds to the motivation to conduct this study and to achieve the main research objective. Finally, no literature was found that examined the relationship between the cost of capital and firm performance which act as another motivational factor to conduct this study. Most of the literature examined only the impact of capital structure on firm performance (Reverte, 2011; Wu et al., 2012; Pouraghajan, et al., 2012).

Finally, to summarize the entire literature review in this study, prior empirical studies found no consistent results examining board structure and performance (Reddy et al., 2010; Okpara, 2011; Mishra & Mohanty, 2011), board structure and intellectual capital (Williams, 2003; Al-Musalli & Ismail, 2012; Zamani et al., 2012; Appuhami & Bhuyan, 2015), board structure and cost of capital (Berger et al., 1997; Asbaugh-Skaife, 2006; Byun, 2007; Hajj et al., 2013), intellectual capital and firm performance (Chen et al., 2005; Wang & Chang, 2005; Kamukama et al., 2010; Rahman, 2012). Also, no study was found that examined the cost of capital and firm performance. Instead, capital structure and performance were examined. Thus, this adds to the motivation to conduct and incorporate the cost of capital in examining the relationship between board structure and firm performance.

Examining the capital structure and corporate performance, a positive association was found between WACC, ROE, and ROA (Pouraghajan, et al., 2012). Also, the firm size for 121 companies on Swiss stock exchange was found to be associated negatively with ROE when examining disclosure of corporate with capital cost (Perova et al.,2012). Contrary to these studies, Wu et al. (2012) and Reverte, (2011) revealed an association between capital structure and TOBINQ to be positive when examining 484 Taiwanese firms from 2007 to 2010.

Inconsistent results are found in the studies due to the different proxies used for board structure, firm performance, and intellectual capital. Also, no study to the best of our knowledge was found that studied board structure impact on performance through the cost of capital. Also, in terms of intellectual capital only three studies (Nkundabanyanga, 2014; Nkundabanyanga et al., 2016; Hamdan et al., 2017) were found that examined board structure impact on performance through intellectual capital. In the New Zealand context, no study was found that examined board structure, intellectual capital, firm performance or board structure, cost of capital, and firm performance. Studies found in New Zealand context were interlocking directorship effect on performance (Bhuiyan & Roudaki, 2013), corporate governance compliance (Bhuiyan et al., 2013), female representation on board effect on performance (Duppati et al., 2017), board and ownership structure and performance (Fauzi & Locke, 2012), Companies Act 1993 effect on board and performance (Hossain et al., 2001), financing patterns, corporate governance and cost of capital (Koerniadi & Tourani-Rad, 2014).

Therefore, this study fills the gap in the New Zealand context by incorporating intellectual capital and cost of capital variables in examining board structure and firm performance which none of the studies in the literature conducted. Also, the main contribution and aim of this study are to join the two streams of literature discussed above into one i.e., we examine board structure, intellectual capital, cost of capital and firm performance in one model which has not been examined in prior literature.

CHAPTER 3: THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

This chapter is divided into three main sections. The first section explains three theories that are suitable for the study i.e., resource dependency theory, agency theory and resource-based view theory. The second section illustrates the theoretical framework for the study. Following, the last section where the hypothesis for the study is developed.

3.1. Theoretical framework

According to Chapter two, prior studies have used resource-based and resource dependency theory to examine board structure and intellectual capital (Goodstein, Gautam & Boeker, 1994; Al-Musalli & Ismail, 2012; Nkundabanyanga et al., 2014; Nkundabanyanga, 2016) and agency theory to examine the effect of cost of capital (Berger et al., 1997; Andersen et al., 2004). To understand and predict specific phenomena a theoretical framework is used.

It was argued by Filatotchev & Boyd (2009) that usage of a single theory limits the explanatory power and creates a problem due to its narrow assumptions. A call for multiple theoretical approaches is enhanced for better hypothesis development and finding interpretations. This study examines board structure, intellectual capital, cost of capital, and firm performance and therefore applies theory triangulation method by using three theories i.e., resource dependency, resource-based and agency theory to explain the relationship. The use of multiple theories in examining a phenomenon is referred to as theory triangulation (Denzin, 1970). Theory triangulation provides an alternative interpretation of the same phenomena where a single theory lacks to provide a multi-dimensional interpretation of the issues (Hoque, 2006). The selection of these theories is

based on the link to corporate governance and prior studies. Thus, theories used fits the nature of this study to examine the relationship between board structure, intellectual capital, cost of capital, and firm performance.

3.1.1. Resource dependency theory

Resource dependency theory drives from management discipline for which there exists no specific resource definition (Nicholson & Kiel (2007). Resource dependency theory views that a firm operates in an environment that relies on the external environment (Pfeffer & Salancik, 1978). It is explained that the directors' role is to get resources and manage firms' reliance on these acquired resources for superior performance. Board act as a link between the firm and critical resources. Pfeffer & Salancik (1978) explained that when a person gets appointed to the board, he/she brings skills, knowledge, and connection to the firm. However, there are four main resources that the board brings to the firm namely, easy access to critical resources in the environment, counseling and advice to management, reputation, and information (Pfeffer & Salancik, 1978). Therefore, directors are not responsible for monitoring/controlling management but also to increase firms' value by bringing resources to the firm.

The resource dependency theory also looks at the board composition. The proactive behavior of board members is also dependent on their skills, experience, and connection (Tong et al., 2013). This theory views board size, independent directors, foreign ownership as components in the board that extracts resources from the environment. Also, the resource dependency theory emphasizes that the board plays a strategic role in decision-making. Independent directors help in information acquisition and firm borrowing (Tong et al., 2013).

Thompson & McEwen (1958) argued that when a firm has high debt, they appoint a bank officer in their board for easy access to money. Similarly, when firms have solvency problem, representatives of a financial institution is appointed in the board (Mizruchi & Stearns, 1988). Also, when firms suffer from bad performance executive directors are replaced with experienced independent directors to provide a fresh perspective to the board (Pearce & Zahra, 1992). Thus, the resource dependency theory views board as an important resource in two ways; first by their connection with the external environment and second by the expertise and knowledge of the directors.

The resource dependency theory explores how external resources affect organizational behavior. Since the organization deals with customers, suppliers, government etc. they get affected. The board of directors acts as the organization wheel for which they should interact with these external resources and try to acquire it to enhance the performance and intellectual capital of the firm.

Linking resource dependency theory to this study, board structure (board size, gender diversity, audit committee etc.) will provide communication channels and networks among corporations (Liu et al., 2013). This will improve the relationship with the external environment and various sources of finance (Reguera-Alvarado et al., 2015). Thus, a good board composition will monitor, control, and enhance the intellectual capital of the firm (Williams, 2000; Zamani et al., 2012; Appuhami & Bhuyan, 2015). Due to the director's competence, there will be a positive impact on the firm leading to productivity, work performance and customer loyalty (Dave, 1998). Similarly, Turkoglu (2016), adds that human capital is the accumulation of information that directors bring with them when they work and that they take when they leave. Improving human capital will increase firms' relational capital, thereby intellectual capital.

3.1.2. Resource-based view theory

It is one of the organizational behavior theories. This theory suggests that resources within the firm help create a competitive advantage (Jensen & Meckling, 2006). Firms should look for a source of competitive advantage within the firm instead of searching externally. Barney (1991) argues that firms should use existing resources within the firm to take advantage of external opportunities.

This theory is based on two assumptions; first, firms achieve competitive advantage by the creation of skills, knowledge, culture which is not easily copied by other firms (Jensen & Meckling, 2006). Second, firms must have immobile resources by which sustainable competitive advantage can be created. Firms must have human capital, social interaction, organizational process, educational opportunities to create immobile resources (Jensen & Meckling, 2006).

This theory suggests intellectual capital to be a package of assets (knowledge) which is regarded as an important resource to enhance performance (Carlucci & Schiuma, 2007). Directors are useful resources along with firms' intellectual capital, thus, a combination of intellectual capital along with the role of board governance enhances performance. Safieddine et al. (2009) argued that firms make a profit depending on how resources are used at their disposal.

Linking resource-based view theory in the context of this study, we examine intellectual capital and the cost of capital from a resource-based view perspective. It is argued that when firms have high intellectual capital efficiency, they will be in a better position to benefit from external opportunities to acquire funds at a lower cost. This is because a good board structure will have the connection, expertise, and knowledge which increases intellectual capital (resource-dependency theory) and at the same time board

will utilize these resources to help firms acquire funds at a lower cost (resource-based view theory). Therefore, a good board structure increases intellectual capital efficiency through which capital cost is lowered.

As discussed in chapter two, to the best of our knowledge no studies are found that link intellectual capital and cost of capital. Studies have only examined intellectual capital disclosure impact on the cost of capital from agency theory perspective (Richardson & Welker, 2001; Botosan & Plumlee, 2002; Orens et al., 2010; Boujelbene & Affes, 2013; Attig et al., 2013).

3.1.3. Agency theory

This theory relies on the foundation that there is a separation between management (agent) and owners (principal) which results in agency cost to solve the conflict between them (Jensen & Meckling, 1976). Besides, the theory assumes managers to be self-centered and self-interested that do not care for the interest of shareholders. Managers have more firm information and knowledge which makes them in a better position to fulfill their interests instead of the shareholder's interest (Fama & Jensen, 1983). For instance, they provide themselves with unimaginable remuneration package, use company resources to fulfill their interest, or may not work in the shareholders' interest by not devoting skill and time for new projects. The self-interest of managers increases the cost of organization in terms of monitoring/controlling managers action which affects companies' profitability and compromise shareholders interest. Agency problem occurs when there are different goals between principals-agents and it is difficult for the principal to see what the agent is doing (Eisenhardt, 1989).

Agency theory suggests three agency issues: separation of control-ownership, conflict of interest between firms and external contractors like creditors, employees, and

conflict of interest among shareholders. First, separation of control-ownership is where a large number of shareholders are unable to monitor or participate in daily actions. Therefore, they select board members i.e., the board of directors to monitor managers. Second, the conflict of the firm with creditors is where the company acts as an agent and invest in risky projects for higher returns. In this case, the company will capture profit where the cost will be transferred to the creditors (Jensen & Meckling, 1976). Thus, through monitoring mechanisms and restrictive covenants creditors try to protect themselves. Finally, according to Shleifer & Vishny (1997), conflict of interest among shareholders occur when minority shareholders become the principals, and majority shareholder's become agents. Minority shareholders have fewer voting rights and power to influence the management of the firm. Thus, minority shareholders depend on majority shareholders for monitoring the firm.

This theory suggests that agency costs can be reduced by internal/external control systems such as the corporate governance mechanism (Hudaib & Haniffa, 2006). Internal mechanisms like auditing, the board of directors, independent external auditors, and independent non-executive directors helps to monitor agents. External corporate governance mechanism can be the market itself assuming it is an efficient market. Thus, corporate governance structure reduces agency cost which increases firms' value by increasing future cash inflow.

In the context of this study, agency theory is applied to explain the relationship between board structure- intellectual capital and intellectual capital-cost of capital. When firms' have good board composition with skills, expertise, and knowledge it will enhance the intellectual capital of the firm (resource-dependency theory) and board composition will also act as effective monitoring of the management (agency theory). Therefore,

agency costs will be decreased implying lower capital cost. Mande et al. (2012) argue agency costs related to debt and equity can be reduced with the implementation and adoption of the corporate governance structure. Therefore, it is expected that good practices of corporate governance will decrease the cost of debt/equity, thereby, cost of capital. This will improve the firm performance because corporate governance is designed to lower agency problems which reduce agency cost.

According to New Zealand's listing rule 10.4.5 requires companies to disclose gender diversity in their annual report. Also, the best corporate governance practice of New Zealand requires the disclosure of director's remuneration and board composition. Therefore, assuming firms disclose their corporate governance structure, where an independent director is appointed then the intellectual capital will get enhanced (resource-dependency theory) and at the same time this independent director will be considered as an effective mechanism to monitor agents. So, when finance suppliers know that a non-executive director exists in the board, they get confidence, where agency cost, default risk, demand for the rate of return decreases implying a lower cost of capital. Thus, it is argued that when a firm has a good board structure, there will be high intellectual capital efficiency through which firms will experience a low cost of capital. As discussed in chapter two, there are various studies found that a good corporate governance structure decreases the cost of capital (Berger et al., 1997; Andersen et al., 2004; Bozec & Bozec, 2011; Lorca et al., 2011).

Finally, to conclude this study has used theory triangulation (resource dependency theory, resource-based view theory, and agency theory) to examine the relationship between board structure, intellectual capital, cost of capital, and firm performance. The three theories used in this study are integrated and fit into the conceptual framework of

the study. Resource dependency theory says firms will bring resources from outside for better performance of the board and as a result the increased skills or knowledge of the board will be utilized to enhance intellectual capital which is supported by resource-based view theory. Once, the intellectual capital efficiency is enhanced it reflects the effective monitoring mechanism of the board due to which creditors will demand a lower rate of return which is supported by agency theory. Thus, an integration between the three theories used in the study exists which fits into the conceptual framework proposed.

3.2. Conceptual framework

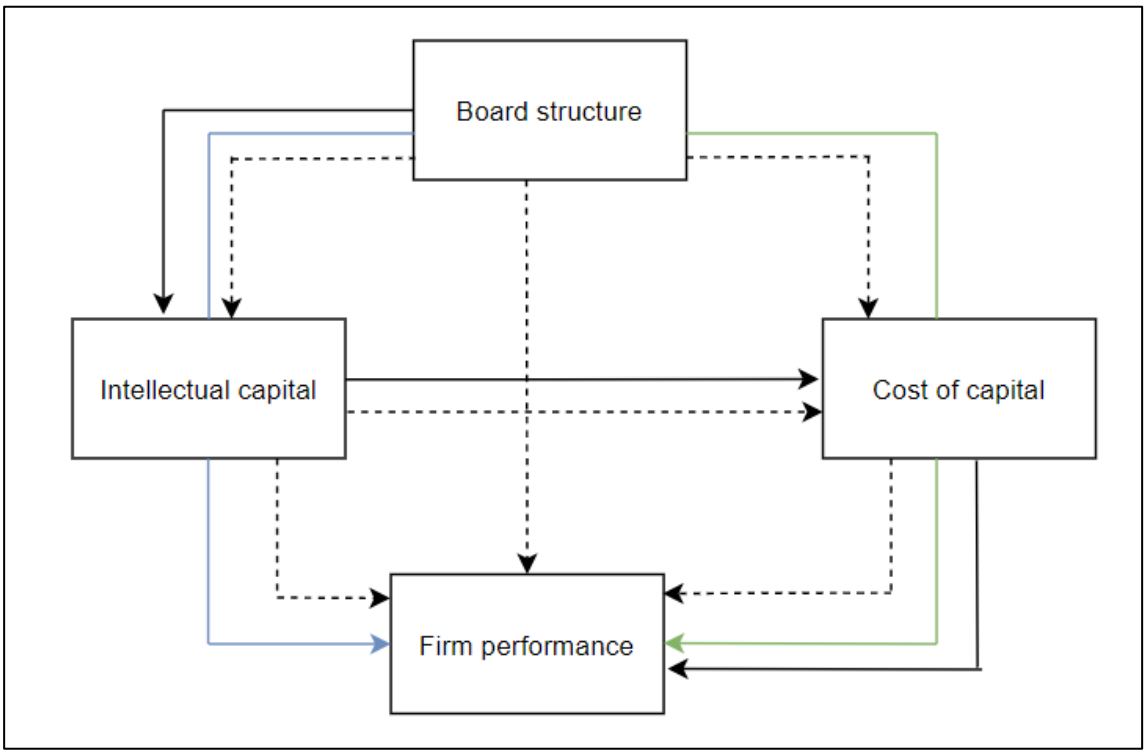

Figure 3. 1.Conceptual framework

Figure 3.1. illustrates the conceptual framework of this study. The straight line between the variables is the main study based on which hypothesis will be made and tested. The indirect relationship of board structure and firm performance with the mediating effect of intellectual capital is shown by the blue line. The indirect relationship of board structure and firm performance with the mediating effect of the cost of capital is shown by the green line. Finally, the indirect relationship of board structure on firm performance through intellectual capital and cost of capital is shown by the black line where board structure impacts intellectual capital (from the perspective of resource-dependency and agency theory) through which cost of capital will be impacted (from the perspective of resource-based view and agency theory) and then firm performance.

The dotted lines between the variables indicate the secondary objectives of the study where dotted line exist between (1) board structure and firm performance (2) board structure and intellectual capital (3) board structure and cost of capital (4) intellectual capital and firm performance (5) intellectual capital and cost of capital (6) cost of capital and firm performance.

3.3.Hypothesis development

Depending on the literature review, theories and the conceptual framework illustrated, below hypothesis are developed for the seven measures of board structure that is to be tested later in this study.

3.3.1. Board size

The appropriate size of the board is still debated in literature based on different perspectives. Some authors suggested smaller board size improves firm performance (Lorsch & Lipton, 1992; Hudaib & Haniffa, 2006; Ozkan, 2011) while others argued the

opposite (Uadiale, 2010; Reddy et al., 2010).

Scholars argue that small boards are better in terms of communication and coordination (Jensen, 1993). As the size of the board increases, it becomes difficult to communicate which might lead to conflict. Empirical studies showed firm performance decreases with a larger board size (Donnelly & Kelly, 2005). On the other hand, a large board is said to be effective than a small board because it enhances the monitoring mechanism and makes resources available. Studies showed a positive relationship between the size of the board and firm performance (Zahra, 1989; Jackling & Johl, 2009).

Based on the conceptual framework, large board size signals increased access to resources (such as new raw material, new market, technology), knowledge, and expertise of the board of directors which positively affects intellectual capital. This large board has more opportunities to have directors with industry experience and a high educational level which helps to provide high-quality advice to management. The service role of the director is to improve company reputation, serve as advisors to executives, and set up contact with externals (Pfeffer & Salancick, 1978). Therefore, from a resource-based view theory perspective, the large board are in a better position to use their knowledge and expertise. This helps to create effective relation with externals and secure resources for the organizational operation which improves firms' intellectual capital and firm performance. Thus, we assume that board size will efficiently utilize intellectual capital which will positively impact firm performance (Lorsch & Lipton, 1992; Hudaib & Haniffa, 2006; Ozkan, 2011). Therefore, we hypothesis below:-

H1a: Intellectual capital positively mediates the relationship between board size and firm performance.

H1c: There is a positive relationship between board size and firm performance.

H1d: There is a positive relationship between board size and intellectual capital.

On the other hand, from a resource-based view theory perspective, firms will utilize their intellectual capital in terms of directors skills, knowledge to increase firm value. As a result, creditors get satisfied that there will be no default risk and firm will be managed properly (Chen et al., 2009). However, due to the absence of intellectual capital in the mediation effect of cost of capital, we hypothesis:

H1b: Cost of capital negatively mediates the relationship between board size and firm performance.

From an agency theory perspective, larger board size acts as an effective monitoring mechanism for management that helps to reduce agency costs and improve firm performance (Uadiale, 2010; Reddy et al., 2010). Also, Fields, Fraser & Subrahmanyam (2012) added that creditors focus on the board structure composition when lending money. With larger board size and a larger proportion of independent directors, creditors demand a lower rate of return (Fields, Fraser & Subrahmanyam, 2012). Thus, we hypothesis :-

H1e: There is a negative relationship between board size and cost of capital.

