

**The relationship between board diversity and financial
performance of publicly listed companies in South Africa**

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Abstract

This research sets out to investigate the links between corporate governance, cognitive diversity among board members and company financial performance of publicly listed companies on the JSE. The purpose is to establish if there is a relationship between cognitive diversity among board members and company financial performance. It follows a quantitative design using secondary data. Simple random sampling was applied and resulted in a sample of 122 companies. Through statistical analyses, the research found that there was a negative relationship between cognitive diversity among board members and company financial performance. The implication for management is that measures should be instituted to mitigate the negative effects of diversity to reap the benefits in terms of creativity and innovation that diversity fosters. The research contributes to the body of literature concerned with diversity and board composition.

Keywords

Board members, cognitive diversity, company financial performance, corporate governance

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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1. Introduction to Research Problem

1.1 Introduction

This section deals with the identification of the research problem by providing the background of the problem and concludes with the purpose of the research. The process will encompass highlighting the significance of the research from a business as well as an academic perspective, and the scope of the research.

1.2 Background

A brief look at the history of corporate failures since the year 2000, both locally and internationally, provides several examples of where corporate governance failures have resulted in the collapse or the near collapse of some of the largest companies. While many corporate failures were experienced within the banking sector since the credit crisis of 2008 (Kumar & Singh, 2013), there were notable failures in other sectors as well.

The collapse of Leisurenent during 2000, Enron during 2001, which then also impacted Arthur Anderson during 2002 (Primbs & Wang, 2016), Worldcom during 2001, Kingfisher Airlines during 2012 (Sharma & Goyal, 2017), and most recently Steinhoff during 2017 (Rossouw & Styan, 2018) are some examples.

The negative impact that these corporate failures have had on stakeholders such as shareholders, employees, service providers amongst others and the broader economy has been disastrous. In many instances, billions in value has been eroded, resulting in individuals and institutions losing a substantial portion of their savings either through direct holdings of company shares and debentures or indirectly through investments held in pension funds and other managed funds (Kumar & Singh, 2013).

This has had further spill over effects resulting in more people becoming dependant on government welfare initiatives to assist in funding their daily living, which increases the reliance on and creates further strain on the social welfare system (Hallerberg, 2013). These dependencies could have potentially been avoided had the directors of the affected companies acted in a manner that was more aligned with the duties and responsibilities bestowed upon them when elected on to the board.

The roles and duties of the board of directors of a company is to steer and set the strategic direction of the company, approve policy and planning that give effect to the strategy, oversee and monitor implementation and execution by management of the strategy, and ensure overall accountability for the organisation's performance (Institute of Directors Southern Africa, 2017). The board is thus responsible for ensuring that the highest standards of corporate governance are implemented and adhered to.

Inefficient and ineffective corporate governance mechanisms were found to have played a significant part in the negative outcomes of the affected companies (Erkens, Hung, & Matos, 2012; Kumar & Singh, 2013; McNulty, Florackis, & Ormrod, 2013).

As the board of directors is responsible for approving crucial financial and strategic operational decisions which are imperative to the company's sustainability and performance (Scholtz & Kieviet, 2018), it is important to understand which attributes concerning the composition of the board of directors can ensure the fulfilment of the required duties in a manner that results in the sustained and improved performance of the company. Knowledge of these attributes can assist businesses in considering which individuals to nominate for board membership, as well as shareholders when it comes to voting in board members.

While there is no single over-arching reason for a board of directors not being able to perform their duties effectively, a possible aspect that has been researched is the diversity among board members. It has been shown that even when an original decision was a mistake, homogenous groups were more likely to copy the mistake believing that there must be some value in it that they did not understand (Mangelsdorf, 2018).

1.3 Research Problem

As a board of directors operates as a team, one such attribute that affects team performance which has been identified, and has been widely researched, is diversity. There has been a considerable amount of research conducted into the effects of diversity on company financial performance from a race, gender, ethnicity, board size, and board composition perspective (Andrevski, Richard, Shaw, & Ferrier, 2014; Conyon & He, 2017; Muchemwa, Padia, & Callaghan, 2016; Sanan, 2016; Scholtz & Kieviet, 2018; Zainal, Zulkifli, & Saleh, 2013).

The benefits of improving diversity has been researched, with greater diversity among team members leading to more effective decision making (Reynolds & Lewis, 2017). Companies with diverse boards have also demonstrated increased levels of creativity and innovation in their decision making with a greater number of alternatives being considered (Hillman, 2015). In addition, research has indicated that diversity amongst board members can have a positive influence on company financial performance (Erhardt, Werbel, & Shrader, 2003; Erkens et al., 2012; Scholtz & Kieviet, 2018).

Whilst there have been studies that have researched diversity at board level as mentioned previously, there are fewer studies that have considered the effect that human capital characteristics have on the decision-making process of board members. Human capital refers to the experience and skills of individuals (Johnson, Schnatterly, & Hill, 2013). The experience dimension has received some attention from researchers, but the skills dimension from the perspective of educational qualifications much less so.

Recently there has been an increasing focus on studying deeper-level measures of diversity among teams and, in particular, cognitive diversity (Mello & Delise, 2015), which has been defined as the differences in perspective or information processing styles (Reynolds & Lewis, 2017). Dahmann (2017) and Maurer (2011) have shown that increasing the level of education obtained by individuals has a positive influence on individual cognitive skills. The level of education attained by individuals affects their cognitive and decision-making abilities (Johnson et al., 2013). Further, diversity in educational backgrounds of team members increases the breadth of cognitive perspectives (Scholtz & Kieviet, 2018).

Research conducted regarding board member qualifications and the effect on company financial performance has tended to concentrate on the level of qualifications attained with qualifications being categorised as undergraduate, Honours, Masters and so forth (Darmadi, 2013; Francis, Hasan, & Wu, 2015; Gray & Nowland, 2017; Kaczmarek, Kimino, & Pye, 2014). The conclusions reached have been mixed; and thus further research would be required to gain clarity.

This research then identifies a need to consider educational diversity from a different perspective, one which considers the value derived by companies from having a board of directors with a broader set of differing qualifications. Therefore, the research will focus on differences in educational background, as measured by qualifications attained, as a means of assessing the level of cognitive diversity among board members.

As such, it has been ascertained that there is a need to improve the functioning of boards, and cognitive diversity could possibly play a role in ensuring the improved performance of boards.

This leads to the problem of understanding whether there is a relationship between board member cognitive diversity and company financial performance. It is this problem that underpins the purpose of the research as outlined in the following section.

1.4 Research Purpose

In understanding the importance of ensuring that companies have a well-functioning board of directors, and that cognitive diversity has positive effects on the functioning and output of decisions taken by teams, the purpose of this research is to investigate the relationship between cognitive diversity among board members and the financial performance of companies. The aim is to contribute to the understanding of the potential impact that cognitive diversity has on board performance, and subsequently on overall company performance. The research was limited to an emerging market context and focused on a sample of publicly listed companies on the Johannesburg Stock Exchange (JSE).

1.5 Conclusion

Poor decision-making is a characteristic of poorly-functioning boards, which could be a result of a lack of creativity and innovation, or a tendency of homogenous boards to erroneously support a poor decision.

This research aims to contribute to the growing knowledge base of board composition and company performance, in order to provide guidance to stakeholders concerned with the nomination and election of directors. It will further contribute to the breadth of knowledge concerning diversity and diversity management.

The next section of this research consists of a literature review exploring the topics of diversity, cognitive diversity including educational diversity, corporate governance, and company performance. This is followed by the conceptual framework upon which the research is conducted, and the hypotheses generated from the literature review. The

research continues with the research methodology, and the presentation and subsequent discussion of the results obtained. Finally, the research ends with the conclusions reached, including limitations of the study and recommendations for future research.

2. Literature Review

2.1 Introduction

This section looked to explore the concept of corporate governance, the role of the board of directors and factors that influence the board's performance, diversity and the affect it had on decision making and lastly, company financial performance.

It begins with a review of the literature on corporate governance, the board of directors, diversity, and company performance, highlighting what has been researched and the implications thereof. The need to consider additional dimensions of diversity was presented with a focus on cognitive diversity. The factors affecting cognitive diversity were then discussed with the focus being on education. This was followed by a review of the measures used to assess company financial performance. A conclusion was then presented wherein the concepts reviewed were brought together.