3.3.2. Board independence

With majority independent directors, the board is said to be independent. Independent directors provide contacts, prestige, and expertise needed by the managers to make decisions about intellectual capital (Haniffa & Cooke, 2002). Also, non-executive directors play a wide range of roles that help in executing a firm's strategy affecting firm performance (Kroll et al., 2007).

Mixed results between board independence and firm performance are seen in prior literature. Some argued that independent directors in the board may be politicians or

environmental activists due to which they do not add value to the firm and the result showed a negative relation (Agrawal & Knoeber, 1996). While, others argued negative relation resulted because of the unqualified independent directors (Kiel & Nicholson, 2003). However, a positive relation was also found where independent directors helped in inter-company loans, excess return, and reduced wastage of firm resources (Rosenstein & Wyatt, 1990; Ho & Williams, 2003).

Independent directors prefer to show to the board that they are performing well so they are more conducive towards the goal, mission, and strategy of the organization. Besides, they come with a different background from different organizations bringing more knowledge and skill compared to inside directors who are vested only within their working place. Independent directors provide up-to-date operational information to the board, provide better decision-making basis. This help in protecting the firm from the external environment by reducing uncertainty, suggesting resources that can increase firms' recognition and status, exchange information and represent the firm to stakeholders (resource-based view theory). Independent directors through their connection with externals, experience, knowledge, and skills can improve a firm's intellectual capital and increase firm performance. Thus, the below hypothesis is developed:

H2a: Intellectual capital positively mediates the relationship between board independence and firm performance.

H2c: There is a positive relationship between board independence and firm performance.

H2d: There is a positive relationship between board independence and intellectual capital.

As per agency theory, independent directors who have no relationship with the company are more likely to monitor effectively, balance the board (Hudaib & Haniffa, 2006) and reduce information asymmetry by which creditors trust in lending capital to the firm. Creditors trust independent directors as the source to validate and authenticate the control process and accounting numbers (Usman, Farooq, Zhang, Makki & Khan, 2019). Thus, we see a negative association between board independence and the cost of capital. However, when board structure impacts firm performance through the cost of capital there is a lack of intellectual capital utilization (resource-based view theory) or signals provided by independent directors to creditors about the firm in terms of board knowledge, skills, or external relation. Therefore, we hypothesis below:-

H2b: Cost of capital negatively mediates the relationship between board independence and firm performance.

On the other hand, from an agency theory perspective, independent directors reduce agency costs, balance the board, and challenge CEO which makes default risk lower i.e., lower cost of capital (Anderson et al., 2004; Anwar et al., 2019). Therefore, we hypothesis below:

H2e: There is a negative relationship between board independence and the cost of capital.

3.3.3. CEO duality

When a person is board chairman and at the same time holds CEO position (Finkelstein & D'Aveni, 1994) it is said that CEO duality exists. Regarding agency theory, CEO duality leads to a conflict of interest and ignores the monitoring mechanism of the board of directors that protects the interest of shareholders. The board of directors is not effective unless it controls decisions made by the top people (Fama & Jensen,

1983). CEO duality has a greater power that can affect board independence which is needed to control the opportunistic behavior of the CEO.

Empirical studies showed inconsistent results with positive, negative, and no relationship between CEO duality and performance (Kesner, 1988; Elsayed, 2007; Chen et al., 2008; Iyengar & Zampelli, 2009; Bliss, 2011; Appuhami & Bhuyan, 2015). Vafeas & Theodorou (1998) found no relationship prevails between CEO duality and firm performance and argued that it depends on the personal characteristics of the person. Contrary, Appuhami & Bhuyan (2015) found the CEO to be positively associated with intellectual capital showing the efficient use of intellectual capital by the firm. Power concentration motivates a person to increase firm value through intellectual capital.

CEO duality control board meetings and put self-interest ahead (Boivie et al., 2011). This opportunistic behavior of CEO duality suggests that CEO duality uses organizational resources for their welfare to increase status and prestige without making effective intellectual capital decisions. When board structure comprises CEO duality intellectual capital will not be utilized efficiently due to which negative mediation on performance is assumed. Thus, from an agency theory perspective, CEO duality avoids efficient and effective intellectual capital decisions and reduces the value of shareholders and negatively impacts firm performance (Chen et al., 2008; Iyengar & Zampelli, 2009). Therefore, the below hypothesis is developed:

H3a: Intellectual capital negatively mediates the relationship between CEO duality and firm performance.

H3c: There is a negative relationship between CEO duality and firm performance.

H3d: There is a negative relationship between CEO duality and intellectual capital.

Also, from an agency theory perspective, the cost of capital increases as CEO duality does not enhance intellectual capital, negatively impacting performance. Also, because CEO duality is viewed as poor corporate governance in New Zealand (Pham, Suschard, Zein, 2011), creditors will demand a higher rate of return as default risk increases. Thus, the combination of a higher rate of return along with CEO duality will negatively impact performance and due to which we hypothesis:

H3b: Cost of capital negatively mediates the relationship between CEO duality and firm performance.

As argued by Fields, Fraser & Subrahmanyam (2012) that creditors focus on board composition when lending capital. The existence of CEO duality increases the probability of self-interest by the CEO. Also, the internal behavioral mechanism of the firm will not function efficiently to monitor managers' actions to protect shareholder's interests as suggested by agency theory. Thus, creditors charge a higher premium rate, and therefore we hypothesis the below:

H3e: There is a positive relationship between CEO duality and the cost of capital.

3.3.4. Audit committee composition

Listing rules and governance code of New Zealand requires issuers on the stock exchange to have an audit committee with minimum three directors, where the majority should be independent and at least one with accounting/finance background. There are a growing number of studies examining the relationship between performance and audit committee (Chan & Li, 2008; Saibaba & Ansari, 2013; Appuhami & Bhuyan, 2015).

From an agency theory perspective, an independent audit committee helps the board in decision-making (Fama & Jensen, 1983). Due to the high proportion of independent directors in the audit committee, the monitoring function increases, the

internal control process gets enhanced, and the information asymmetry gets reduced (Keenan & Aggestam, 2001; Jing et al., 2008). Thus, the establishment of an audit committee ensures the opportunistic behavior is controlled and the organizational resources are used efficiently for effective investment in intellectual capital to enhance value of shareholders and firm performance. From the resource dependency theory perspective, the audit committee is regarded as a bundle of resources and knowledge because the majority are independent directors in audit committee with diverse skills and knowledge. Audit committee works closely with the board and communicates issues relating to internal controls, financial reporting, provide an overview of ethics and compliance, risk management etc. This helps the board of directors to gain information and ideas from the audit committee composed of majority independent directors to make effective decisions. The independent members in the audit committee are in a better position to utilize intellectual capital efficiency and add value to increase firm performance (Chan & Li, 2008; Saibaba & Ansari, 2013). Therefore, the below hypothesis is developed:

H4a: Intellectual capital positively mediates the relationship between audit committee composition and firm performance.

H4c: There is a positive relationship between audit committee composition and firm performance.

H4d: There is a positive relationship between audit committee composition and intellectual capital.

From the perspective of agency theory, independent members in the audit committee can effectively monitor the internal control process of the organization, maintain good relations with the external auditor, verify financial statements, etc. (Chan

& Li, 2008; Saibaba & Ansari, 2013). Thus, the existence of an audit committee satisfies the requirements of creditors that the probability of default risk will be low (Anderson et al., 2004; Ramly, 2011). Therefore, this reduces the cost of capital. However, when the cost of capital mediates the relationship between audit committee composition and firm performance there is an absence of intellectual capital, which contradicts the theory of resource-based view i.e., audit committee composition will not be able to utilize their skills to influence creditors. Therefore, we hypothesis below:

H4b: Cost of capital negatively mediates the relationship between audit committee composition and firm performance.

On the other hand, Ramly (2011) argues that the audit committee looks after the financial reporting process and keep close relations with external auditors regarding financial statements and internal controls. From an agency theory perspective, we add that independent members play an important role in the audit committee by performing an effective monitoring mechanism in terms of internal controls which assures creditors about their money. Thus, default risk reduces and therefore we hypothesis the below:

H4e: There is a negative relationship between audit committee composition and the cost of capital.

3.3.5. Gender diversity

The positive relation between female diversity and firm performance was found in prior literature (Provan, 1980; Kesner, 1988; Mitchell Williams, 2000). Also, it was found that firms with female directors are more involved in charity (Williams, 2003). On the other hand, contrary results were found showing fewer females improves performance in a better way (Bilimoria & Piderit, 1994; Fauzi & Locke; 2012). Female directors have different cognitive frames such as information seeking and information evaluation

processes which enhances firm performance compared to male directors. They incorporate community issues within the organization's development and growth, thus, broaden the scope of boards' decision-making process. Besides, female presence on board enforces firms to look for more talented employees within the labor market because females can attract and communicate with larger employees increasing competitive abilities within the firm (Graves & Powell, 1988). They provide innovation and generation of ideas and helps in strategic change.

From the resource-dependency theory perspective, gender diversity is based on the perspectives, experience, problem-solving approaches, and social network relation that they bring to the board. Also, from the resource-based view theory perspective females can use those skills to efficiently invest in intellectual capital and increase firm performance. In line with prior studies, (Terjesen et al.,2015; Christiansen et al., 2016; Zahoor, 2016) it is argued that females can contribute and add value to the intellectual capital efficiency of the firm, Therefore, below hypothesis are developed:

H5a: Intellectual capital positively mediates the relationship between gender diversity and firm performance.

H5c: There is a positive relationship between gender diversity and firm performance.

H5d: There is a positive relationship between gender diversity and intellectual capital.

Similarly, females lack quick response in case of market shock, increase disagreement within the board, and create interpersonal conflicts that affect the efficient and effective working of the board (Smith et al., 2005; Petrovic, 2008). These factors affect cooperation and communication reducing board monitoring mechanisms (agency

theory), thereby, finance suppliers charge higher risk premiums (Smith et al., 2005; Petrovic, 2008). Also, from resource-based view theory perspective female directors use their cognitive skills to influence creditors but due to the absence of intellectual capital through the mediation effect of cost of capital we hypothesis the below:

H5b: Cost of capital negatively mediates the relationship between gender diversity and firm performance.

In line with the study of Lucas-Perez et al (2015), Gull et al. (2017) and Usman, Farooq, Zhang, Makki & Khan (2019) female directors showed a negative association with cost of capital. It is argued from the agency theory perspective that female directors avoid managers from earning management, enhance the independence of the board, be more responsible, and reduce the cost of the agency problem. Thus, creditors believe default risk to be minimal with the presence of females on board and demand a lower rate of return Gull et al., 2017). There, we hypothesis the below:

H5e: There is a negative relationship between gender diversity and the cost of capital.

3.3.6. *Board background and skill diversity*

The skill diversity of directors' increases board effectiveness in terms of the high level of integrity, judgment, experience, and intellectual ability (Hilmer, 1998). They provide a mixture of competencies and capabilities which provide a different perspective in decision-making (Carver, 2002). Qualified board member provides knowledge base environment enhancing a thoughtful process to solve problems and provide innovative ideas to develop policies. Also, boards with greater educational qualification are more likely to be flexible, have a better ability to accept innovation, and adopt new ideas and have greater capabilities to process information. These characteristics of board members

help them to create policies and strategies on how to best use, obtain, and enhance intellectual capital resources. On the contrary, board with less skill level will result in a lack of innovation and thinking.

Supporting the above arguments, prior studies showed board members with industrial experience and skills to be associated positively with Tobin-Q and ROA (Girbina et al., 2012; Darmadi, 2013). From a resource-based view theory perspective, when board members are highly qualified, they will have a higher level of skills and knowledge i.e., positively affecting intellectual capital efficiency and firm performance. Thus, the below hypothesis is developed:

H6a: Intellectual capital positively mediates the relationship between board background and skill diversity and firm performance.

H6c: There is a positive relationship between board background and skill diversity and firm performance.

H6d: There is a positive relationship between board background and skill diversity and intellectual capital.

Resource- based view theory argues that board background and skill diversity helps the board to come up with innovative ideas, a various solution to problems as directors vary with different educational background and level (Ruigrok et al., 2006; Wincent et al., 2010). Thus, directors skill and education will help to improve intellectual capital efficiency and influence creditors to demand a lower rate of return. However, due to the mediating effect of cost of capital alone, board background and skill diversity may not contribute positively to firm performance due to the missing effect of intellectual capital efficiency that influences creditors to trust corporate governance of the firm. Therefore, we hypothesis the below:

H6b: Cost of capital negatively mediates the relationship between board background and skill diversity and firm performance.

From an agency theory perspective, when board members are highly qualified, they can monitor management more effectively, reducing agency costs. Also, creditors will get the confidence and trust that the default risk will be lower due to the presence of highly educated board members, thereby demand lower rates of return (Easley & O'Hara, 2004). Thus, below hypothesis is developed:

H6e: There is a negative relationship between board background and skill diversity and the cost of capital.

3.3.7. Board meeting

Firms that conduct regular board meetings can manage themselves during a difficult time. Managers can take effective decisions as they get supported by the board meeting where the problem is understood and discussed in a better way (Mangena & Tauringana, 2008). Board meeting helps to develop intellectual capital because it provides counseling to management and provides extensive strategic advice. Thus, firms are in a better position to formulate policies and strategies to get resources related to intellectual capital (Marques et al., 2006). Resource dependency theory argues board meetings help to convey up-to-date information among the directors which positively contributes to get relevant resources and improve intellectual capital and firm performance. Also, knowledge shared in the board meeting helps to generate innovative ideas, policy, and strategy that enhances intellectual capital, thereby firm performance. Therefore, the below hypothesis is developed:

H7a: Intellectual capital positively mediates the relationship between a board meeting and firm performance.

H7c: There is a positive relationship between board meeting and firm performance.

H7d: There is a positive relationship between board meeting and intellectual capital.

The impact of the board meeting on firm performance through the mediation effect of cost of capital is assumed to be negative because agency theory argues board meeting enhances the monitoring mechanism which improves performance (Vafeas, 1999). However, when the cost of capital alone mediates without the interaction of intellectual capital, creditors are not influenced to lower the required rate of return. Thus, we hypothesis below:

H7b: Cost of capital negatively mediates the relationship between board meeting and firm performance.

From the perspective of agency theory, management is monitored by the board that reduces agency costs. The effectiveness of the board increases when they meet regularly and show greater work diligence. As a monitoring mechanism, it is easier to get better governance by more board meetings to discuss issues (Vafeas, 1999). As a result, board meetings help to convey up-to-date information among the directors which positively contributes to set strategic decisions. Therefore, creditors demand a lower rate of return due to increased board meeting and trust in the monitoring mechanism of the firm (Marques et al., 2006). Hence, we develop below hypothesis:

H7e: There is a negative relationship between board meetings and the cost of capital.

In addition to all the above developed hypotheses, to achieve secondary research objectives 4,5 and 6 we develop three additional hypotheses.

According to the resource-based view theory, intellectual capital is said to be a package of assets (knowledge) which is regarded as an important resource to enhance performance (Carlucci & Schiuma, 2007). Directors are useful resources along with firms' intellectual capital, thus, a combination of intellectual capital along with the role of board governance enhances performance. According to Rahman (2012), higher intellectual capital efficiency implies higher firm performance. By using the VAIC model, Rahman (2012) found a positive relation for 100 UK firms. Thus, the profit-making capacity of the firm depends on their ability to how they use intellectual capital (Safieddine et al., 2009). An important element for the sustainability of firm growth is assumed to be intellectual capital (Safieddine et al., 2009). Therefore, we hypothesis:

H8: There is a positive relationship between intellectual capital and firm performance.

Similarly, resource-based view theory suggests that firms will be in a better position to get funds at a lower cost with higher intellectual capital efficiency (Easley & O'Hara, 2004; Orens et al., 2010). This is because firms will have the required skills, connection to seek lenders' trust and acquire capital at a lower cost which positively impacts performance (Safieddine et al., 2009). Therefore, the below hypothesis is developed:

H9: There is a negative relationship between intellectual capital and cost of capital.

H10: There is a negative relationship between the cost of capital and firm performance.

CHAPTER 4: METHODOLOGY

This chapter is divided into five sections. First, research design to answer the research question proposed in this study is discussed followed by a research context. Second, the sample selected for the study and the reasoning is provided. Followed, by the process and source for collecting variables data in the study is explained. Finally, the operationalization of dependent (endogenous), independent (exogenous) and control variables are explained in the last section.

4.1. Research design

A general plan to run research to answer the research question is defined as a research design. It also includes the procedures to collect information needed. This study uses panel data analysis which is used when the dataset consists of both cross-sectional elements and time series, specifically when studying multiple variables over a period. With a larger data set, panel data provide variability with less collinearity compared to cross-section/time-series data. Apart from the informative data provided, panel data helps to get more reliable estimates. On the other hand, panel data may cause problems due to large data collection and management.

However, to examine the relationship between board structure, intellectual capital, cost of capital, and firm performance this study uses path analysis which is explained in detail in the next chapter.

This study relies on the positivist paradigm using quantitative techniques with deducting reasoning. The positivist approach is where the researcher views reality as measurable and objective and the research looks to explain the effects and causes (Collis & Hussey, 2003). The reasoning in this study is deductive because the first hypothesis is

developed and then data is collected to either accept or reject the hypothesis (Collis & Hussey, 2003). Therefore, quantitative data and techniques will be applied in this study to test the hypothesis. The quantitative method supports a statistical method for analysis, rigorous measurement, and data collection from either primary/secondary sources. The quantitative method can generalize results for a larger population but fails to provide an in-depth understanding.

4.2. Research context

The context of New Zealand has been selected in this study due to a lack of prior studies that focused on New Zealand compared to other OECD countries regarding corporate governance. Also, as found in chapter two, studies conducted in New Zealand context were interlocking directorship effect on performance (Bhuiyan & Roudaki, 2013), corporate governance compliance (Bhuiyan et al., 2013), female representation on board effect on performance (Duppati et al., 2017), board and ownership structure and performance (Fauzi & Locke, 2012), Companies Act 1993 effect on board and performance (Hossain et al., 2001), financing patterns, corporate governance and cost of capital (Koerniadi & Tourani-Rad, 2014). There is no study found in the context of New Zealand that examined the effect/relation of intellectual capital. This lacked acted as a motivation to choose New Zealand and compare the findings with other OECD countries. Also, the corporate governance practices reform from 2003 to 2017 motivated to conduct the study to investigate how New Zealand firms board structure impacted firm performance.

The continuous corporate governance reforms in New Zealand indicate the effort exercised by the policymakers, regulators to help improve firm performance and gain the

trust of stakeholders in terms of corporate governance. As the New Zealand stock market is home for most of Asia's Pacific dynamic and successful companies, policymakers are always keen to update corporate governance policy for an efficient capital market (New Zealand Corporate Governance, 2019). The goal of these efforts of policymakers can be achieved by the result of this study to understand how intellectual capital and cost of capital mediate the relationship between board structure and firm performance. In addition, countries geographically located near New Zealand and that share the same business characteristics are likely to find the result of this study relevant. Therefore, selection of New Zealand context is based on two reasons (1) no prior studies incorporating intellectual capital were examined in the context of New Zealand (2) this study can have major practical implications in New Zealand, especially where the ownership concentration is very high to improve the efficiency of the capital market and firm performance.

4.3. Sample

This study focuses on firms listed on New Zealand's stock exchange which constitutes the NZX 50 Index. The NZX50 is the market index that checks the performance of 50 largest publicly listed companies. One reason for selecting the top 50 companies is because large companies have greater intellectual capital. This would provide a better understanding of the study to examine the relationship between board structure, intellectual capital, cost of capital and firm performance. Second, the study can be applicable and examined for all types of companies and operations. Third, New Zealand's corporate governance code, Companies Act 1993 applies to all listed companies constituting the NZX50 index. Top companies would have more disclosure of

the variables incorporated in the study compared to small and less liquid firms listed on the stock exchange.