2.2 Corporate Governance

The concept of corporate governance has been in existence and explored in the extant literature for many years. However, it was only in the early 1990's that it was formalised in the UK following on from the numerous corporate failures and financial scams witnessed during the 1980s (Gupta & Sharma, 2014). The potential economic and long-term consequences due to weak corporate governance systems which threatened global financial stability has gained increasing recognition amongst researchers, corporates, and policy makers globally (Claessens & Yurtoglu, 2013).

Implementing a well-functioning and effective corporate governance system can ensure the appropriate division of power between shareholders, directors and management which creates a strong foundation on which to structure, operate, and control the company towards achieving its strategic goals to the satisfaction of its stakeholders (Amba, 2014). Further, it has been considered as an enabler of long-term value maximisation of a company when viewed from the perspective of company performance (Gupta & Sharma, 2014).

Corporate governance consists of legal, institutional, and cultural procedures that affect the way in which a company is administered (Andreou, Louca, & Panayides, 2014). It is a set of regulations among a company's stakeholders which deals with conflicts of

interest and aligns the interests of stakeholders through mechanisms designed to prevent corporate misconduct (Madanoglu & Karadag, 2016). There are both internal and external stakeholders that have a role to play in ensuring a corporate governance structure and mechanism that is efficient and effective in guiding the interests of stakeholders.

Externally, government legislation, institutional regulations, societal needs and expectations, supplier and consumer needs, and shareholder expectations guide and dictate the environment within which the company conducts business. Internally, the board of directors, the CEO and, senior management are tasked with ensuring adherence to and implementation of good corporate governance principles. It is the latter which is the focus of this research and particularly the role that the board of directors fulfil since they are considered to be a highly effective and important internal mechanism of corporate governance (Singh, Tabassum, Darwish, & Batsakis, 2018).

A theoretical construct such as corporate governance, which is an unobservable variable, has been measured by researchers using proxy variables considered to be appropriate measures for assessing corporate governance. These measures have covered a broad range of variables and have accounted for CEO duality (Amba, 2014; Andreou et al., 2014; Dandago & Gugong, 2016; Singh et al., 2018), board structure in relation to the proportion of non-executive directors, size and number of committees (Amba, 2014; Dandago & Gugong, 2016; Erkens et al., 2012; Gupta & Sharma, 2014; Singh et al., 2018), ownership structures regarding management and institutional shareholdings (Andreou et al., 2014; Wessels, Wansbeek, & Dam, 2016), CEO compensation (Wessels et al., 2016), and the percentage of directors serving on other boards (Andreou et al., 2014).

The results obtained from prior research undertaken to assess the effect of corporate governance on company financial performance has been mixed. Research has found that there is a compelling case in support of improving the effectiveness of corporate governance at the company level as it has been shown to result in better financial performance (Claessens & Yurtoglu, 2013; Singh et al., 2018; Wessels et al., 2016) and stimulated increased investment by external parties into the company (Andreou et al., 2014; Claessens & Yurtoglu, 2013).

In contrast, there is evidence from research which has found that corporate governance has either a negative relation to company performance (Madanoglu & Karadag, 2016),

or a limited impact on company market value and financial performance (Gupta & Sharma, 2014), or no relationship to company financial performance (Dandago & Gugong, 2016).

Considering the above it would seem that there is no definitive relationship between corporate governance and company financial performance. Could an alternative perspective on the board of directors and their ability to implement good corporate governance practices provide different insights? Could greater diversity amongst board members positively affect their decision making?

The following section explores the literature relating to the board of directors and discusses its links to corporate governance.

2.3 Board of Directors

Scholtz and Kieviet (2018, p.118) note that: “A board of directors is considered to be the key decision-making body in a company and is responsible for approving important strategic operational and financial decisions”.

In South Africa the Companies Act (Act 71 of 2008) stipulates that all publicly listed companies are required to have a board of directors. The board of directors (consisting of executive and independent non-executive members) is the body tasked with ensuring the overall governance of a company.