The time interval of this study is 10 years i.e., from 2010 to 2019. All 50 companies forming the NZX 50 index are included in the study. However, 9 firms were removed from our sample (4 firms were established within the period of our study and 5 firms had insufficient data) leaving a sample of 41 companies with 410 observations. However, after the normality test 19 observations were removed, and 391 observations were left as the final sample size. The 41 sample firms selected are classified by the industrial sector as shown in Table 4.1.

Table 4. 1. Sample firms classified by industrial sector

Industrial sector	Number of firms
Airport Services and Airlines	2
Diversified Banks and REITs	6
Health Care Facilities & Equipment	4
Packaged Foods & Meats	4
Electric Utilities	4
Alternative Carriers	1
Health Care Distributors	1
Construction Materials	1
Air Freight & Logistics	2
Retail, healthcare and Industrial REITs	3
Specialty Stores	1
Renewable Electricity	1
Energy Processing	1
Financial Exchanges & Data	1
Marine Ports & Services	1
Restaurants	1
Casinos & Gaming	1
Industrial Machinery	1
Cable & Satellite	1
Integrated Telecommunication Services	1
Trucking	1
Internet & Direct Marketing Retail	1
Multi-Utilities	1

4.4. Data collection

Data for the independent, dependent and control variables are collected from Bloomberg and Thomson Reuters. Thomson Reuters database is considered as a corporate governance data source that has been used in literature for its credibility and reliability (Maury, 2006; Kim & Lim, 2010). However, some missing variables data were collected manually from the annual report. Each company's annual report was downloaded from their specific website. Finally, analysis of the data was conducted using Stata software.

4.5. Variable measurement

This section explains the operationalization of the variables used in the study i.e., board structure, intellectual capital, cost of capital, firm performance, and control variables. The summary of all variable's measurements used in this study is shown in Table 4.2.

Table 4. 2. Measurement of variables

Variable name	Abbreviation	Measurement	Data collection source	Prior studies
Exogenous variables				
Board size	BSIZE	Total number of board members	Thomson Reuters	(Williams, 2003; Appuhami & Bhuyan, 2015)
Board independence	BIND	Number of Independent directors divided by total number of board members	Thomson Reuters	(Morellec et al., 2012)
CEO duality	CEOD	Dummy variable; 1 if CEO duality 0 otherwise	Thomson Reuters	(Appuhami & Bhuyan, 2015)
Audit committee	AUDITC	Number of Independent members divided by total number of members in audit committee	Thomson Reuters	(Appuhami & Bhuyan, 2015)
Gender diversity	GEND	Number of female directors divided by total number of board members	Thomson Reuters	(Christiansen et al., 2016; Gordini & Rancati, 2017).
Board background and skill diversity	BBS	Number of board members with either industrial-specific or financial background divided by total number of board members	Thomson Reuters	(Girbina et al., 2012; Darmadi, 2013)
Board meeting	BMEET	Number of board meeting in a year	Thomson Reuters	(Jackling & Johl, 2009; Brick & Chidambaran, 2010)
Endogenous variables				
Weighted average cost of capital	WACC	After-tax weighted cost of debt + weighted cost of equity	Bloomberg	(Pham et al., 2012; Bozec & Bozec; 2011)

Table 4. 3. Measurement of variables - (Continued)

Variable name	Abbreviation	Measurement	Data collection source	Prior studies
Cost of equity	COE	risk free rate + beta x risk premium	Bloomberg	(Pled & Latridis, 2012; Mohamed & Faouzi, 2014)
Cost of debt	COD	(total interest incurred/ total debt) x 100	Bloomberg	(Xuan et al., 2014),
Intellectual Capital	IC	VAIC	Financial Statement + Thomson + Bloomberg	(Rahman, 2012; Morariu, 2014 Appuhami & Bhuyan, 2015)
Return on Asset	ROA	Net income / average total assets	Thomson Reuters	(Adler, 2001; Lenard et al., 2014)
Return on Equity	ROE	Net income / average total equity	Thomson Reuters	(Huang & Liu, 2005; Morariu, 2014)
Tobin-Q	Tobin-Q	(total market value equity + total liabilities) / (total equity + total liabilities)	Thomson Reuters + Bloomberg	(Gordini & Rancati, 2017; Jubliee et al., 2018; Abdelzaher & Abdelzaher, 2019).
Control variables				
Firm Size	FSIZE	Log of total asset	Annual report	(Ho & Williams, 2003; Jing et al, 2008)
Firm Leverage	FLEV	Total debt to total equity ratio	Thomson Reuters	(Ho & Williams, 2003; Jing et al, 2008)
Firm Age	FAGE	Log of number of years since the company establishment	Company website	(Ho & Williams, 2003; Jing et al, 2008)
Industry	INDUSTRY	SIC Code	Thomson Reuters	
Cluster	CLUSTER	As per year		

4.5.1. Exogenous / Independent variable

As mentioned earlier in the study that seven variables are used to measure board structure (board size, board independence, CEO duality, audit committee, gender diversity, board background and skill diversity, and board meeting).

Board size is measured by the total number of board members serving on the board of directors (Goodstein, Gautam & Boeker, 1994; Williams, 2003; Appuhami & Bhuyan, 2015). Board independence is measured by the number of independent directors divided by the total number of board members (Morellec et al., 2012). CEO duality is measured using a dummy variable, where it takes 1 if CEO duality exists and 0 otherwise (Appuhami & Bhuyan, 2015). Existing literature accepts the usage of the dummy variable for CEO duality (Jackling & Johl, 2009). The audit committee is measured by the number of independent directors divided by the total number of members in the audit committee (Appuhami & Bhuyan, 2015). Gender diversity is measured by the number of female directors divided by the total number of board members (Christiansen et al., 2016; Gordini & Rancati, 2017). Board background and skill diversity are measured by the number of board members with either industrial-specific or financial background divided by the total board members (Girbina et al., 2012; Darmadi, 2013). Finally, the board meeting is measured by the number of meetings held in a year (Jackling & Johl, 2009; Brick & Chidambaran, 2010).

4.5.2. Endogenous / Dependent variables

There are three endogenous variables used in this study i.e., intellectual capital, cost of capital, and firm performance.

There are many models developed for the measurement of intellectual capital (Ulam et al, 2014) such as balanced scorecard by Robert Kaplan and David Norton, intellectual capital index by Goran Roos, Skandia navigator by Lief and Michael, value-added intellectual coefficient by Pulic, and extended value-added intellectual capital coefficient by Jamal & Irene. Each valuation model has advantages and disadvantages and there is no agreement among the scholars for the suitable valuation model of intellectual capital (Sydler et al., 2014).

However, to measure intellectual capital, this study uses the Value-Added Intellectual Coefficient (VAIC) model which was developed by Pulic. VAIC model measures the added value depending on intellectual resources. A higher value of VAIC for a firm shows greater intellectual capital associated with firms' resources (Pulic, 1998). The VAIC model has been used widely in the intellectual capital field as found earlier in chapter two (Williams, 2003; N-P Swartz & Firer, 2005; Al-Musalli & Ismail, 2012; Rahman, 2012; Morariu, 2014 Appuhami & Bhuyan, 2015). Besides, Volkov (2012) found that the VAIC model has been cited by 2373 studies and used in 46 studies.

VAIC model has five main advantages (Firer & Williams, 2003; Goh, 2005; Laing et al., 2010); (1) VAIC model can be used by the firm itself to examine its performance associated with intellectual capital (2) unlike other models which require financial, non-financial information and subjective judgment, VAIC does not require such information which makes comparison across companies easier (3) VAIC model relies on audited financial statement data which is verifiable and can be relied upon (4) VAIC model is easy and simple to apply to calculate intellectual capital (5) VAIC model uses data that is feasible and publicly available which can be retrieved directly from the audited financial statement.

Similarly, scholars have criticized the VAIC model (Chang, 2007; Mehralian et al., 2012; Ulam et al., 2014). Chang (2007) argued that the VAIC model ignores intellectual property and research and development expenditure related to profitability and firms' market value. Similarly, Ulam et al., (2014) argued that the VAIC model does not include any measurement for relational capital though it mentions there are three components of intellectual capital (human, structural and relational capital efficiency). He added that relational capital is the main factor in today's competitive environment that affects firms' value. Mehralian et al., (2012) added that VAIC is a less future-oriented technique because it ignores company risk and the negative value-added by the companies.

However, depending on three criteria, the VAIC model has been selected for this study. First, the measure of intellectual capital should be made simple to help understanding and ease in data collection. This can be justified for cost/benefit reasons. Second, using a complicated model will increase the risk of ambiguity which will reduce understandability. Finally, based on the study of Volkov (2012) and prior studies examining board structure and intellectual capital, this study measures intellectual capital by VAIC model and is measured as follows:

Equation 1: $VA_{it} = OP_{it} + EC_{it} + D_{it} + A_{it}$

$VA_{it:}$ value-added by resources of firm i at year t

OP_{it}: operating profit of firm i at year t

EC_{it}: employee cost of firm i at year t

$D_{it:}$ depreciation of firm i at year t

A_{it}: amortization of firm i at year t

Equation 2:

CEE_{it}: VA_{it} / CE_{it}

HCE_{it}: VA_{it} / HC_{it}

$SCE_{it:}$ SC_{it}/ VA_{it}

$CE_{it:}$ book value of the net asset of firm i at year t

HC_{it}: total salary and wages of firm i at year t

$SC_{it:}$ VA_{it} - HC_{it}

CEE_{it}: Capital employed efficiency for firm i at year t / contribution by every unit of a physical asset to VA

HCE_{it}: Human capital efficiency for firm i at year t / contribution by every unit of money invested in HC to VA

$SCE_{it:}$ Structural capital efficiency for firm i at year t / contribution by every unit of money invested in SC to VA

Equation 3:

$VAIC_{it} = CEE_{it} + HEC_{it} + SCE_{it}$

$VAIC_{it}$: Intellectual capital coefficient for firm i at year t

Cost of capital is measured in terms of cost of debt (Xuan et al., 2014), cost of equity (Pled & Latridis, 2012; Mohamed & Faouzi, 2014) and weighted average cost of capital (Pham et al., 2012; Bozec & Bozec; 2011). The cost of capital which includes debt and equity is the return required by the finance suppliers as compensation for their contribution of capital to the firm. The cost of debt is the money paid by the company as a cost for its debt. On the other hand, equity cost is the required return by shareholders for investment and ownership risk. It is calculated using the Capital Asset Pricing Model (CAPM). WACC is expected return on a portfolio for the firm securities i.e., equity and debt. It is calculated once the cost of debt and equity is calculated. This study

operationalizes the cost of the capital variable by cost of equity, cost of debt, and WACC and is measured as follows:

Cost of equity = risk free rate + beta x risk premium

Cost of debt = (total interest incurred/ total debt) x 100

WACC = After- tax weighted cost of debt + weighted cost of equity

Measures of performance used in literature fit into both market-based and accounting-based measures (Kiel & Nicholson, 2003). A meta-analytic review of corporate governance literature showed no reliability in measures of performance (Dalton et al., 1998).

This study measures firm performance using accounting-based measures (ROE and ROA) and market-based measures (TOBINQ). ROA provides a sign of how the firm uses and manages its resources in generating profit. In other words, it helps to estimate the efficiency of assets and shows the earnings made by the investment in capital assets. Since management is responsible for managing a firm's assets, ROA provides a sign of how the corporate governance system is working to secure and motivate the management. Studies have used ROA to measure firm performance (Adler, 2001; Lenard et al., 2014). Similarly, ROE is another accounting-based measure that shows the efficiency of the company to generate income for every unit of owner's equity. Prior studies have used ROE to measure performance and to examine the impact of intellectual capital (Huang & Liu, 2005; Morariu, 2014).

Market-based measure i.e., TOBINQ indicates the expected firm performance (Terjesen et al., 2016). The value of TOBINQ more than one signifies that the market believes the value of the firm to be more than the current book value. Besides, when the value of TOBINQ is less than one market will expect share will lose value (Terjsen et al.,

2016). Similarly, prior studies used TOBINQ when measuring firm performance (Gordini & Rancati, 2017; Jubliee et al., 2018; Abdelzaher & Abdelzaher, 2019). In the area of corporate governance, a low value of TOBINQ signals less effective governance mechanisms with managerial discretion, and a high TOBINQ signals an effective governance mechanism with managers and shareholders interest aligned (Weir et al., 2002).

ROA = Net income / average total assets

ROE = Net income / average total equity

Tobin-Q = (total market value equity + total liabilities) / (total equity + total liabilities)

4.5.3. Control variables

Control variables isolate the effect of controlled proxies in examining the association between dependent-independent variables when performing regression. This study uses three control variables at the firm level i.e., firm leverage, firm size, and firm age.

Control variables selected in this study are based on intellectual capital and corporate governance studies (Ho & Williams, 2003; Jing et al, 2008). Firms might use debt to invest in intellectual capital because lenders will view intellectual capital as positive that will be returned; thus, leverage is chosen (Balakrishnan & Fox, 1993). Increasing the efficiency of intellectual capital by using leverage will lower capital costs and enhance performance.

Due to financial solvency, large firms may easily invest in intellectual capital, therefore, firm size is controlled. When firms are large, they can easily get critical resources to improve intellectual capital through which the cost of capital decreases and

performance increases. Amato & Burson (2007) examined profit and firm size relationships for the financial service sector and found a negative influence of size on profitability using a linear form of relationship. In contrast, Akinyomi & Olagunju (2013) used panel data from 2005 to 2012 for the Nigerian manufacturing sector to examine the effect of firm size on ROA. They used leverage, liquidity and inventory as control variables. The results showed that firm size measured as the total asset-total sale is related to ROA positively and negatively with leverage.

Finally, firm age is another control variable chosen because older firms are more likely to have higher market value i.e., intellectual capital efficiency. Thus, finance suppliers may demand a lower rate of return that may improve the performance of the company. In Turkey, Dogan (2013) examined the effect of firm size on 200 companies' profit between 2008 and 2011. With multiple regression, the result revealed that the size of the firm was positively related to ROA and leverage, and age were negatively related to ROA.

CHAPTER 5: RESULTS AND DISCUSSION

Empirical findings of this study are discussed in this chapter. The chapter is divided into ten sections. First, the normality of the data is examined. Next, the path analysis model is developed, goodness fit of the model is examined, followed by descriptive statistics and correlation test. Then, to achieve the main research objective the mediation test of intellectual capital and cost of capital is made along with the total, direct, and indirect effect of board structure on firm performance. Finally, six additional tests are executed to achieve the secondary objectives of this study.

5.1. Normality testing

Skewness and Kurtosis test for normality was performed as shown in Appendix 1. The result showed normal distribution only for BIND, AUDITC, COD, and FSIZE variables where the p-value was more than 0.05. The data was normalized by removing the outliers. As a rule of thumb outliers six standard deviation away from the median were removed (Hair et al., 2016).

5.2. Path analysis

Developed in the 1920's path analysis is used to examine casual patterns among variables (Stage, Carter & Nora, 2004). To examine the influence associated with dependent variables within the path analysis model a series of regression is conducted. For the regressions that are made later within the model, dependent variables (endogenous variables) act as independent variables (exogenous variables). According to Garson (2004), studies in the literature use path analysis to test the correlation matrix fit, where it is considered an extension of the regression model. One of the strength of path analysis model is that the direct and indirect effect can be simultaneously studied with

multiple dependent and independent variables. Also, path analysis aims to provide magnitude estimation and significance of casual connection which is hypothesized among the set of variables. The hypothesized connections are shown using a path diagram, which is an illustration with identified variables. In the diagram, arrows are drawn from one variable to another to show causal relationship which is based on theory.

In addition, path analysis is used to examine the system of equations where all variables are observed. It assumes a perfect measurement of the observed variables where only the structured relationship among the observed variables is modeled (Stage, Carter & Nora, 2004). A path analytic approach is used to test the hypothesized causal path in this study between the variables. To estimate the path coefficients and model fit, where the estimation is simultaneous, the Maximum Likelihood is used in Stata. In Maximum Likelihood, estimation of parameters in the model is calculated at the same time repetitively. The path model in this study is hypothesized as shown in figure 5.1. based on the conceptual framework discussed earlier in figure 3.1. The path model is shown in figure 5.1. which focuses on the direct and indirect effect of board structure on firm performance. Thus, to examine the indirect effect, board structure variables are connected to intellectual capital, intellectual capital to cost of capital and cost of capital to firm performance. To examine the direct effect, board structure variables are connected to firm performance (ROA, ROE, and TOBINQ). Before interpreting path coefficients, the overall goodness fit of the model needs to be tested which is explained in the next section.

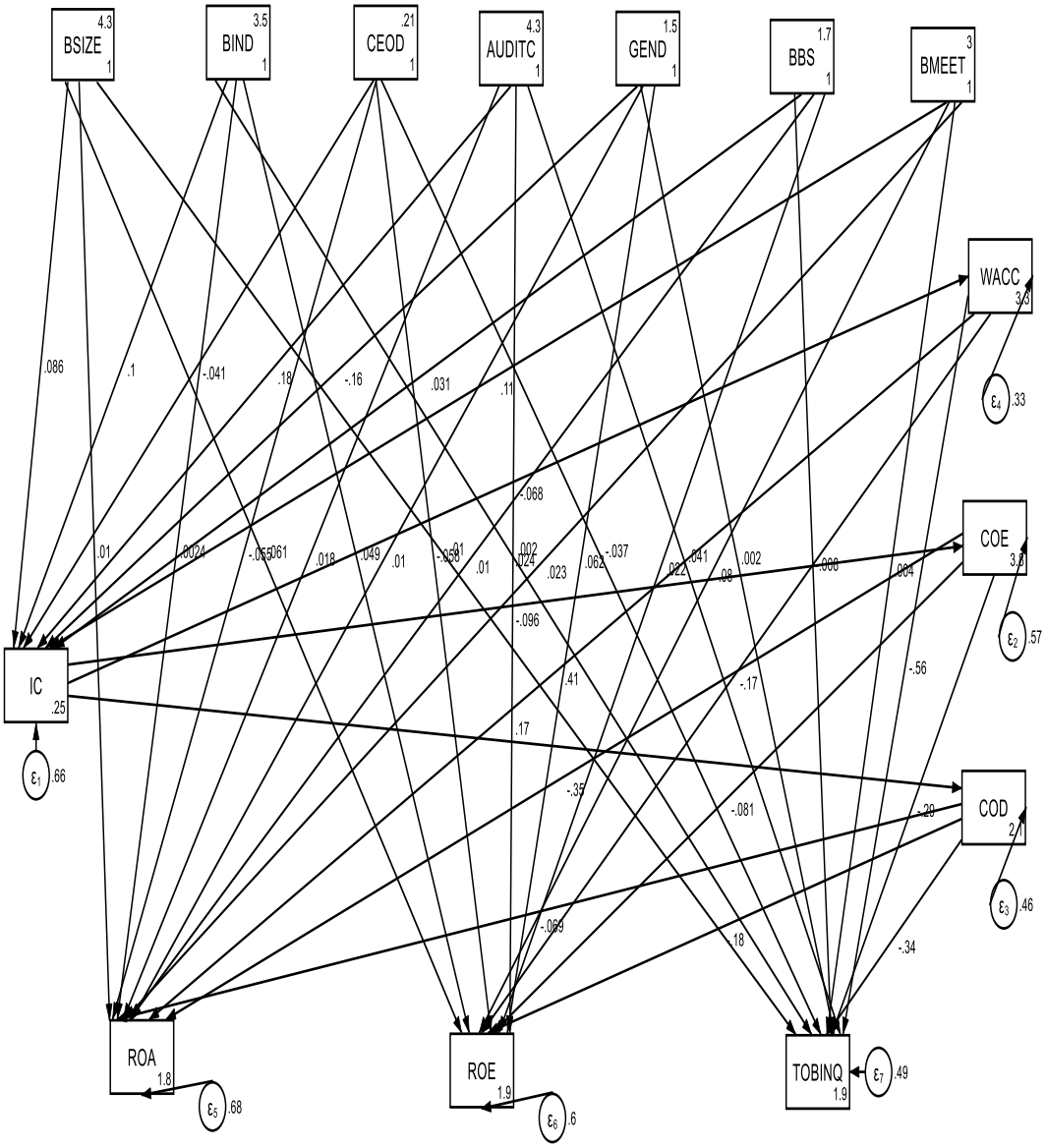

Figure 5. 1. Path analysis model

5.3. Goodness fit of the model

The overall fitness of the model is tested using chi-square where the model gets rejected if the p-value is less than 0.05. Three major indices used in research to test the overall goodness of the model are RMSEA, CFI, and TLI (Steiger, 1990; Bentler & Bonett, 1980). RMSEA assesses the gap between the hypothesized model and the perfect model whereas CFI and TLI compare the fit of the hypothesized model with the baseline model. Hu & Bentler (1999) suggested CFI and TLI > 0.95 and RMSEA < 0.06 indicates in general a good fit for models using maximum likelihood estimation. Their recommendation became highly influential and the cutoff values have been applied in structural equation modeling practices.