According to (Institute of Directors Southern Africa, 2017), the roles and duties of the board is to steer and set the strategic direction of the company, approve policy and planning that give effect to the strategy, oversee and monitor implementation and execution by management of the strategy and ensure overall accountability for the organisation’s performance.

Considering these role and duties, the decisions taken by the board has a significant impact on the performance of the company (Erhardt et al., 2003).

In South Africa, the Companies Act (Act 71 of 2008) stipulates that publicly listed companies are required to have at least three members on the board of directors. In addition and , according to the King IV report on corporate governance, the composition should look to attain an appropriate balance of knowledge, skill, experience, diversity,

and independence to ensure the objectivity and effectiveness of its role and responsibilities (Institute of Directors Southern Africa, 2017).

The board of directors is also seen to be a highly effective and important internal mechanism of corporate governance (Singh et al., 2018) as it considered as one of the key pillars in a robust corporate governance framework (Scholtz & Kieviet, 2018).

Taking into consideration the boards' role in sustaining overall company performance and ensuring good corporate governance it would seem logical that any measures that result in improving the functioning of the board would be promoted.

An attribute demonstrated to have positively influenced improved board functioning is diversity (Erkens et al., 2012; Muchemwa et al., 2016; Scholtz & Kieviet, 2018). The dimensions of diversity relevant to improved decision making and effective governance that should be promoted include field of knowledge, skills and experience (Institute of Directors Southern Africa, 2017). Thus, to ensure that the board is effective in the fulfilment of its duties, diversity amongst board members is both strongly encouraged and necessary.

Unfortunately, not all types of diversity among board members is necessarily related to or been shown to have a significant impact, whether positive or negative, on company financial performance. The following section explores the literature relating to diversity and discusses the links to the board of directors' effectiveness and decision making.

2.4 Diversity

Diversity can be defined as differences amongst individuals based on particular characteristics. These characteristics cover a wide range of attributes such as age, race, gender, nationality, socio-economic background, religion, ethnicity, and so forth. Diversity has been found to increase conflict and reduce communication and performance in groups however it also increases resources, innovation and creativity (Cheong & Sinnakkanu, 2014). The benefit of having diverse teams is that they are deemed more effective in performing better both financially and in terms of innovation (Nelson, 2014). Research studying the effect of diversity on team decision making has shown that greater diversity among team members leads to more effective decision making (Reynolds & Lewis, 2017) and that companies with diverse boards demonstrated

increased levels of creativity and innovation in their decision making with a greater number of alternatives being considered (Hillman, 2015).

There is additional research that has investigated the potential link between board diversity and corporate performance which found that diversity among board members can influence corporate performance (Andrevski et al., 2014; Ayub & Jehn, 2018; Cheong & Sinnakkanu, 2014; Conyon & He, 2017; Erhardt et al., 2003; Estelyi & Nisar, 2016; Fedaseyeu, Linck, & Wagner, 2018; Frijns, Dodd, & Cimerova, 2016; Iturralde, Maseda, Arosa, & Garcia-Ramos, 2016; Mazibuko & Govender, 2017; Nielsen & Nielsen, 2013; Ntim, 2015; O'Sullivan, Mamum, & Hassan, 2016; Richard, Kirby, & L Chadwick, 2013; Scholtz & Kieviet, 2018; Shehata, Salhin, & El-Helaly, 2017).

In examining decision making, research indicates that greater levels of diversity among team members enables better outcomes when dealing with complex decisions (Mangelsdorf, 2018). The decisions taken by the board are inherently complex in nature as directors are required to consider a multitude of factors within the internal and external environments that the company operates in. Therefore, given the positive effects of diversity on complex decision making and the nature of decisions taken by the board, the rationale for increased diversity among board members is reinforced.

In conducting this literature review, the author discovered that much of the prior research focused on the demographic dimensions of diversity such as race, gender, age, and culture. Andrevski et al. (2014), Cheong and Sinnakkanu (2014), Mazibuko and Govender (2017), and Richard et al. (2013) found that there was a significant positive relationship between racial diversity and company performance.

Conyon and He (2017), Ntim (2015), and Richard et al. (2013) found a significant positive relationship between gender diversity and company performance while Shehata et al. (2017) found that there was a significant negative relationship between gender diversity and company performance.

Schneid, Isidor, Steinmetz, and Kabst (2016) found that there was no significant overall relationship between age diversity and company performance while Shehata et al. (2017) found that there was a significant negative relationship between age diversity and company performance.

Frijns et al. (2016) found that cultural diversity had a negative relationship with company performance.

In looking to extend beyond these variables further research included tenure, nationality, and education. Iturralde et al. (2016) and O'Sullivan et al. (2016) found that there was a positive relationship between director tenure and company performance.

Ayub and Jehn (2018), Estelyi and Nisar (2016), and Nielsen and Nielsen (2013) found that there was a positive relationship between director nationality and company performance and Fedaseyeu et al. (2018) found that director qualifications affect company performance.

The preceding examples indicated that the results from prior research into the effect of diversity of top management teams and company performance has been mixed and therefore inconclusive.

As noted previously, diversity in the fields of knowledge among board members is an aspect that should be promoted. This can be achieved through ensuring that there is a mix of qualifications attained by board members. This mix in qualifications could result in a degree of cognitive diversity among board members. The following section explores the literature relating to cognitive diversity.

2.4.1 Cognitive diversity

Cognitive diversity has been studied across multiple disciplines such as psychology, organisational behaviour, management and strategy with many researchers having sought to formulate an explicit definition of cognitive diversity (Mello & Rentsch, 2015). This has resulted in a breadth of conceptualisations and differing conclusions being reached across studies. This has also created difficulties in drawing comparisons across studies.

However, Mello and Rentsch (2015) sought to provide a framework for categorising the variables used to represent cognitive diversity found in the literature. This categorisation is based on the perceived stability of the variable. Table 1 provides a summary of the framework.

Table 1. *Framework for categorising variables representing cognitive diversity*

Category	Description	Examples
Trait-like	Variables that are considered most stable and are innate characteristics that persevere over time and unaffected by environmental or contextual influences	personality, goal orientation, thinking style and problem-solving style
Developmental	Variables that are concerned with values based individual differences that develop through one's life experiences and are relatively enduring across contexts and over time	teamwork values and work values
Acquired	Variables that are context specific and can be easily changed or controlled by external forces	expertise, experience, job satisfaction and educational background
Exposed	Variables that are the most easily manipulated and context specific and thus the least stable	training and decision rules

Note: adapted from "Cognitive Diversity in Teams: A Multidisciplinary Review," by A. L. Mello and J. R. Rentsch, 2015, *Small Group Research*, 46 (6). Copyright 2015 by The Author(s)

The authors defined stability as referring to the degree that external forces such as time and context influenced or changed the variable with the outcome being that the more enduring and context independent a variable was found to be then the more stable (Mello & Rentsch, 2015). This assessed stability then provided a degree of consistency that allowed for comparative studies to be conducted.

More recently, Reynolds and Lewis (2017) defined cognitive diversity as the "differences in perspective or information processing styles" (p. 3). These differences in perspective or information processing styles could be influenced by multiple factors. Such factors included (but were not limited to) personality, socio-economic background, experience, functional background and educational background (Reynolds & Lewis, 2017).

2.4.2 Educational background and cognitive diversity

Individuals acquired knowledge and skills on an ongoing basis. While there are many ways in which to acquire new knowledge and learn new skills or improve on current skills, a clear and structured path is desired by some and often dictated by the work that one wishes to engage in.

For example, one is required to have qualified from medical school in order to practice as a doctor. There are ethical and legal barriers that prevent one from acquiring the necessary knowledge and experience outside of the formal structures that have been

created. On the other hand, it is relatively easy to become a financial markets trader without having completed any tertiary qualifications. However, the deeper knowledge of investments, economics and mathematics that come with a relevant tertiary qualification is desirable if a trader wishes to improve their chances of success.

The educational requirements needed differs across occupations and professions. This results in individuals being characterised by different cognitive styles (Agarwal & Woolley, 2013). These differences in cognition could be attributed to their differing educational backgrounds as improving education improved cognitive skills (Dahmann, 2017). This is supported by research having noted that companies with a more educated board of directors performed better (Scholtz & Kieviet, 2018) and that educational level affected directors' cognition (Johnson et al., 2013).