Table 5.1. shows the overall goodness fit of the path analysis model. The p-value is 0.193 not significant, thus our model is accepted. RMSEA is 0.014 which is less than 0.06 and CFI and TLI are 0.968 and 0.996 greater than 0.95. Thus, the model shows a good fit and can be used to test the hypothesis developed without any need for adjustment.

Table 5. 1. Overall goodness-of-fitness statistic

Fit statistic	Value
Likelihood ratio	
chi2	15.133
P > chi2	0.193
Population error	
Root mean squared error of approximation (RMSEA)	0.014
Baseline comparison	
Comparative fit index (CFI)	0.968
Tucker-Lewis index (TLI)	0.996

5.4. Descriptive statistics

General understanding of the sample and the preliminary information useful in proceeding with regression analysis is provided by descriptive statistics (Table 5.2). The board size of the NZX50 companies ranges from 4 to 16 directors on board with an average of 7 directors, suggesting that NZX50 companies have enough directors. The firms met the New Zealand listing requirement that there should be at least three directors. The average number of directors (6.9) from 2010 to 2019 is consistent with the number of directors (6.23) found by Bhuiyan et al., (2013) in 2010. Also, 72.86% of the board directors are independent which satisfies the listing rule 3.3.1 of New Zealand. However, some firms had board independence of 17.65% which is less than the required independent directors, but because New Zealand applies the principle-based approach, firms can provide valid justification. Meetings per year are around 10 on average which represents meeting every 36 days. Since, the board conducts frequent meetings, the decision-making process along with strategic decisions reflects firms' profit and earnings. Similarly, although CEO duality is limited in New Zealand, some firms had CEO duality representing an average of 0.05. The proportion of female directors is 21.89% on average ranging from 0% to 66.67%. This represents that female participation on the board is still low. Similarly, the proportion of directors having financial or industrial experience is on an average of 35.5% which is less than 50%. This represents a major concern for most of the companies where directors suffer a lack of industry-specific knowledge or financial background. This is supported by the argument of Bhuiyan & Roudaki (2013) who argues that with the presence of board interlocking firms in New Zealand suffer to find a suitable independent expert director. Thus, due to board interlocking a director may lack financial background or experience/knowledge of one specific industry in detail. Finally, 84.74%

of audit committee members are independent which satisfies the listing rules and governance code of New Zealand.

Regarding endogenous variables, NZX50 companies have created on average 6.29 intellectual capital i.e., average total value efficiency created by the companies using the resources employed is 6.29. The better the resources utilized by the company, the higher will be the value creation. The intellectual capital efficiency of NZX50 companies ranges from -3.96 to 156.37. Also, the average cost of debt and equity is 3.36% and 11.66% respectively. This represents an appropriate justification where the risk and return of debt are less compared to equity, thus less cost of debt compared to equity. The overall cost of financing ranges from 1.22% to 19.04% with an average of 8.08%.

The average ROA is 7.33% and ROE is 12.81%. ROE is more than ROA by 5.48%, which indicates NZX50 companies have good performance when comparing return with the cost of equity and cost of debt. Similarly, Tobin-q ranges from 0.59 to 19.39 with an average of 1.67 which indicates that stock is overvalued.

Finally, the average age of the firms selected is 3 years with the oldest firm established 5 years ago, and the latest firm established around 3 years ago. The average firm leverage is 41.8% ranging from 0.02% to 153.37%. The average firm size is 6.27 with the largest firm size 8.99 and the smallest firm size 3.92.

Table 5. 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Exogenous variables:					
BSIZE	391	6.958537	1.605534	4	16
BIND	391	.7286846	.2062243	.1765	1
BMEET	391	10.1878	3.3836	5	33
CEOD	391	.0512195	.2207145	0	1
GEND	391	.2188715	.1431424	0	.6667
BBS	391	.3554832	.2099978	0	.9832
AUDITC	391	.8473751	.20037	.11	1
Endogenous variables:					
IC	391	6.291093	17.42386	-3.962984	156.3709
COD	391	.0336665	.015868	0	.0825
COE	391	.1166227	.3482652	.0149	0.0713
WACC	391	.0808046	.0256803	.0122	.1904
ROA	391	.0733302	.0691721	-.5232	.4863
ROE	391	.1281022	.1178406	-.8842	.6941
Tobin-q	391	1.66867	1.56905	0.59138	19.39671
Control variables:					
FAGE	391	3.581845	.6755347	2.833213	5.308268
FLEV	391	.418	.2431318	.0002	1.5337
FSIZE	391	6.279941	.7849296	3.917611	8.991129

5.5. Correlation test

Table 5.3 shows the results of the correlation matrix between the variables. In regression, two highly correlated variables will result in redundant information. To avoid this problem, a correlation test was conducted, which revealed no high correlation among variables. There are five categories of correlation coefficients as per Evans (1996): 0.00 - 0.19 considered as very weak, 0.2 - 0.39 as weak, 0.4 - 0.59 as moderate, 0.6 - 0.79 as strong and 0.8 - 1.0 very strong. No variables used in the study fall in the strong and very strong category which results in no problem of multi-collinearity.

Table 5. 3. Pearson correlation

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. BSIZE	1.0000																
2. BIND	-0.1222	1.0000															
3. BMEET	0.1603	0.1216	1.0000														
4. CEOD	0.0819	-0.0399	-0.0162	1.0000													
5. GEND	0.0161	0.2269	0.1715	-0.0946	1.0000												
6. BBS	0.0884	0.0195	0.0123	-0.0350	-0.0776	1.0000											
7. AUDITC	-0.0464	0.5860	-0.0231	-0.0025	0.0454	0.1643	1.0000										
8. IC	-0.1224	0.0131	-0.0312	0.0946	-0.1878	0.0146	0.1308	1.0000									
9. COD	-0.0500	-0.1963	0.1157	0.0693	-0.3028	0.0517	-0.1945	0.1781	1.0000								
10. COE	-0.0125	0.0294	-0.0124	-0.0013	-0.0798	-0.0113	-0.0392	-0.0269	0.0521	1.0000							
11. WACC	-0.0245	-0.0923	-0.0689	0.1734	-0.1069	-0.0687	-0.0002	-0.0780	0.1896	0.0295	1.0000						
12. ROA	-0.1495	-0.0230	0.0305	-0.0662	0.0020	-0.0955	-0.1174	0.0304	-0.0933	-0.1322	0.1651	1.0000					
13. ROE	-0.0248	-0.0232	0.0243	-0.0670	0.0980	-0.0654	-0.1116	-0.0480	-0.1902	-0.1753	0.0837	0.9003	1.0000				
14. Tobin-q	-0.1165	0.0203	-0.0916	0.0048	-0.0263	-0.1337	0.0250	-0.0386	-0.3362	-0.0148	0.3417	0.5735	0.4485	1.0000			
15. FAGE	0.0619	-0.0529	-0.0151	0.0876	0.0398	-0.0311	0.0001	0.0185	-0.0421	-0.0274	0.1007	0.0217	0.0260	0.0496	1.0000		
16. FLEV	-0.0569	-0.0972	0.0080	-0.0022	-0.0211	-0.0514	-0.1361	-0.0595	0.2044	0.0867	0.0759	0.1005	0.0765	0.0308	0.0134	1.0000	
17. FSIZE	0.4537	0.2277	0.1346	-0.0326	0.2470	0.2398	0.1373	-0.0658	-0.1770	0.0008	-0.3379	-0.3221	-0.1189	-0.3260	-0.0080	-0.2428	1.0000

Note: Numbers 1 to 17 on the top represent the variables as mentioned in the first left-side column of the table

5.6. Board structure and firm performance with the mediating effect of intellectual capital

To assess the model to be used in this study (panel data), literature has provided two main popular and useful models i.e., fixed, and random effect models. Hausman test and Breusch and Pagan LM test are conducted to choose the appropriate model.

Hausman test provides a clear idea of whether to use a fixed or random-effect model. The null hypothesis is that random effect is an appropriate and alternative hypothesis that the fixed effect model is appropriate. If the p-value is less than 0.05 we reject the null hypothesis and use the fixed effect model.

Similarly, Breusch and Pagan LM test provides an additional test of whether to use a random effect model or pooled regression model. The null hypothesis is that pooled regression is an appropriate and alternative hypothesis that the random effect model is appropriate.

To choose the appropriate model in this section, we run the Hausman test as shown in Appendix 2 and we rejected our null hypothesis. Thus, the below fixed effect model is used to examine board structure and firm performance with the mediating effect of intellectual capital to achieve research objective (1) and answer the main research question:

$$\text{Firm performance}_{it} = \alpha_{it} + \beta_1 (BSIZE)_{it} + \beta_2 (BIND)_{it} + \beta_3 (CEOD)_{it} + \beta_4 (AUDITC)_{it} + \beta_5 (GEND)_{it} + \beta_6 (BBS)_{it} + \beta_7 (BMEET)_{it} + \beta_8 (BSIZE*IC)_{it} + \beta_9 (BIND*IC)_{it} + \beta_{10} (CEOD*IC)_{it} + \beta_{11} (AUDITC*IC)_{it} + \beta_{12} (GEND*IC)_{it} + \beta_{13} (BBS*IC)_{it} + \beta_{14} (BMEET*IC)_{it} + \beta_{15} (FSIZE)_{it} + \beta_{16} (FLEV)_{it} + \beta_{17} (FAGE)_{it} + \beta_{18} (CLUSTER)_{it} + \beta_{19} (INDSUTRY)_{it} + \varepsilon_{it}$$

Where firm performance = ROA, ROE, TOBINQ, i is the company, t is the time and Ɛ is the error term.

. ROA model had adjusted R^2 of 29.78% i.e., 29.78% of the variation in the performance is justified and explained by the independent variables in the model. 70.22% of the variation is not explained by the model. Similarly, ROE and TOBINQ models had adjusted R^2 of 20.3% and 43.31% respectively. This test is carried out to check if intellectual capital enhances the relationship between board structure and firm performance.

With the mediating effect of intellectual capital, only board independence showed a stronger association with ROA at 5% as shown in Table 5.4. Thus, we accept the H2a hypothesis which indicates that intellectual capital mediates the relationship between board independence and firm performance. Also, audit committee composition and board meetings that were significant before the mediating effect became insignificant with the addition of the mediating effect of intellectual capital. We can say that even though firms have intellectual capital efficiency it is important to manage and utilize the resources efficiently to positively impact performance. Resource-dependency theory supports the argument, where it explains that acquisition, management, and reliance of firms on the acquired resource is the role of the board. Besides, the resource-based view theory adds that firms should use existing resources within the firm to take advantage of external opportunities. Thus, the way of how the board of directors uses or motivates management to utilize intellectual capital efficiency matters more than just having intellectual capital efficiency. The result found contradicts the study of Nkundabanyanga (2014) and Hamdan et al., (2017). The contradicting result might be because of the way in examining the intellectual capital variable. Prior studies

(Nkundabanyanga, 2014; Hamdan et al., 2017) have examined the effect of intellectual capital components as mediating variables and found only a few variables to be significant while this study examined intellectual capital without breaking it into components. Therefore, we reject H1a, H3a, H4a, H5a, H6a and H7a hypothesis where it is found that intellectual capital does not mediate the relationship between board structure (board size, CEO duality, audit committee composition, gender diversity, board background and skill diversity and board meeting) and firm performance.

Table 5. 4. Fixed effect regression analysis: board structure and firm performance with mediating effect of intellectual capital

	ROA	**ROE**	**TOBINQ**
BSIZE	-0.12 (0.901)	1.18 (0.237)	0.9 (0.368)
BIND	1.74 (0.082)***	1.22 (0.222)	2.27 (0.024)**
CEOD	-1.28 (0.201)	-1.08 (0.283)	-1.06 (0.292)
AUDITC	2.03 (0.044)**	2.08 (0.039)**	-0.43 (0.67)
GEND	-0.2 (0.842)	1.11 (0.268)	-0.06 (0.951)
BBS	0.77 (0.442)	0.68 (0.498)	-0.88 (0.382)
BMEET	0.76 (0.449)	0.74 (0.461)	-1.94 (0.054)***
BSIZE_IC	1.24 (0.215)	0.15 (0.878)	-0.29 (0.77)
BIND_IC	0.05 (0.048)**	1.26 (0.208)	1.03 (0.306)
CEOD_IC	0.75 (0.454)	0.32 (0.749)	-0.08 (0.934)
AUDITC_IC	0.48 (0.631)	1.12 (0.265)	0.41 (0.685)
GEND_IC	1.07 (0.284)	0.21 (0.836)	0.78 (0.437)

Table 5.4. Fixed effect regression analysis: board structure and firm performance with mediating effect of intellectual capital (Continued)

	ROA	**ROE**	**TOBINQ**
BBS_IC	-1.04 (0.298)	-0.56 (0.577)	-0.74 (0.462)
BMEET_IC	-0.49 (0.625)	-0.61 (0.54)	0.79 (0.431)
FSIZE	-6.05 (0)*	-3.24 (0.001)*	-6.13 (0)*
FLEV	0.34 (0.734)	0.45 (0.652)	-1.2 (0.232)
FAGE	1.24 (0.216)	1 (0.319)	1.35 (0.179)
CLUSTER	-0.24 (0.81)	-0.09 (0.931)	-2.28 (0.023)**
INDUSTRY	0.97 (0.331)	2.74 (0.006)*	-2.78 (0.006)*
_cons	6.17 (0)*	2.88 (0.004)*	7.41 (0)*
R^2	0.3128	0.215	0.4724
Adjusted R^2	0.2978	0.203	0.4331

t-value (P value in bracket). * , ** and *** Significant at 1%, 5% and 10% respectively

5.7. Board structure and firm performance with mediating effect of cost of capital

To choose the right model, we run the Hausman test as shown in Appendix 3 and we accepted our null hypothesis (random model is appropriate). The below random effect model is used to examine board structure and firm performance with mediating effect of cost of capital to achieve research objective (2) and answer the main research question:

Firm performance $_{it} = \alpha_{it} + \beta_1 (BSIZE)_{it} + \beta_2 (BIND)_{it} + \beta_3 (CEOD)_{it} + \beta_4 (AUDITC)_{it} + \beta_5 (GEND)_{it} + \beta_6 (BBS)_{it} + \beta_7 (BMEET)_{it} + \beta_8 (BSIZE*WACC)_{it} + \beta_9 (BIND*WACC)_{it} + \beta_{10} (CEOD*WACC)_{it} + \beta_{11} (AUDITC*WACC)_{it} + \beta_{12}$

$(GEND*WACC)_{it} + \beta_{13} (BBS*WACC)_{it} + \beta_{14} (BMEET*WACC)_{it} + \beta_{15} (FSIZE)_{it} + \beta_{16} (FLEV)_{it} + \beta_{17} (FAGE)_{it} + \beta_{18} (CLUSTER)_{it} + \beta_{19} (INDSUTRY)_{it} + \varepsilon_{it}$

Firm performance $_{it} = \alpha_{it} + \beta_1 (BSIZE)_{it} + \beta_2 (BIND)_{it} + \beta_3 (CEOD)_{it} + \beta_4 (AUDITC)_{it} + \beta_5 (GEND)_{it} + \beta_6 (BBS)_{it} + \beta_7 (BMEET)_{it} + \beta_8 (BSIZE*COE)_{it} + \beta_9 (BIND*COE)_{it} + \beta_{10} (CEOD*COE)_{it} + \beta_{11} (AUDITC*COE)_{it} + \beta_{12} (GEND*COE)_{it} + \beta_{13} (BBS*COE)_{it} + \beta_{14} (BMEET*COE)_{it} + \beta_{15} (FSIZE)_{it} + \beta_{16} (FLEV)_{it} + \beta_{17} (FAGE)_{it} + \beta_{18} (CLUSTER)_{it} + \beta_{19} (INDSUTRY)_{it} + \varepsilon_{it}$

Firm performance $_{it} = \alpha_{it} + \beta_1 (BSIZE)_{it} + \beta_2 (BIND)_{it} + \beta_3 (CEOD)_{it} + \beta_4 (AUDITC)_{it} + \beta_5 (GEND)_{it} + \beta_6 (BBS)_{it} + \beta_7 (BMEET)_{it} + \beta_8 (BSIZE*COD)_{it} + \beta_9 (BIND*COD)_{it} + \beta_{10} (CEOD*COD)_{it} + \beta_{11} (AUDITC*COD)_{it} + \beta_{12} (GEND*COD)_{it} + \beta_{13} (BBS*COD)_{it} + \beta_{14} (BMEET*COD)_{it} + \beta_{15} (FSIZE)_{it} + \beta_{16} (FLEV)_{it} + \beta_{17} (FAGE)_{it} + \beta_{18} (CLUSTER)_{it} + \beta_{19} (INDSUTRY)_{it} + \varepsilon_{it}$

Where firm performance = ROA, ROE, TOBINQ, i is the company, t is the time and ε is the error term.

Focusing on WACC, 39.35% of the variation in ROE is justified and explained by the independent variable. TOBINQ had adjusted R^2 of 29.14% and ROA 21.38%. The size of the board showed a positive association at 1% with firm performance. However, with the mediating effect of WACC, performance decreased with a larger size of the board (Butt & Hasan, 2009; Bozec & Bozec, 2011; Hajjha et al., 2013). This shows that, board size can improve firm performance if firms enjoy lower external financing costs. Similarly, board independence and audit committee composition showed a negative association with performance and positive relation after the mediating effect of WACC. The result supports the finding of Pham, Suschard, Zein

(2011), where monitoring mechanism of independent directors/members increases with external financing cost which positively affects performance and may help to lower capital cost. On the other hand, board background and skill diversity lower firm performance with the mediating effect of WACC i.e., the directors in New Zealand may not have the required knowledge to deal with external financing cost which negatively affects performance. The board lacks a fast and in-depth assessment of decision making which increases the information asymmetry between the board and other stakeholders. Board background and skill diversity also showed a negative association with performance in the below discussed results. Prior literature studied in New Zealand supports our argument where a negative association was found between educational level and performance Bathula (2008). Also, the mediating effect of WACC showed a positive relation of board meeting with TOBINQ at 10%. This shows that with external financing cost, board meeting increases to discuss issues related to the best usage of capital. This may help to develop strategic actions or to optimize a firm's capital structure which positively impacts firm value increasing TOBINQ. Finally, among control variables larger firms showed lower firm performance. We can say that firms with high total assets are unable to use economies of scale or has incapable management to use these assets to positively influence firm performance. In other words, large firms have come under the control of managers that pursue self-interest rather than profit-maximizing objective for the firm that negatively affects performance. The result agrees with the study of Amato & Burson (2007) and contradicts Dogan (2013).

Focusing on COE, 25.12% of the variation in TOBINQ is justified and explained by independent variables. ROA had adjusted R^2 of 19.88 % and ROE 11.14

%. Board size, board independence, and audit committee composition showed similar results as the mediating effect of WACC. However, CEO duality showed a negative association with ROE with the mediating effect of COE. This confirms that whenever CEO duality exists, the board does not work effectively where corporate governance is regarded as weak, and the cost of equity increases which negatively affects performance (Bliss, 2011). Also, gender diversity improves performance with the mediating effect of COE i.e., finance suppliers reduce the cost of capital with the presence of female directors due to their effective monitoring and advising capability which positively impacts performance. Usman, Farooq, Zhang, Makki & Khan (2019) supports the argument made where it was found that information asymmetry and opportunistic behavior reduces with the presence of a female on board. Contradicting with the mediating effect of WACC, board meetings showed a negative association with performance supporting the study of Rodriguez-Fernandez (2014). Higher board meetings lower firm performance with the effect of cost of equity where the negative association may be due to the time lag effect as time is required to exercise the ideas discussed in the meeting (Brick & Chidambaran, 2010). Also, a possible explanation would be that the quality of the meeting matters more than the frequency of the meeting. Finally, among control variables, firm age showed a positive relationship with performance where older firms along with their experience and good corporate governance positively influence performance compared to new firms. Similarly, firm size showed the same relationship as discussed above.

Finally, discussing COD, similar results are found as discussed above. Board size, CEO duality, board background and skill, and board meeting showed a negative association with firm performance with mediating effect of debt cost. Independence of

the board and audit committee composition showed a positive relation. Also, firm size showed a negative association, and firm leverage positive association with firm performance. From the above discussion of the results, we: -

1. Accept the H1b hypothesis under WACC, COE, and COD model where the cost of capital negatively mediated the relationship between board size and firm performance.
2. Reject H2b hypothesis under WACC, COE, and COD model where the cost of capital positively mediated the relationship between board independence and firm performance
3. Accept the H3b hypothesis under the COE and COD model, where the cost of capital negatively mediated the relationship between CEO duality and firm performance and reject H3b hypothesis under the WACC model as no mediation effect found.
4. Reject H4b hypothesis under WACC, COE, and COD model where the cost of capital positively mediated the relationship between audit committee composition and firm performance.
5. Reject H5b hypothesis under the COE model where the cost of capital positively mediated the relationship between gender diversity and firm performance and reject H5b hypothesis under the WACC and COD model as no mediation effect found.
6. Accept the H6b hypothesis under WACC and COD model, where the cost of capital negatively mediated relationship between board background and skill diversity and firm performance and reject H6b hypothesis under the COE model as no mediation effect found.

7. Reject H7b hypothesis under the WACC model where cost of capital positively mediated relationship between board meeting and firm performance and accept H7b hypothesis under COE and COD model where the cost of capital negatively mediated relationship between board meeting and firm performance.

Table 5. 5. Random effect regression analysis: board structure and firm performance with mediating effect of cost of capital

	ROA	**ROE**	**TOBINQ**
BSIZE	3.05 (0.002)*	2.73 (0.007)*	2.58 (0.01)*
BIND	-3.24 (0.001)*	-2.9 (0.004)*	-0.71 (0.48)
CEOD	0.35 (0.726)	0.16 (0.876)	-0.55 (0.581)
AUDITC	-0.8 (0.422)	-1.08 (0.279)	-2.4 (0.017)**
GEND	-0.76 (0.448)	0.85 (0.394)	-0.01 (0.992)
BBS	0.59 (0.555)	1.3 (0.196)	2.29 (0.023)**
BMEET	0.49 (0.623)	0.12 (0.903)	-2.01 (0.045)**
BSIZE_WACC	-3.16 (0.002)*	-2.56 (0.011)**	-2.54 (0.012)**
BIND_WACC	4.23 (0)*	3.42 (0.001)*	1.39 (0.167)
CEOD_WACC	-0.92 (0.361)	-0.55 (0.581)	-0.08 (0.938)
AUDITC_WACC	0.1 (0.924)	0.59 (0.555)	2.38 (0.018)**
GEND_WACC	0.64 (0.525)	-0.56 (0.575)	-0.11 (0.909)
BBS_WACC	-0.43 (0.665)	-1.2 (0.23)	-2.76 (0.006)*
BMEET_WACC	-0.16 (0.871)	-0.05 (0.963)	1.73 (0.084)***
FSIZE	-4.91 (0)*	-2.43 (0.016)**	-4.67 (0)*
FLEV	0.33 (0.744)	0.59 (0.556)	-0.91 (0.364)

Table 5.5. Random effect regression analysis: board structure and firm performance with mediating effect of cost of capital - (Continued)

	ROA	**ROE**	**TOBINQ**
FAGE	1.45 (0.148)	1.09 (0.277)	0.88 (0.38)
CLUSTER	-0.27 (0.785)	-0.21 (0.836)	-1.83 (0.068)***
INDUSTRY	0.19 (0.847)	2.23 (0.027)**	-2.5 (0.013)**
_cons	5.24 (0)*	2.71 (0.007)*	6.3 (0)*
R^2	0.2456	0.401	0.3212
Adjusted R^2	0.2138	0.3935	0.2914

t-value (P value in bracket). * , ** and *** Significant at 1%, 5% and 10% respectively

	ROA	**ROE**	**TOBINQ**
BSIZE	2.18 (0.03)**	1.51 (0.133)	1.71 (0.088)***
BIND	-0.43 (0.664)	0.34 (0.734)	2.9 (0.004)*
CEOD	1.04 (0.301)	1.5 (0.135)	1.07 (0.285)
AUDITC	-1.73 (0.084)***	-1.94 (0.053)***	-3.79 (0)*
GEND	-3.42 (0.001)*	-2.44 (0.015)**	-3.65 (0)*
BBS	-1.42 (0.157)	-1.15 (0.25)	-0.59 (0.555)
BMEET	2.17 (0.031)**	1.85 (0.065)***	0.48 (0.632)
BSIZE_COE	-2 (0.047)**	-0.93 (0.355)	-1.17 (0.244)
BIND_COE	1.79 (0.074)***	0.32 (0.746)	2.05 (0.041)**
CEOD_COE	-1.54 (0.125)	-1.87 (0.062)***	-1.62 (0.105)
AUDITC_COE	0.98 (0.327)	1.4 (0.163)	3.83 (0)*
GEND_COE	3.45 (0.001)*	2.74 (0.006)*	3.61 (0)*

Table 5. 5. Random effect regression analysis: board structure and firm performance with mediating effect of cost of capital – (Continued)

	ROA	**ROE**	**TOBINQ**
BBS_COE	1.55 (0.121)	1.26 (0.207)	0.26 (0.792)
BMEET_COE	-1.99 (0.048)**	-1.83 (0.068)***	-1.01 (0.311)
FSIZE	-6.95 (0)*	-4.01 (0)*	-7.84 (0)*
FLEV	0.5 (0.621)	0.92 (0.359)	-1.05 (0.292)
FAGE	1.86 (0.064)***	1.43 (0.153)	1.65 (0.101)
CLUSTER	-0.36 (0.72)	0.04 (0.971)	-1.56 (0.119)
INDUSTRY	0.95 (0.342)	3.08 (0.002)*	-2.37 (0.018)**
_cons	6.56 (0)*	3.4 (0.001)*	8.45 (0)*
R^2	0.2132	0.1385	0.2752
Adjusted R^2	0.1988	0.1114	0.2512

t-value (P value in bracket). * , ** and *** Significant at 1%, 5% and 10% respectively

	ROA	**ROE**	**TOBINQ**
BSIZE	2.08 (0.039)**	1.34 (0.181)	0.28 (0.778)
BIND	-4.84 (0)*	-3.44 (0.001)*	-3.72 (0)*
CEOD	-3.24 (0.001)*	-2.36 (0.019)**	-1.05 (0.292)
AUDITC	-3.62 (0)*	-2.21 (0.028)**	-1.93 (0.054)***
GEND	-0.35 (0.73)	-0.24 (0.813)	-0.19 (0.847)
BBS	1.4 (0.161)	2.06 (0.04)**	-1.55 (0.123)
BMEET	2.46 (0.014)**	1.01 (0.313)	1.67 (0.095)***
BSIZE_COD	-2.38 (0.018)**	-1.77 (0.078)***	-0.2 (0.84)

Table 5.5. Random effect regression analysis: board structure and firm performance with mediating effect of cost of capital – (Continued)

	ROA	**ROE**	**TOBINQ**
BIND_COD	4.76 (0)*	3.73 (0)*	3.18 (0.002)*
CEOD_COD	-3.14 (0.002)*	-2.35 (0.019)**	0.86 (0.392)
AUDITC_COD	2.76 (0.006)*	1.4 (0.163)	1.27 (0.204)
GEND_COD	0.31 (0.757)	0.65 (0.519)	-0.02 (0.983)
BBS_COD	-1.14 (0.255)	-1.96 (0.051)***	1.36 (0.176)
BMEET_COD	-2.02 (0.044)**	-0.67 (0.501)	-2.2 (0.028)**
FSIZE	-6.46 (0)*	-3.51 (0.001)*	-6.9 (0)*
FLEV	1.22 (0.223)	1.66 (0.097)***	0.75 (0.453)
FAGE	1.27 (0.205)	0.83 (0.407)	1.33 (0.184)
CLUSTER	-0.61 (0.543)	-0.51 (0.611)	-2.67 (0.008)*
INDUSTRY	-0.17 (0.864)	1.73 (0.085)***	-3.16 (0.002)*
_cons	7.02 (0)*	4.2 (0)*	8.37 (0)*
R^2	0.2451	0.2011	0.3519
Adjusted R^2	0.2239	0.1649	0.330

t-value (P value in bracket). * , ** and *** Significant at 1%, 5% and 10% respectively

5.8. A direct and indirect effect of board structure and firm performance

After testing the mediating effect of intellectual capital and cost of capital separately, now we compare the direct effect of board structure on firm performance with the indirect effect of board structure on firm performance through intellectual capital and cost of capital to achieve research objective (3) and answer the main

research question. We used the postestimation tool in Stata, decomposition of effects into total, direct, and indirect. (Table 5.6).

Table 5. 6. Direct, indirect, and total effect of board structure and firm performance

	BSIZE	BIND	CEOD	AUDITC	GEND	BBS	BMEET
ROA							
Direct	0.01	0.003	-0.055	0.018	0.01	0.01	0.023
effect	(0.231)	(0.091)***	(0.083)***	(0.041)**	(0.333)	(0.294)	(0.294)
Indirect	0.03	0.035	-0.014	0.063	-0.056	0.011	0.039
effect	(0.051)***	(0.041)**	(0.210)	(0.018)**	(0.157)	(0.199)	(0.082)**
Total	0.04	0.038	-0.069	0.081	-0.046	0.021	0.062
effect	(0.0321)**	(0.063)***	(0.311)	(0.211)**	(0.118)	(0.316)	(0.0831)***
ROE							
Direct	0.061	0.049	-0.058	0.024	0.062	0.022	0.08
effect	(0.218)	(0.093)***	(0.222)	(0.0421)**	(0.132)	(0.0642)***	(0.739)
Indirect	0.065	0.076	-0.031	0.136	-0.121	0.024	0.083
effect	(0.504)	(0.058)***	(0.119)	(0.045)**	(0.185)	(0.123)	(0.065)***
Total	0.126	0.125	-0.089	0.16	-0.059	0.046	0.163
effect	(0.121)	(0.093)***	(0.321)	(0.0421)**	(0.213)	(0.351)	(0.015)**
TOBINQ							
Direct	0.01	0.002	-0.037	0.041	0.002	-0.008	0.004
effect	(0.084)***	(0.345)	(0.063)***	(0.541)	(0.082)***	(0.531)	(0.015)***
Indirect	0.022	0.026	-0.011	0.046	-0.041	0.008	0.028
effect	(0.032)**	(0.461)	(0.104)	(0.21)	(0.083)***	(0.225)	(0.123)
Total	0.032	0.028	-0.048	0.087	-0.039	0	0.032
effect	(0.082)**	(0.721)	(0.103)	(0.215)	(0.0736)***	(0.212)	(0.066)***

coefficient (P value in bracket). * , ** and *** Significant at 1%, 5% and 10% respectively

Focusing on ROA, the total effect between the size of the board and ROA is significant at 5% with β=0.04. When we control the indirect effect, the association between the size of the board and performance becomes insignificant with β=0.01. The difference we see between the value of β is the indirect effect where β=0.03. This indicates that the association between board structure and performance is enhanced by intellectual capital and capital cost. Similarly, other board structure variables show the

same mechanism as discussed above. Only gender diversity revealed a direct positive effect on ROA, but when mediated through intellectual capital and capital cost, gender diversity negatively impacts firm performance. This can be argued that gender diversity cannot take complex decisions in terms of capital structure or influence the cost of capital of the firm. This can be described in the sense that, gender diversity positively impacts intellectual capital (Table 5.9) but when mediated through the cost of capital they negatively impact firm performance. This is also supported by our additional test result (Table 5.10) where gender diversity negatively impacted the cost of capital.

Focusing on ROE and TOBINQ, we find a similar result as ROA where the relationship between board structure and firm performance is improved by intellectual capital and capital cost except for gender diversity. Also, we see the significance level for some variables becomes stronger with the indirect effect compared to the direct effect.

The result of this study confirms that the total effect on performance is improved by the structure of the board, intellectual capital, and capital cost which is in line with the agency, resource-based view, and resource dependency theories. It is also in line with the argument of Keenam & Aggestam (2001) that managerial decision-making enhances the value of shareholders by capital while corporate governance uses intellectual capital to create value. If the board does not focus on intellectual capital it would be a failure of board governance that can affect performance. This study also challenges the criticisms made that board structure does not perform well when the firm performance is poor. This is because intellectual capital and cost of capital contribute towards the impact of firm performance and not only the board. Finally, findings of prior studies where no relationship was found between board structure and firm

performance (Haslindar & Fazilah, 2011) might be because of ignoring the fact to examine intellectual capital and capital cost variables.

To conclude from the test performed in section 5.6, 5.7 and 5.8, it is noticed that board structure and firm performance was not mediated much by intellectual capital (Table 5.4) compared to the mediation effect by the cost of capital. But when the indirect effect of board structure on firm performance is examined through intellectual capital and cost of capital, the relationship between board structure and firm performance is enhanced in a better way compared to the separate mediation effect test and the direct effect test. Thus, we conclude and answer the main research question in the study by saying that yes, the relationship between board structure and firm performance is mediated by intellectual capital and cost of capital i.e., a good board structure will be able to increase intellectual capital efficiency, thereby reducing the cost of capital implying increased firm performance.

5.9. Path analysis model estimation

After using the postestimation tool to estimate direct, indirect, and total effect, now the entire path analysis model (Figure 5.1) is estimated. Based on the Maximum Likelihood estimation of the path analysis model, regression output was formulated as shown in Table 5.7 which help to achieve secondary objective number 1, 2, 5, and 6 of this study.

Hypothesis H1c and H1d are accepted, where board size is significantly positively related to intellectual capital and firm performance. Large board size signals increased access to resources (such as new raw material, new market, and technology), knowledge, and expertise of the board of directors which positively impacts intellectual

capital. The large board has a higher opportunity to have directors with industry experience and a high educational level which helps to provide high-quality advice to management. The service role of the director is to improve company reputation, serve as advisors to executives, and establish contact with externals (Pfeffer & Salancick, 1978). Therefore, from a resource-based view theory perspective, the large board are in a better position to utilize their knowledge and expertise. This helps to create effective relation with externals and secure resources for the organizational operation which improves firms' intellectual capital. Also, from an agency theory perspective, they act as effective monitoring for management. This helps to reduce agency cost and improve performance. The result is in line with (Zahra, 1989; Jackling & Johl, 2009).

We accept our hypothesis H2c and H2d, where board independence is significantly positively associated with intellectual capital and firm performance. However, the result contradicts the study of Agrawal & Knoeber (1996); Barhart & Rosenstein (1998), and Kiel & Nicholson (2003). Independent directors prefer to show to the board that they are performing well so they are more conducive towards the goal, mission, and strategy of the organization. Also, they come with a different background from different organizations bringing more knowledge and skill compared to inside directors who are vested only within their working place. Independent directors provide up-to-date operational information to the board, provide a better decision-making basis. This help to protect firms from the external environment by reducing uncertainty, suggest resources that can increase firms' recognition and status, exchange information, and represent the firm to stakeholders. Thus, they enhance firms' intellectual capital and performance.

We partially accept hypothesis H3c and H3d, where CEO duality is negatively

associated with intellectual capital and firm performance but is not significant. CEO duality control board meetings and put self-interest ahead (Boivie et al., 2011). This opportunistic behavior of the CEO suggests that CEO duality uses organizational resources for their welfare to increase status and prestige without making effective intellectual capital decisions. Thus, from an agency theory perspective, CEO duality avoids efficient and effective intellectual capital decisions and reduces the value of shareholders.

We accept hypothesis H4c and H4d, where audit committee composition is significantly positively associated with intellectual capital and firm performance. Result found is in line with the study of Collier (2001); Chan & Li (2008) and Saibaba & Ansari (2013). An independent audit committee helps the board in decision-making (Fama & Jensen, 1983). Due to the high proportion of independent directors in the audit committee, the monitoring function increases, the internal control process gets enhanced, and the information asymmetry gets reduced (Keenan & Aggestam, 2001; Jing et al., 2008). Thus, the establishment of an audit committee ensures the opportunistic behavior is controlled and the organizational resources are used efficiently for an effective investment in intellectual capital to increase shareholders' value. From the resource dependency theory perspective, the audit committee is regarded as a bundle of resources and knowledge because the majority of independent members in the audit committee are with diverse skills and knowledge. An audit committee works closely with the board and communicates issues relating to internal controls, financial reporting, provide an overview of ethics and compliance, risk management. This helps the board of directors to gain information and ideas from independent members in the audit committee.

We reject hypothesis H5c, where gender diversity is negatively associated with firm performance (TOBINQ). On the other hand, we accept hypothesis H5d, where gender diversity is significantly positively associated with intellectual capital. From the resource-dependency theory perspective, gender diversity relies upon the perspectives, experience, problem-solving approaches, and social network relation that they bring to the board. Thus, females on the board efficiently invest in intellectual capital. The result is consistent with the findings of Provan, (1980); Kesner, (1988) and Mitchell Williams (2000).

We partially accept our hypothesis H6c and H6d, where board background and skill diversity are positively related to intellectual capital and firm performance but are not significant. Board members with background and skill diversity provide a mixture of capabilities and competencies for the firm which provides a different perspective in decision-making. Qualified board member provides knowledge base environment that enhances a thoughtful process to solve problems and provide innovative ideas to develop policies. Also, boards with a higher educational qualification are more likely to be flexible, have a better ability to accept innovation and adopt new ideas and have greater capabilities to process information. These characteristics of board members help them to create policies and strategies on how to best utilize, obtain, and enhance intellectual capital efficiency.

We accept our hypothesis H7c and H7d, where board meeting is significantly positively related to intellectual capital and firm performance (Ntim & Osei, 2011; Francis, 2012). Due to increased board meetings, intellectual capital performance increases since innovation increases the stake of intangible and facilitates intellectual capital development (Marques et al., 2006). The resource dependency theory

perspective argued that board meetings help to convey up-to-date information among the directors which positively contributes to acquire relevant resources to improve intellectual capital. Also, the knowledge shared in the board meeting helps to generate innovative ideas, policy, and strategy that enhances intellectual capital.

With regards to WACC, we partially accept hypothesis H9 where there is an insignificant negative association between intellectual capital and WACC. With regards to COE, we accept hypothesis H9 where a significant negative association is found between intellectual capital and COE. Finally, in terms of COD, we reject hypothesis H9 where a significant positive relation is found between intellectual capital and COD. The results indicate that shareholders in New Zealand value the firm more than creditors when assessing the cost of capital. Creditors focus on intellectual capital disclosure as opposed to intellectual capital efficiency as disused in prior literature (Easley & O'Hara, 2004; Orens et al., 2010). Besides, the cost of debt depends more on the economic condition of the country compared to intellectual capital efficiency. Even though intellectual capital efficiency is high, the economic situation in the country may not be stable due to which interest rate increases and thereby the cost of debt. Therefore, high intellectual capital efficiency increases firms' value and decreases the required return by shareholders and increases the required return by creditors.

Finally, we accept hypothesis H10 where a negative association is found between the cost of capital and firm performance. A low cost of capital implies more capital is retained within the business which can be utilized for growth. Thus, the low cost of capital implies higher firm performance. This result contradicts the findings of Reverte, (2011); Pouraghajan, et al. (2012), Wu et al. (2012).

Table 5. 7. Path analysis model estimation

ROA		**ROE**		**TOBINQ**		**IC**		**WACC**	
WACC	-0.4112 (0.000)*		-0.1749 (0.011)**		-0.5629 (0.000)*		0.0864 (0.084)***		-0.0680 (0.176)
COE	-0.3458 (0.000)*	WACC	-0.0810 (0.243)	WACC	-0.2910 (0.000)*	BSIZE	0.1007 (0.076)***	IC	3.304666 (0.000)
COD	-0.0691 (0.115)	COE	-0.1752 (0.000)*	COE	-0.3360 (0.000)*	BIND	-0.0417 (0.336)	_cons	
BSIZE	0.03 (0.051)***	COD	0.065 (0.504)	COD	0.022 (0.032)**	CEOD	0.1794 (0.004)*	**COE**	
BIND	0.035 (0.041)**	BSIZE	0.076 (0.058)***	BSIZE	0.026 (0.461)	AUDITC	0.1591 (0.002)*	IC	-0.0955 (0.056)***
CEOD	-0.014 (0.210)	BIND	-0.031 (0.119)	BIND	-0.011 (0.104)	GEND	0.0305 (0.544)	_cons	3.842868 (0.000)
AUDITC	0.063 (0.018)**	CEOD	0.136 (0.045)**	CEOD	0.046 (0.21)	BBS	0.1114 (0.028)**	**COD**	
GEND	-0.056 (0.157)	AUDITC	-0.121 (0.185)	AUDITC	-0.041 (0.083)***	BMEET	0.2506 (0.462)	IC	0.1731 (0.000)*
BBS	0.011 (0.199)	GEND	0.024 (0.123)	GEND	0.008 (0.225)	_cons		_cons	2.120363 (0.000)
BMEET	0.039 (0.082)**	BBS	0.083 (0.065)***	BBS	0.028 (0.123)				
_cons	1.1782 (0.000)	BMEET	1.2593 (0.000)	BMEET	1.2941 (0.000)				
		_cons		_cons					

Coefficient (P value in bracket). *, ** and *** Significant at 1%, 5% and 10% respectively.

5.10. Additional tests

To achieve secondary objectives of the study, six tests have been performed to check if a similar result is found in the prior literature. Secondary research objectives 1,2,5, and 6 have been achieved in section 5.9 by using the path analysis estimation. However, in this section, we run the fixed/random regression model to re-confirm the results of secondary research objectives 1,2,5, and 6. Also, the secondary research objective 3 and 4 are achieved in this section.

5.10.1. Board structure and firm performance

To choose the appropriate model, we run the Hausman test as shown in Appendix 4 and we rejected our null hypothesis. Thus, the below fixed effect model is used to examine board structure and firm performance to achieve secondary research objective number 1:

$$\text{Firm performance}_{it} = \alpha_{it} + \beta_1 (BSIZE)_{it} + \beta_2 (BIND)_{it} + \beta_3 (CEOD)_{it} + \beta_4 (AUDITC)_{it} + \beta_5 (GEND)_{it} + \beta_6 (BBS)_{it} + \beta_7 (BMEET)_{it} + \beta_8 (FSIZE)_{it} + \beta_9 (FLEV)_{it} + \beta_{10} (FAGE)_{it} + \beta_{11} (CLUSTER)_{it} + \beta_{12} (INDSUTRY)_{it} + \varepsilon_{it}$$

Where, firm performance = ROA, ROE, TOBINQ, i is the company, t is the time and ε is the error term.

ROA, ROE, and TOBINQ fixed model regression results revealed mixed results compared to prior literature as shown in Table 5.8. ROA model had adjusted R^2 of 20.7% i.e., 20.7% of the variation in performance is justified and explained by the independent variables in the model. 79.3% of the variation is not explained by the model. Similarly, ROE and TOBINQ models had adjusted R^2 of 18.6% and 19.8% respectively. Considering the ROA model only board independence, audit committee

composition and firm size were significant at 10%, 5%, and 1% respectively. Under the ROE model, audit committee composition and firm size were significant at 10% and 1% respectively. Similarly, at 10% significance level, board independence, and board meeting and at 1% significance level firm size were significantly related under the TOBINQ model.

Board size under all the three models was positive but insignificant resulting in partial acceptance of hypothesis H1c. The result is consistent with the study of De Andres et al., (2005) in New Zealand, Connelly & Limpaphyom, (2004) in Thailand and Pi & Timme, (1993); Belkhir, (2006) who found the size of the board does not impact firm performance. The result is supported by Bhuiyan & Roudaki (2013) who argue that with the presence of board interlocking, firms in New Zealand suffer to find a suitable independent expert director. Also, board size in New Zealand has decreased from 7.5 to 6.95 from 1985 to 2019. Despite the decreasing board size (less knowledge and expertise), NZX 50 firms are contributing positively to firm performance but are insignificant.

We accept H2c, where board independence at 1% significance level showed a positive relation with ROA and TOBINQ. This indicates that with a high number of independent directors the board has more knowledge about the market, new ideas which positively impacts firm performance. A high proportion of independent directors can help firms to set decisions, balance interest, bring new knowledge to the board, and build connections. This helps the firm to use its resources effectively in generating profit increasing ROA. Similarly, when the market sees more independent directors on board the firm value increases, positively impacting TOBINQ. The result is consistent with the study of Reddy et al. (2010), Hossain et al. (2001) where independent directors

in New Zealand positively impacted TOBINQ. Also, the result is consistent with Dey, A. (2008) who found a positive relation between ROA and board independence for 371 US firms from 2000 to 2001. On the other hand, the result contradicts the study of 348 Australian firms by Kiel & Nicholson (2003) who found a negative relation. Result also contradicts the study of Barhart & Rosenstein (1998), Agrawal & Knoeber (1996), and Kiel & Nicholson (2003).

Consistent with the study of Kesner (1988), Vafeas & Theodorou (1998), Chen et al. (2008) & Iyengar & Zampelli (2009), we partially accept hypothesis H3c, where CEO duality is negatively related with firm performance but is not significant. This can be argued that because of the low representation of CEO duality in New Zealand, the result showed no relationship with performance. Also, t-value coefficients show negative sign between CEO duality and firm performance but insignificant (no relation) i.e., whenever CEO duality exists it leads to agency problem and shareholders view it as lack of good corporate governance due to which firm performance gets negatively impacted though it is not significant in this study.

Like board independence, we accept hypothesis H4c where, audit committee composition is positively related to ROA and ROE at 5% and 10% significance level. The independent subcommittee improves the internal control process of the organization (Jing et al., 2008). The existence of high proportion of independent members in the audit committee provides effective internal controls implementation. This helps to control resources, provide extensive knowledge, enhance corporate governance, and help firms to use resources efficiently to generate profit. Thus, audit committee positively impact ROA and ROE. The result is in line with the study of 200 fortune companies by Chan & Li (2008), Saibaba & Ansari (2013) and (Collier, 2001)

who found 63% of 142 UK-based large companies have independent directors in audit committee that helps to minimize information asymmetry positively impacting firm performance.

Contradicting with the study of Zahoor (2016) this study found no significant relationship between gender diversity and firm performance. We partially accept hypothesis H5c, where gender diversity is positively related but not significant. The result is in line with the study of Duppati et al. (2017) in New Zealand, where no significant effect of gender diversity was found. We can say that because of the small number of females on board in New Zealand, there is no relation between firm performance and gender diversity. Besides, examining the ownership effect on firm performance in the New Zealand context, Fauzi & Locke (2012) also concluded that gender diversity had a low impact on performance.

Consistent with the study of Murray (1989) we reject hypothesis H6c where board background and skill diversity and firm performance are negatively related under the TOBINQ model. However, the result contradicts Girbina et al. (2012) and Darmadi (2013) who found a positive relation. The discrepancies between the result found and prior literature would be because of cultural diversity factors. Different thoughts are shared by board members and each director approaches problem-solving in his/her way which brings unique cultural knowledge. This can create a problem in terms of communication leading to personal problems that affects board commitment, effectiveness, and trust. Thus, the cultural diversity represented by the background and skill diversity of the board can create a lack of trust between directors with different backgrounds but not with the same background. Thus, the study showed no relationship between background and skill diversity and performance.

We reject hypothesis H7c where board meetings showed a negative relationship (Bathula, 2008; Brick & Chidambaran, 2010; Ilaboya & Obaretin, 2015) with TOBINQ at 10% significance level and no relationship with ROA and ROE. Result found can be interpreted in the sense that the number of board meetings does not always lead to higher firm performance, but the timely decision implementation and quality of board meetings are necessary.

Finally, among the control variables only firm size was negatively related to firm performance at 1% significance level. It can be argued that firms with high total assets are unable to use economies of scale or has incapable management to utilize these assets to positively influence firm performance. The result agrees with the study of Amato & Burson (2007) and contradicts the study of Dogan (2013). Also, it is found that firm age is insignificantly positively related, and firm leverage is insignificantly negatively related to firm performance. Older firms tend to have more experience, knowledge, and value which contributes positively to performance but is insignificant. Similarly, when firms have high debt it negatively impacts performance but insignificantly. The result is consistent with the studies of Akinyomi & Olagunju (2013) & Dogan (2013).

Comparing the result found in path analysis estimation (Table 5.7) and result found here (Table 5.8) we find inconsistent results where board size was associated positively with firm performance under path analysis whereas not associated under the fixed effect model. Similarly, the board meeting was positively associated with performance under path analysis whereas negatively associated under the fixed model. Thus, we answer the secondary research question number 1 by saying that there is an association between board structure and firm performance based on the results found in

Table 5.7 and Table 5.8. However, this association varies depending on the way of examining the relationship.

Table 5. 8. Fixed effect regression analysis: board structure and firm performance

	ROA	**ROE**	**TOBINQ**
BSIZE	0.67 (0.504)	1.42 (0.157)	1.29 (0.199)
BIND	1.9 (0.058)***	0.74 (0.461)	1.94 (0.053)***
CEOD	-1.56 (0.119)	-1.01 (0.312)	-1.33 (0.183)
AUDITC	2.38 (0.018)**	1.74 (0.082)***	-0.31 (0.759)
GEND	0.31 (0.753)	1.42 (0.156)	0.62 (0.533)
BBS	0.41 (0.684)	0.29 (0.769)	-1.17 (0.244)
BMEET	1.05 (0.294)	0.33 (0.739)	-1.85 (0.066)***
FSIZE	-6.22 (0)*	-3.22 (0.001)*	-6.35 (0)*
FLEV	-0.01 (0.991)	-0.37 (0.714)	-1.27 (0.203)
FAGE	1.36 (0.176)	1.08 (0.279)	1.38 (0.167)
CLUSTER	-0.32 (0.748)	-0.08 (0.937)	-2.38 (0.018)
INDUSTRY	0.72 (0.474)	2.68 (0.008)	-2.54 (0.011)
_cons	6.24 (0)	3.09 (0.002)	7.34 (0)
R^2	0.223	0.20	0.219
Adjusted R^2	0.207	0.186	0.198

t-value (P value in bracket). * , ** and ***
Significant at 1%, 5% and 10% respectively

5.10.2. Board structure and intellectual capital

To choose the appropriate model, we run the Hausman test as shown in Appendix 5 and we accepted our null hypothesis (random model is appropriate). We further did Breusch and Pegan LM test, and rejected null hypothesis (pooled regression appropriate), confirming that random effect model is appropriate to examine board structure and intellectual capital to achieve secondary research objective number 2:

$$IC_{it} = \alpha_{it} + \beta_1 (BSIZE)_{it} + \beta_2 (BIND)_{it} + \beta_3 (CEOD)_{it} + \beta_4 (AUDITC)_{it} + \beta_5 (GEND)_{it} + \beta_6 (BBS)_{it} + \beta_7 (BMEET)_{it} + \beta_8 (FSIZE)_{it} + \beta_9 (FLEV)_{it} + \beta_{10} (FAGE)_{it} + \beta_{11} (CLUSTER)_{it} + \beta_{12} (INDSUTRY)_{it} + \varepsilon_{it}$$

Where, i is the company, t is the time and Ɛ is the error term.

Table 5.9. showed board size and gender diversity significant at 1%, audit committee composition at 5%, and board meeting at 10%. However, no significant relationship was found between board independence, CEO duality, board background and skill diversity, and intellectual capital resulting in the rejection of hypothesis H2d, H3d, and H6d.

We reject H1d, where board size measured in terms of a board member is negatively associated with intellectual capital efficiency. It can be argued that the number of directors, not necessarily impact the intellectual capital of a firm, but it is the director who is independent matters to positively affect intellectual capital. The directors on the board may not be independent and are unable to bring resources, ideas, and knowledge to the board due to which they negatively affect intellectual capital efficiency. The argument is supported by Bhuiyan & Roudaki (2013) which showed that due to the presence of board interlocking, firms in New Zealand suffer to find a suitable independent expert director. Similarly, we accept hypothesis H4d, where audit

committee composition when measured in terms of the proportion of independent members positively affected intellectual capital efficiency. It is the independent director who is more likely to minimize shareholders' exploitation by management and add value to the firm. They can effectively monitor and manage CEO behavior to improve intellectual capital efficiency (Chan & Li, 2008; Saibaba & Ansari, 2013; Collier, 2001).

We accept hypothesis H5d, where gender diversity also showed a positive association with intellectual capital. Female directors incorporate community issues within the organization's development and growth, thus, broaden the scope of the board's decision-making process. Female directors invest efficiently in intellectual capital that helps to maintain good external community relations compared to male directors improving the overall intellectual capital efficiency. Prior literature has also found a positive association (Kesner, 1988; Provan, 1980; Mitchell Williams, 2000; Terjesen et al., 2015). However, the result contradicts the study of Bilimoria & Piderit (1994) and Duppati et al. (2017).

Finally, we accept hypothesis H7d, where board meetings showed a positive association with intellectual capital efficiency (Ntim & Osei, 2011; Francis, 2012). Board meetings provide advice and counseling which helps to formulate strategy/policy to enhance intellectual capital (Ntim & Osei, 2011). Also, it improves the innovative performance of the firm in the sense that it allows directors to handle uncertainties. Consequently, since innovation increases the stake of intangible and eases intellectual capital development, the intellectual capital performance increases.

Comparing the result found in path analysis estimation (Table 5.7) and result found here (Table 5.9) no much difference is found, except the random regression

model showed a negative association between board size and intellectual capital while path analysis estimation showed a positive association. Thus, we answer the secondary research question number 2 by saying that there is a positive relationship between board structure (except board size) and intellectual capital based on the results found in Table 5.7 and Table 5.9.

Table 5. 9. Random effect regression analysis: board structure and intellectual capital

	IC
BSIZE	-2.79 (0.006)*
BIND	0.41 (0.685)
CEOD	1.13 (0.258)
AUDITC	2.16 (0.032)**
GEND	2.79 (0.006)*
BBS	-0.76 (0.449)
BMEET	0.23 (0.085)***
FSIZE	1.23 (0.221)
FLEV	-0.64 (0.522)
FAGE	0.51 (0.608)
CLUSTER	0.1 (0.918)
INDUSTRY	-4.59 (0)*
_cons	1.26 (0.209)
R^2	0.383
Adjusted R^2	0.368

t-value (P value in bracket). * , ** and *** Significant at 1%, 5% and 10% respectively

5.10.3. Board structure and cost of capital

To choose the appropriate model, we run the Hausman test as shown in Appendix 6 and we rejected our null hypothesis. Thus, the below fixed effect model is used to examine board structure and cost of capital to achieve secondary research objective number 3:

$$\text{Cost of capital}_{it} = \alpha_{it} + \beta_1 (BSIZE)_{it} + \beta_2 (BIND)_{it} + \beta_3 (CEOD)_{it} + \beta_4 (AUDITC)_{it} + \beta_5 (GEND)_{it} + \beta_6 (BBS)_{it} + \beta_7 (BMEET)_{it} + \beta_8 (FSIZE)_{it} + \beta_9 (FLEV)_{it} + \beta_{10} (FAGE)_{it} + \beta_{11} (CLUSTER)_{it} + \beta_{12} (INDSUTRY)_{it} + \varepsilon_{it}$$

Where cost of capital = WACC, COE, COD, i is the company, t is the time and ε is the error term.

Fixed regression analysis (Table 5.10) shows that board size is negatively associated with WACC, COE, and COD but is significant only with COD at 5%; thus, hypothesis H1e is accepted. This can be interpreted from the resource dependency theory perspective that large board provides access to various resources which signals the stakeholder's representation on board. A large board with qualified experience and knowledge increases communication with various stakeholders that helps to increase firm value, lower asymmetry of information, and reduce default risk. Thus, large boards help to reduce the cost of debt (Butt & Hasan, 2009; Bozec & Bozec, 2011; Lorca et al., 2011; Hajjha et al., 2013).

Agreeing with the study of Lorca et al. (2011) and Setiany et al. (2017) hypothesis H2e is rejected where no relationship is found between board independence and the cost of capital. However, board independence is insignificantly positively associated which can be interpreted that the independent directors lack a monitoring

mechanism that do not solve agency risk. Thus, they are unable to create value for creditors' increasing the cost of capital.

Hypothesis H3e is accepted where CEO duality showed a positive association with WACC at 10%. From an agency theory perspective, CEO duality holds greater power which affects board independence. CEO as chairperson can take decisions and control boards and meetings for personal interest (Boivie et al., 2011). Thus, organizational resources get diverted for personal interest where shareholder value does not get enhanced and the default risk increases forcing creditors to increase the rate of return.

The audit committee composition is negatively associated with COD at 1% significance level (Anderson et al., 2004) where hypothesis H4e is accepted. A higher proportion of independent members in the audit committee provide credibility of financial statements to stakeholders. In addition, they increase the monitoring of financial discretion of management. Thus, a high proportion/number of independent members in the audit committee influences the financial process of the firm, reduces the default risk assuring stakeholders about good internal controls.

In line with the study of Lucas-Perez et al., (2015), Gull et al., (2017), and Usman, Farooq, Zhang, Makki & Khan (2019), gender diversity showed negative association with COE and COD but was significant only with COD at 10%. Females on board avoid managers from earnings management, improve board independence, and reduce agency costs. As a result, information asymmetry reduces, and the assumption of loan default decreases which makes creditors ask for a lower rate of return. On the other hand, gender diversity is positively related at 1% with WACC. The discrepancy of the result between WACC and COD might be because of lack of agreement within

the board. Also, the incapability of females to respond to market shock makes the overall cost of capital to increase with female presence on board (Smith et al., 2005; Petrovic, 2008). However, due to reduced assumption of default loan by creditors and increased monitoring by female directors the cost of debt decreases. Thus, hypothesis H5e is accepted under the COD model and rejected under the WACC model.

Similarly, we reject hypothesis H6e where no significant association is found between board background and skill diversity and cost of capital. Finally, hypothesis H7e is accepted where board meetings showed a negative association with WACC and COD at 1% and 5% significance level. From an agency theory perspective, management is monitored by the board which reduces agency cost. The effectiveness of the board increases when they meet regularly and show greater work diligence. As a monitoring mechanism, it is easier to get better governance by more board meetings to discuss issues (Vafeas, 1999). Thus, higher board meeting implies better monitoring mechanism, less information asymmetry with less agency problem and reduced cost of capital.

Among control variables, firm size, and firm age are positively associated with WACC at 1% and 5%. It can be argued that large and old firms always tend to have more capital for growth opportunities. Thus, more and more acquisition of capital increases the firms' risks, thereby the cost of capital increases. Similarly, firm leverage is positively significant with the cost of debt, where firms experiencing high debt will face financial risk which makes creditors demand a higher rate of return, increasing debt cost. Therefore, secondary research question number 3 can be answered by saying that there is a mixed association between board structure and cost of capital based on the results found in table 5.10.

Table 5. 10. Fixed effect regression analysis: board structure and cost of capital

	WACC	**COE**	**COD**
BSIZE	-1.62 (0.106)	-0.26 (0.799)	-2.38 (0.018)**
BIND	1.21 (0.228)	1.44 (0.15)	0 (0.996)
CEOD	1.76 (0.08)***	0.03 (0.979)	0.09 (0.93)
AUDITC	0.43 (0.669)	-1.26 (0.207)	-2.97 (0.003)*
GEND	4.7 (0)*	-1.38 (0.169)	-1.93 (0.054)***
BBS	-0.4 (0.688)	-0.25 (0.804)	0.94 (0.346)
BMEET	-3.69 (0)*	-0.4 (0.692)	-2.05 (0.041)**
FSIZE	7.03 (0)*	0.59 (0.552)	0.06 (0.955)
FLEV	-0.97 (0.332)	1.53 (0.126)	3.57 (0)*
FAGE	2.01 (0.045)**	-0.54 (0.588)	-0.86 (0.389)
CLUSTER	-3.21 (0.001)*	-0.3 (0.764)	-0.31 (0.756)
INDUSTRY	-1.32 (0.189)	1.15 (0.251)	-0.63 (0.53)
_cons	11.56 (0)*	0.31 (0.759)	6.49 (0)*
R^2	0.321	0.26	0.284
Adjusted R^2	0.295	0.254	0.276

t-value (P value in bracket). * , ** and ***
Significant at 1%, 5% and 10% respectively

5.10.4. Intellectual capital and firm performance

To choose the appropriate model, we run the Hausman test as shown in Appendix 7 and we accepted our null hypothesis (random model is appropriate). The below random effect model is used to examine intellectual capital and firm performance to achieve secondary research objective number 4:

$IC_{it} = \alpha_{it} + \beta_1$ firm performance $_{it} + \beta_2 (FSIZE)_{it} + \beta_3 (FLEV)_{it} + \beta_4 (FAGE)_{it} + \beta_5 (CLUSTER)_{it} + \beta_6 (INDSUTRY)_{it} + \varepsilon_{it}$

Where firm performance = ROA, ROE, TOBINQ, i is the company, t is the time and ε is the error term.

In line with the study of Morariu (2014), this study found a negative association of intellectual capital with TOBINQ at 10% significance level (Table 5.11) leading to the rejection of hypothesis H8. This shows that even though firms are effective in monitoring and creating value from intellectual capital components, it is not appreciated by the investors in New Zealand. However, when we look at accounting-based measures, we partially accept hypothesis H8 where intellectual capital is positively related to ROA and ROE same as the study of Phusavat et al. (2011) and Alipour (2012) but is not significant. This indicates that whenever intellectual capital efficiency increases firms acquire and use their resources more efficiently which helps to generate profit and increase ROA and ROE.

Among control variables firm age, firm leverage showed no relationship and firm size showed negative association at 1% under ROA, ROE, and TOBINQ, which is like the study of Hamdan et al., (2017). Assets might not be used at their best by large firms compared to small firms to create an appropriate return. This might be related to the internal environment factor of the organization. Therefore, based on table 5.11 we answer secondary research question number 4 by saying that there is an association between intellectual capital and firm performance where intellectual capital is positively related to accounting-based measure (ROA and ROE) and negatively related to market-based measure (TOBINQ).

Table 5. 11. Random effect regression analysis: intellectual capital and firm performance

	ROA	**ROE**	**TOBINQ**
IC	0.68 (0.494)	0.19 (0.851)	-1.87 (0.063)***
FSIZE	-6.76 (0)*	-2.8 (0.005)*	-7.21 (0)*
FLEV	0.4 (0.686)	0.78 (0.434)	-1.37 (0.171)
FAGE	1.12 (0.262)	1.12 (0.262)	1.3 (0.195)
CLUSTER	-0.26 (0.793)	-0.06 (0.956)	-2.16 (0.032)**
INDUSTRY	1.45 (0.147)	3.06 (0.002)*	-2.38 (0.018)**
_cons	6.35 (0)*	2.82 (0.005)*	8.24 (0)*
R^2	0.421	0.278	0.333
Adjusted R^2	0.384	0.255	0.301

t-value (P value in bracket). * , ** and ***
Significant at 1%, 5% and 10% respectively

5.10.5. Intellectual capital and cost of capital

To choose the appropriate model, we run the Hausman test as shown in Appendix 8 and we rejected our null hypothesis. Thus, the below fixed effect model is used to examine intellectual capital and cost of capital to achieve secondary research objective number 5:

$IC_{it} = \alpha_{it} + \beta_1 \text{ cost of capital}_{it} + \beta_2 (FSIZE)_{it} + \beta_3 (FLEV)_{it} + \beta_4 (FAGE)_{it} + \beta_5 (CLUSTER)_{it} + \beta_6 (INDSUTRY)_{it} + \varepsilon_{it}$

Where cost of capital = WACC, COE, COD, i is the company, t is the time and ε is the error term.

As shown in Table 5.12, intellectual capital showed strong a negative

association with WACC and COD (Easley & O'Hara, 2004; Boujelbene & Affes, 2013) leading to the acceptance of hypothesis H9. From the resource dependency theory perspective, with increased intellectual capital efficiency firms can acquire, manage resources at their best interest which lowers the required rate of return. Similarly, resource-based view theory argues that firms can use resources available inside the firm whether knowledge, skills, or external connection to acquire capital at a lower cost. Whenever intellectual capital disclosure is higher, lenders gain confidence, information asymmetry reduces, and demand for the rate of return decreases. However, this study measured intellectual capital using the VAIC model instead of focusing on disclosure.

Among control variables, firm size, age, and leverage showed a positive and negative relationship with the cost of capital. Firm size was strongly negatively associated with WACC where large firms use their resources efficiently to acquire capital at a lower cost compared to smaller firms. Firm leverage showed a positive relationship with the cost of debt i.e., irrespective of intellectual capital efficiency firms with high debt face financial risk due to which creditors demand a higher rate of return.

Comparing the result found in path analysis estimation (Table 5.7) and result found here (Table 5.12) no much difference is found, except under path analysis estimation. COD showed a positive association with intellectual capital while under the fixed effect model COD was negatively associated with intellectual capital. Thus, we answer the secondary research question number 5 by saying that there is a negative relationship between intellectual capital and cost of capital (except COD) based on the results found in Table 5.7 and Table 5.12.

Table 5. 12. Fixed effect regression analysis: intellectual capital and cost of capital

	WACC	COE	COD
IC	-3.46 (0.001)*	-0.19 (0.852)	-3.76 (0)*
FSIZE	-7.04 (0)*	0.34 (0.735)	-1.45 (0.147)
FLEV	-1.07 (0.283)	1.51 (0.132)	4.06 (0)*
FAGE	2.4 (0.017)**	-0.75 (0.451)	-1.22 (0.222)
CLUSTER	-3.04 (0.003)*	-0.17 (0.866)	-0.19 (0.848)
INDUSTRY	-1.65 (0.101)	1.26 (0.207)	0.25 (0.804)
_cons	12.4 (0)*	0.2 (0.842)	5.74 (0)*
R^2	0.482	0.29	0.366
Adjusted R^2	0.461	0.261	0.332

t-value (P value in bracket). * , ** and ***
Significant at 1%, 5% and 10% respectively

5.10.6. Cost of capital and firm performance

To choose the appropriate model, we run the Hausman test as shown in Appendix 9 and we rejected our null hypothesis. Thus, the below fixed effect model is used to examine the cost of capital and firm performance to achieve secondary research objective number 6:

Cost of capital $_{it} = \alpha_{it} + \beta_1$ firm performance $_{it} + \beta_2 (FSIZE)_{it} + \beta_3 (FLEV)_{it} + \beta_4 (FAGE)_{it} + \beta_5 (CLUSTER)_{it} + \beta_6 (INDSUTRY)_{it} + \mathcal{E}_{it}$

Where cost of capital = WACC, COE, COD and firm performance = ROA, ROE, TOBINQ, i is the company, t is the time and $\mathcal{E}$ is the error term.

Table 5.13. revealed that WACC is positively associated with firm performance rejecting hypothesis H10 while COE and COD are negatively associated with firm

performance (Reverte, 2011; Pouraghajan et al., 2012; Wu et al., 2012) leading to the acceptance of hypothesis H10. When the weighted cost of capital increases, firm performance increases. It indicates that firms are risk seeker, where they acquire capital (debt and equity) at a higher rate and because high risk implies a higher return, higher WACC leads to higher performance. However, when looked at the source of capital separately, a negative association with firm performance is found. When firms acquire more of either only equity or debt, the financial risk increases, due to which cost of debt and equity increases and the firm performance decreases. Thus, the result shows that a balanced capital structure is necessary for effective firm performance.

The control variable firm size showed a negative association for all the models of the cost of capital and performance. Petrova et al. (2012) examined corporate disclosure and capital cost for 121companies and found ROE to be less for larger firms. This implies that a large firm uses more capital inefficiently for growth opportunities which negatively affects performance compared to smaller firms. Also, firm leverage showed a positive relation with ROE at 10% significance level only under the COE model. This implies that when firms have high debt, shareholder's equity reduces, and ROE increases. Finally, firm age and performance are not related.

Comparing the result found in path analysis estimation (Table 5.7) and result found here (Table 5.13) no much difference is found, except under the fixed effect model, WACC showed a positive association with firm performance while under path analysis negative association with firm performance was found. Thus, we answer the secondary research question number 6 by saying that there is a negative relationship between the cost of capital (except WACC) and firm performance based on the results found in Table 5.7 and Table 5.13.

Table 5. 13. Fixed effect regression analysis: cost of capital and firm performance

	ROA	**ROE**	**TOBINQ**
WACC	2.33 (0.02)**	1.92 (0.055)***	7.05 (0)*
FSIZE	-5.69 (0)*	-2.03 (0.043)**	-4.85 (0)*
FLEV	0.46 (0.644)	0.88 (0.378)	-1.02 (0.306)
FAGE	0.86 (0.389)	0.89 (0.371)	0.52 (0.606)
CLUSTER	0.09 (0.928)	0.23 (0.817)	-1.2 (0.23)
INDUSTRY	1.43 (0.155)	3.3 (0.001)*	-1.81 (0.072)***
_cons	4.39 (0)*	1.44 (0.151)	3.69 (0)*
R^2	0.776	0.753	0.291
Adjusted R^2	0.734	0.742	0.267

t-value (P value in bracket). * , ** and *** Significant at 1%, 5% and 10% respectively

	ROA	**ROE**	**TOBINQ**
COE	-2.77 (0.006)*	-3.79 (0)*	-0.26 (0.796)
FSIZE	-6.79 (0)*	-2.78 (0.006)*	-7.13 (0)*
FLEV	0.58 (0.565)	1.1 (0.272)	-1.26 (0.207)
FAGE	1.04 (0.3)	0.99 (0.321)	1.27 (0.204)
CLUSTER	-0.29 (0.774)	-0.09 (0.929)	-2.15 (0.032)**
INDUSTRY	1.52 (0.129)	3.52 (0)*	-1.98 (0.048)**
_cons	6.56 (0)*	2.9 (0.004)*	8.04 (0)*
R^2	0.849	0.7646	0.7641
Adjusted R^2	0.80	0.732	0.715

t-value (P value in bracket). * , ** and ***
Significant at 1%, 5% and 10% respectively

Table 5.13. Fixed effect regression analysis: cost of capital and firm performance – (Continued)

	ROA	**ROE**	**TOBINQ**
COD	-3.25 (0.001)*	-4.95 (0)*	-10.24 (0)*
FSIZE	-7.1 (0)*	-3.26 (0.001)*	-8.79 (0)*
FLEV	0.97 (0.335)	1.73 (0.084)***	0.53 (0.596)
FAGE	0.96 (0.338)	0.87 (0.387)	0.83 (0.407)
CLUSTER	-0.29 (0.769)	-0.1 (0.918)	-2.52 (0.012)**
INDUSTRY	1.22 (0.221)	3.13 (0.002)*	-2.58 (0.01)*
_cons	7.23 (0)*	4.23 (0)*	11.67 (0)*
R^2	0.5705	0.4321	0.6630
Adjusted R^2	0.5510	0.3842	0.6110

t-value (P value in bracket). * , ** and ***
Significant at 1%, 5% and 10% respectively

CHAPTER 6: CONCLUSION

6.1. Summary

This study examined the indirect relationship between board structure and firm performance with the mediating effect of intellectual capital and the cost of capital. Using theory triangulation (resource dependency theory, resource based-view theory, and agency theory), 10 hypotheses were formulated in the study. The study had three main objectives and six secondary objectives. Main objectives were to examine (1) the indirect relationship between board structure and firm performance with the mediating effect of intellectual capital (2) indirect relationship between board structure and firm performance with the mediating effect of cost of capital (3) the direct, indirect, and total effect of board structure on firm performance. Secondary objectives were to examine the direct relationship: (1) between board structure and firm performance (2) between board structure and intellectual capital (3) between board structure and cost of capital (4) between intellectual capital and firm performance (5) between intellectual capital and cost of capital (6) between the cost of capital and firm performance. Therefore, we focused on companies comprising of the NZX 50 index and ended up with a final sample of 391 observations for the period 2010-2019.

To achieve the main objectives, the fixed regression model was used to examine the mediating effect of intellectual capital between board structure and firm performance where only board independence was found to be mediated by intellectual capital (Rosenstein & Wyatt, 1990; Ho & Williams, 2003; Liu et al., 2015; Duchin et al; 2010). The result contradicted with the study of Nkundabanyanga (2014), Nkundabanyanga (2016), and Hamdan et al (2017) where intellectual capital did not mediate the relationship between board structure and firm performance except for board

independence. We argue the contradiction may be because of the high ownership concentration in New Zealand. This may lead to resources not managed efficiently and focused more towards the fulfillment of the opportunistic behavior of managers (Reddy et al., 2015). Thus, intellectual capital does not mediate the relationship between board structure and firm performance.

On the other hand, the random regression model was used to examine the mediating effect of cost of capital between board structure and firm performance where board size, CEO duality, board background and skill diversity, and board meeting were found to be mediated negatively by the cost of capital under WACC, COE and COD models (Butt & Hasan, 2009; Bozec & Bozec, 2011; Hajjha et al., 2013; Lorca et al., 2011). From an agency theory perspective, it is argued that due to the ineffective monitoring mechanism, cost of capital negatively mediates between board size, CEO duality, board background and skill diversity and board meeting, and firm performance. Besides, board independence, gender diversity, and audit committee composition were found to be mediated positively by the cost of capital under WACC, COE and COD models (Fields, Fraser & Subrahmanyam, 2012). This result supports the prior literature arguments where independent directors and females were found to be highly influential factors for creditors to demand a lower rate of return (Piot & Missonier-Piera, 2007). The findings fill the gap in the literature to understand that not only intellectual capital but also the cost of capital mediates the relationship between board structure and firm performance.

Finally, to check if both the variables i.e., intellectual capital and cost of capital mediate the relationship between board structure and firm performance we used the path analysis postestimation tool in Stata. It was revealed that the indirect effect of

board structure (except gender diversity) on firm performance is enhanced in a better way through intellectual capital and cost of capital compared to the direct effect of board structure on firm performance and the separate mediation effect of intellectual capital and cost of capital. Thus, the findings fill the gap in the literature by contributing that intellectual capital and cost of capital together mediates the relationship between board structure and firm performance. A good board structure enhances intellectual capital efficiency through which lower cost of capital can be obtained implying higher firm performance.

To achieve the secondary objectives, we first run the estimation tool for the path analysis model which helped to achieve secondary objectives 1,2,5, and 6. Further additional tests were made to re-confirm the results found in the path analysis model for secondary objectives 1,2,5, and 6 and to achieve secondary objectives 3 and 4. Secondary objective (1) revealed the positive association of board independence and audit committee composition with firm performance (Dey, 2008; Saibaba & Ansari, 2013; Liu et al., 2015) and negative association of board meeting with firm performance (Brick and Chidambaran, 2010; Ilaboya and Obaretin, 2015). Secondary objective (2) revealed the negative association of board size with intellectual capital (Donnelly & Kelly, 2005; Mak & Kusnadi, 2005) and positive association of audit committee composition, gender diversity and board meeting with intellectual capital (Chan & Li, 2008; Garcia-Ramos, 2011; Terjesen et al.,2015; Christiansen et al., 2016). Secondary objective (3) revealed the negative association of board size, audit committee composition, gender diversity and board meeting with the cost of debt (Butt & Hasan, 2009; Bozec & Bozec, 2011; Hajjha et al., 2013; Lorca et al., 2011) and positive association of gender diversity with WACC (Smith et al., 2005; Petrovic,

2008). Secondary objective (4) revealed a negative association of intellectual capital with TOBINQ (Huang and Liu, 2005; Morariu, 2014). Secondary objective (5) revealed a negative association of WACC and the cost of debt with intellectual capital (Botosan & Plumlee, 2002; Orens et al., 2010). Finally, secondary objective (6) revealed WACC to be positively associated with firm performance and cost of debt and equity to be negatively associated with firm performance (Reverte, 2011; Wu et al., 2012; Pouraghajan et al., 2012). The findings of secondary research objectives validate the prior literature and fill the gap in the literature for the context of New Zealand where no research was found to be conducted in New Zealand regarding the relationship between board structure - intellectual capital, board structure - cost of capital, intellectual capital - cost of capital, intellectual capital - firm performance and cost of capital - firm performance.

6.2. Contribution and implication

Based on the results found, academicians, practitioners and society can be benefitted from this study. From a managerial perspective, the company board, management would use this finding as a guideline to know how to improve firm performance and what to focus on within the board structure to enhance intellectual capital. Although directors are emphasized by the Companies Act 1993 and other corporate governance codes, board structure should not divorce itself from intellectual capital. Board of directors should try to enhance intellectual capital because it will help the firm to get capital at less cost thereby improve firm performance which is beneficial to all stakeholders. Also, from a practical implication perspective, this study findings can help policymakers and the stock market to decide on how to set corporate

governance principles or codes that can help firms to enhance firm performance focusing on intellectual capital. Especially, in New Zealand where ownership concentration is very high and market capitalization low, it becomes difficult for intellectual capital to be utilized or managed efficiently and effectively due to the owners influence and control over management. Since the finding of the results showed intellectual capital mediates positively between board structure and firm performance and lowers the cost of capital, the study guides practitioners in New Zealand on developing principles/codes on the importance of intellectual capital and encouraging dispersed ownership.

On the academic front, this study shows a sign of matured discipline to incorporate mediating variables i.e., intellectual capital and cost of capital to examine board structure and firm performance association for a meaningful conclusion. A relational study without a mediating mechanism provides an incomplete understanding. Therefore, the incorporation of mediating variables should not be underestimated if more explanation for an outcome is needed. Also, this study adds value to the literature by joining two separate streams of literature into one as no study has examined the cost of capital among board structure, intellectual capital, and firm performance variables. Thus, the development of a model incorporating four variables and showing the mediation effect through two variables is a major contribution of this study. Finally, the study adds to the literature in understanding the link between intellectual capital and cost of capital.

6.3. Limitation and future research

Although this study has made various contributions, some limitation still exists. First, we have focused only on the top 50 companies which comprise the NZX index which may limit the generalizability of the study as other companies listed on the New Zealand stock exchange are not considered. Second, not many control variables are used in the regression analysis. Third, intellectual capital would have been calculated using the latest method of calculation i.e., MVAIC, however reasons for calculating intellectual capital via VAIC are justified in chapter 4. Finally, the study has used different techniques such as path analysis model, path model estimation, fixed/random effect regression to answer main and secondary research objectives. The mixed result between path model estimation and fixed/random effect regression may have impacted the robustness findings of the study.

Future research may test the path analysis model developed in this study in other economies and compare the results. Also, instead of a path analysis model, the SEM model i.e., Structured Equation Modelling including latent variables or 3SLS can be used as a methodology to examine the relationship between board structure, intellectual capital, cost of capital, and firm performance. The different methodologies may provide different results if any.

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APPENDICES

Appendix 1: Normality test

Variable	Obs	Pr (Skewness)	Pr (Kurtosis)	adj chi2 (2)	Prob>chi2
BSIZE	410	0.0000	0.0000	60.5900	0.0000
BIND	410	0.0946	0.2971	3.8900	0.1429
CEOD	410	0.0000	0.0000	.	0.0000
AUDITC	410	0.0246	0.7474	5.1600	0.0756
GEND	410	0.0000	0.5861	7.0700	0.0292
BBS	410	0.0000	0.7227	18.4300	0.0001
BMEET	410	0.0000	0.0000	.	0.0000
IC	410	0.0000	0.0000	.	0.0000
WACC	410	0.0000	0.0163	50.9700	0.0000
COE	410	0.0000	0.5643	3.8900	0.0000
COD	410	0.6476	0.0433	4.3000	0.1163
ROA	410	0.0000	0.0000	.	0.0000
ROE	410	0.0000	0.0000	.	0.0000
TOBINQ	410	0.0000	0.0000	.	0.0000
FSIZE	410	0.7567	0.0567	.	0.0671
FLEV	410	0.0000	0.0167	17.1000	0.0002
FAGE	410	0.0000	0.6249	39.0600	0.0000
CLUSTER	410	0.9529	0.0000	.	0.0000
INDUSTRY	410	0.0000	0.3737	22.6100	0.0000

Appendix 2: Hausman test (Board structure and firm performance {ROA, ROE, TOBINQ} with mediating effect of intellectual capital)

	b (fe)	B (re)	(b-B) Difference	sqrt (diag (V_b-V_B)) S.E.
BSIZE	0.0878838	0.0110048	0.076879	.
BIND	0.0313456	0.0231818	0.0081638	0.0019225
CEOD	-0.1689475	-0.5941165	0.425169	0.1416012
AUDITC	-0.0350488	0.0348003	-0.0002484	.
GEND	0.0024444	0.0249432	-0.0224988	0.0122684
BBS	0.0171287	0.0187934	-1.66E-03	0.0022049
BMEET	0.0440528	0.0626214	-1.86E-02	0.0196176
BSIZE_IC	0.0636862	0.0596282	0.0040581	.
BIND_IC	-0.0006223	0.0008826	-0.0015049	0.0004809
CEOD_IC	0.134669	0.1021905	0.0324785	0.0154926
AUDITC_IC	-0.0023513	-0.002373	0.0000217	.
GEND_IC	-0.0004238	-2.24E-03	1.81E-03	0.0005608
BBS_IC	-0.0016568	-0.0031641	0.0015072	0.0005043
BMEET_IC	-0.0044162	-0.005593	0.0011768	.
FSIZE	-3.333187	-3.212545	-0.1206423	.
FLEV	0.013088	0.0104043	0.0026837	.
FAGE	0.5321914	0.5547608	-0.0225694	.
CLUSTER	0.0040937	0.0000566	0.004037	.
INDUSTRY	0.0002942	0.0002625	0.0000317	5.62E-06

chi2(18) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 14.05
Prob>chi2 = 0.032

Note: for all the models the p-value was less than 0.05. Thus, fixed effect is used for all above mentioned models

Appendix 3: Hausman test (Board structure and firm performance {ROA, ROE, TOBINQ} with mediating effect of cost of capital {WACC, COE, COD})

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
BSIZE	1.3722	1.332278	0.0399222	0.0466066
BIND	-0.1100815	0.0957361	-0.0143454	0.0081731
CEOD	-3.461552	-4.579491	1.117938	0.1692082
AUDITC	-0.078147	0.1002276	-0.0220806	0.0068202
GEND	0.004206	0.0100796	-0.0142857	0.0254232
BBS	0.0263821	0.041505	-1.51E-02	0.0046119
BMEET	0.329717	0.443185	-1.13E-01	0.0581119
BSIZE_WACC	-0.1346339	0.1409095	-0.0062756	0.0057751
BIND_WACC	0.0167436	0.015228	0.0015156	0.0007621
CEOD_WACC	0.2868024	0.3873234	-0.100521	0.001531
AUDITC_WACC	0.0043435	0.0068956	-0.0025521	0.0008666
GEND_WACC	-0.0003387	4.37E-03	-4.71E-03	0.0026437
BBS_WACC	-0.0018309	-0.0042866	0.0024557	0.0008848
BMEET_WACC	-0.036628	-0.055713	0.0190851	0.0065286
FSIZE	-3.075036	-3.065784	-0.0092515	0.0698728
FLEV	0.0112577	0.0103683	0.0008894	.
FAGE	0.4583691	0.4953059	-0.0369367	.
CLUSTER	-0.000062	0.0059743	-0.0059123	0.001774
INDUSTRY	0.0002278	0.0001851	0.0000427	1.03E-05

chi2(18) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 12.80
Prob>chi2 = 0.8035

Note: for all the models the p-value was greater than 0.05. Thus, random effect is used for all above mentioned models.

Appendix 4: Hausman test (Board structure and firm performance {ROA, ROE, TOBINQ}

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
BSIZE	0.4036135	0.3028832	0.1007302	0.021561
BIND	0.0247659	0.0243117	0.0004542	0.0022438
CEOD	-0.1285724	-0.5137101	0.3851376	0.1613387
AUDITC	-0.0417584	-0.0433817	0.0016233	.
GEND	0.0073794	0.0205819	-0.0132025	0.0100298
BBS	0.0095508	0.0060277	0.0035231	0.0017696
BMEET	0.0626397	0.0575901	0.0050496	0.0200562
FSIZE	-3.509101	-3.375887	-0.1332134	0.0156166
FLEV	0.0063121	0.0047022	0.0016099	.
FAGE	0.5393841	0.5592643	-0.0198802	.
CLUSTER	0.0009645	-0.0016707	0.0026352	.
INDUSTRY	0.0003055	0.0002788	0.0000266	6.47E-06

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 60.07
Prob>chi2 = 0.0000

Appendix 4: Hausman test (Board structure and firm performance {ROA, ROE, TOBINQ} (Continued)

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
BSIZE	0.6924882	0.8804832	-0.187995	.
BIND	0.0114912	0.0131225	-0.0016312	.
CEOD	-0.7146091	0.0044707	-0.7190798	.
AUDITC	-0.0672225	-0.0642502	-0.0029723	0.0021525
GEND	0.0748702	0.0530095	0.0218607	.
BBS	0.0039411	0.0106202	-0.006679	.
BMEET	-0.0128445	-0.0111438	-0.0017007	.
FSIZE	-2.939213	-3.176329	0.2371158	0.0408811
FLEV	0.011526	0.01495	-0.0034239	0.0024999
FAGE	0.7235837	0.6860013	0.0375824	0.0965186
CLUSTER	0.0018135	0.006884	-0.0050705	0.0053224
INDUSTRY	0.0010694	0.001113	-0.0000436	1.00E-05

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 87.20
Prob>chi2 = 0.0000

Appendix 4: Hausman test (Board structure and firm performance {ROA, ROE, TOBINQ} (Continued)

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
BSIZE	0.6924882	0.0644088	0.6280793	0.3921566
BIND	0.0114912	0.0037759	0.0077154	0.0346391
CEOD	-0.7146091	0.1455242	-0.5690848	2.650405
AUDITC	-0.0672225	0.0026492	-0.0698716	0.0343772
GEND	0.0748702	0.00205	0.0728202	0.0398406
BBS	0.0039411	-0.004349	0.0082901	0.0265194
BMEET	-0.0128445	-0.044873	0.0320285	0.1640283
FSIZE	-2.939213	-0.565222	-2.373991	0.8929589
FLEV	0.011526	0.0002509	0.011777	0.0245926
FAGE	0.7235837	0.0659165	0.6576672	0.7946651
CLUSTER	0.0018135	0.0101361	-0.0119496	0.0479151
INDUSTRY	0.0010694	0.0000519	0.0011212	2.81E-04

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 20.47
Prob>chi2 = 0.0393

Appendix 5: Hausman test (Board structure and Intellectual capital)

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
BSIZE	-0.7591699	-0.7254386	-0.0337314	0.0780343
BIND	-0.0466063	-0.0453217	-0.0012845	0.0073135
CEOD	0.9333974	0.9213125	0.0120849	0.5463622
AUDITC	0.0863771	0.0867428	-0.0003657	0.0055338
GEND	-0.1067482	-0.1165795	0.0098313	0.0216709
BBS	0.0078186	0.0073628	0.0004558	0.0056671
BMEET	0.2973572	0.3040577	-0.0067004	0.049275
FSIZE	0.3757185	0.3744933	0.0012252	0.1495781
FLEV	-0.0217471	-0.020247	-0.0015001	0.0033328
FAGE	-0.4749865	-0.4860264	0.0110399	0.0911835
CLUSTER	-0.0452702	-0.0409721	-0.0042981	0.006062
INDUSTRY	-0.0010286	-0.0010213	-7.34E-06	4.78E-05

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 1.38
Prob>chi2 = 0.9997

Breusch and Pegan LM Test:

Test: Var(u) = 0

chibar2(01) = 70.86

Prob > chibar2 = .0000

Appendix 6: Hausman test (Board structure and cost of capital {WACC, COE, COD})

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
BSIZE	0.1028772	0.1912036	-0.0883264	.
BIND	0.0123199	0.0021066	0.0102133	.
CEOD	0.5544284	1.105978	-0.5515496	.
AUDITC	-0.0013206	0.0033053	-0.0046258	.
GEND	0.0400804	0.0013451	0.0414255	.
BBS	-0.0019554	0.001723	-0.0036784	.
BMEET	-0.1343517	0.0439679	-0.0903838	.
FSIZE	-1.05412	-1.234599	0.1804788	.
FLEV	0.0001483	0.0025146	-0.0023663	.
FAGE	0.2257611	0.2180505	0.0077106	.
CLUSTER	-0.0200676	0.0157513	-0.0043163	.
INDUSTRY	-0.0000527	0.000019	-7.17E-05	.

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 1058.92
Prob>chi2 = 0.0000

Appendix 6: Hausman test (Board structure and cost of capital {WACC, COE, COD}) – (Continued)

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
BSIZE	0.1579002	0.0316637	0.1262364	0.0601829
BIND	-0.0080678	0.0046964	-0.0127642	0.0052992
CEOD	0.7714584	-0.044987	0.8164454	0.4060037
AUDITC	0.0125123	0.0066341	0.0058782	0.0053211
GEND	-0.019399	0.0367937	-0.0561927	0.0050292
BBS	-0.0008508	0.0061798	-0.005329	0.0040542
BMEET	0.0350975	0.0805971	-0.1156945	0.0243551
FSIZE	0.5277631	0.775936	-0.2481729	0.1380333
FLEV	0.0079548	0.0047052	0.0032495	0.0038244
FAGE	0.1558091	0.171415	-0.015606	0.1239716
CLUSTER	-0.0119589	0.0178978	-0.0059389	0.007462
INDUSTRY	0.0000862	0.0000119	9.81E-05	0.0000434

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 397.14
Prob>chi2 = 0.0000

Appendix 6: Hausman test (Board structure and cost of capital {WACC, COE, COD}) – (Continued)

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
BSIZE	-0.0786769	-0.0288804	-0.0497965	.
BIND	0.0001815	-0.0059176	0.0060991	.
CEOD	0.054092	0.4497133	-0.3956212	.
AUDITC	-0.0120417	-0.0087858	-0.0032559	.
GEND	-0.0080868	-0.0298663	0.0217795	.
BBS	0.0038161	0.0061231	-0.0023069	.
BMEET	0.0426436	0.091579	-0.0489354	.
FSIZE	-0.0967826	-0.200211	0.1034284	.
FLEV	0.0085972	0.0102058	-0.0016086	.
FAGE	-0.0566568	0.0591552	-0.0024984	.
CLUSTER	-0.0016099	0.0004553	-0.0020653	.
INDUSTRY	-0.0000362	2.99E-06	-3.92E-05	.

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 659.03
Prob>chi2 = 0.0000

Appendix 7: Hausman test (Intellectual capital and firm performance {ROA, ROE, TOBINQ})

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
ROA	0.0177327	-0.0047249	0.0224577	0.0206967
FSIZE	-0.394409	-0.5897306	0.1953216	0.1377396
FLEV	-0.029089	-0.0253202	-0.0037688	0.0025444
FAGE	-0.6399	-0.6428146	0.0029146	0.0567218
CLUSTER	-0.0537208	-0.0526541	-0.0010667	0.0038771
INDUSTRY	-0.0012078	-0.0012018	-6.02E-06	0.0000194

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 3.43
Prob>chi2 = 0.7528

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
ROE	-0.0462075	-0.0575075	0.0113	0.0116433
FSIZE	-0.548035	-0.6959046	0.1478696	0.1208892
FLEV	-0.0279161	-0.0243326	-0.0035835	0.0027272
FAGE	-0.5886545	-0.593449	0.0047945	0.0634735
CLUSTER	-0.0538835	-0.0527146	-1.17E-03	0.0042207
INDUSTRY	-0.0011494	-0.0011375	-0.0000119	0.0000242

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 2.82
Prob>chi2 = 0.8316

Appendix 7: Hausman test (Intellectual capital and firm performance {ROA, ROE, TOBINQ}) – (Continued)

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
TOBINQ	-1.231433	-1.392318	0.1608845	0.1197041
FSIZE	-1.096311	-1.279017	0.1827056	0.1634627
FLEV	-0.0295585	0.0266551	-0.0029033	0.0028128
FAGE	-0.5508631	0.5542002	-0.0033371	0.0729925
CLUSTER	-0.0650644	0.0649172	-0.0001472	0.005062
INDUSTRY	-0.0012523	0.0012603	-7.98E-06	0.0000245

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 2.44
Prob>chi2 = 0.8755

Appendix 8: Hausman test (Intellectual capital and cost of capital {WACC, COE, COD})

	b (fe)	B (re)	(b-B) Difference		sqrt(diag (V_b-V_B)) S.E.
WACC	-0.7693177	0.4529516	-0.316366		0.1377151
FSIZE	-1.113902	-1.048277	-0.0656246	.	
FLEV	-0.0285706	0.0241949	-0.0043757	.	
FAGE	-0.4300272	0.5314997	-0.1014725	.	
CLUSTER	-0.0666726	0.0612536	-0.0054189	.	
INDUSTRY	-0.0012103	-0.001206	-4.27E-06	.	

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 13.89
Prob>chi2 = 0.0309

	b (fe)	B (re)	(b-B) Difference		sqrt(diag (V_b-V_B)) S.E.
COE	-0.9611549	0.3799632	-0.5811917		0.1801398
FSIZE	0.385963	0.3442535	0.7302165		0.2047467
FLEV	-0.0244267	0.0223514	-0.0020752	.	
FAGE	-0.4423408	0.5776298	-0.1352891	.	
CLUSTER	-0.068679	0.0597566	-0.0089224	.	
INDUSTRY	-0.0011722	0.0011887	1.66E-05	.	

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 9.91
Prob>chi2 = 0.034

Appendix 8: Hausman test (Intellectual capital and cost of capital {WACC, COE, COD}) – (Continued)

	b (fe)	B (re)	(b-B) Difference		sqrt(diag (V_b-V_B)) S.E.
COD	1.748257	1.281451	0.4668058		0.2827839
FSIZE	-0.1288253	-0.1657115	0.0368863		0.02179
FLEV	-0.0449627	-0.0397977	-0.0051651		0.0014487
FAGE	-0.5136898	-0.5602544	0.0465646	.	
CLUSTER	-0.0508543	-0.0473918	-0.0034625	.	
INDUSTRY	-0.0011295	-0.0011512	2.17E-05	.	

chi2(5) = (b B)'[(V_b-V_B)^(1)](b-B)
= 6.73
Prob>chi2 = 0.0245

Appendix 9: Hausman test (Cost of capital {WACC, COE, COD} and firm performance {ROA, ROE, TOBINQ})

	b (fe)	B (re)	(b-B) Difference	sqrt(diag (V_b-V_B)) S.E.
ROA	0.0240989	0.0263807	-0.0022818	0.004303
FSIZE	-0.8418452	-0.7876435	-0.0542017	0.0361619
FLEV	0.0008114	0.0002078	0.0006036	0.0011666
FAGE	0.2432361	0.2438659	-0.0006298	0.0379907
CLUSTER	-0.0171936	-0.0165516	-0.000642	0.0022166
INDUSTRY	-0.0000171	-0.000019	1.89E-06	0.0000132

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 3.40
Prob>chi2 = 0.043

Note: for all the models the p-value was less than 0.05. Thus, fixed effect is used for all above mentioned models.