In noting that the nature of these differing educational backgrounds also fit the definition of a stable variable representing cognitive diversity within the acquired category as per Table 1, and that diversity in educational backgrounds increases the breadth of cognitive perspectives (Scholtz & Kieviet, 2018), the literature points to the use of educational background as a suitable proxy for measuring cognitive diversity.

Now, considering the roles and duties required to be fulfilled by the board of directors, as described earlier (Institute of Directors Southern Africa, 2017), it is expected that individuals would need to have attained some level of tertiary qualification in order to be considered for a board position particularly with respect to publicly traded companies. Thus, it is anticipated that board members would depict a degree of diversity with regards to their respective educational backgrounds from the perspective of the different qualifications attained by board members.

2.5 Company Financial Performance

There are both internal and external factors that impact a company's financial performance. Internal factors can be managed by the employees of the company and are within their control. Some examples of internal factors are productivity, employee remuneration, input costs, efficiency, research and development and, leases.

External factors are generally considered outside the control of employees however it is still their responsibility to manage the impact of these external factors on the business.

Some examples of external factors include economic growth, unemployment, inflation, climate change, legislation and, exchange rates.

Businesses across South Africa have experienced the impact of these external factors over the 2017 financial year. This is evident by the increase in the unemployment rate to its highest since 2003 reaching a peak of 27.7% which had a direct impact on consumer spending and thus business (Statistics South Africa, 2018). Headline consumer inflation (CPI) averaged 5.3% largely driven by the increase in transport costs which saw an increase of 50% in its contribution to CPI (Statistics South Africa, 2018). This was impacted by the volatile R/\$ exchange rate and surging international oil prices. This directly impacted business by pushing up operational costs. GDP growth was low and recorded at 1.3% for 2017 (Statistics South Africa, 2018).

A company's financial performance could be measured using either or both internal and external indicators. Internal indicators of performance are accounting-based measures whereas external indicators of performance are market-based measures. Accounting-based measures are concerned with backward looking, historical, data that are generally found in the company's annual financial statements. Examples include return on assets, return on equity, and profit margins. Market-based measures are considered forward looking and use data that are generally obtained through the stock market. Examples include market value, share price, dividend yield, and price to earnings ratio.

Prior research has used accounting-based measures, market-based measures or a combination of the two in assessing company performance. Amba (2014); Gupta and Sharma (2014), Liu, Wei, and Xie (2014), and Richard et al. (2013) used accounting-based measures for measuring company performance.

Conyon and He (2017), Cheong and Sinnakkanu (2014), Darmadi (2013), Frijns et al. (2016), Muchemwa et al. (2016), Scholtz and Kieviet (2018), and Wessels et al. (2016) used a mix of account-based and market-based measures for measuring company performance.

Andrevski et al. (2014), Erkens et al. (2012), Madanoglu and Karadag (2016), Ntim (2015), and Singh et al. (2018) used market-based measures for measuring company performance.

While the reporting standards that companies are required to adhere to when compiling their financial statements differ between countries, South African public companies are required to compile their financial statements according to the International Financial Reporting Standards as set by The International Accounting Standards Board as per Regulation 27 to the Companies Act (Act 71 of 2008).

In as much as these reporting standards desired to create consistency across the financial statements produced by companies, differences in the interpretation and application thereof could result in the disclosure of substantially different results. Thus, accounting-based measures were potentially open to manipulation.

Market-based measures on the other hand were considered less susceptible to manipulation as their determinants were not open to interpretation. Therefore, their use in measuring company performance allowed for comparisons across companies.

Further, the decisions taken by the board provided signals to the financial markets and have been shown to have a greater impact on market-based measures of performance than accounting-based measures (Kaczmarek et al., 2014). Therefore, the research selected a market-based measure for company financial performance.

2.6 Conclusion

The literature review explored the importance of ensuring adherence to and implementation of sound corporate governance standards and the impact on company financial performance. It then explored the role and responsibilities of the board of directors and the link to corporate governance. Factors that affected the performance of the board were then discussed with a focus on the diversity among board members. The many dimensions of diversity within boards were discussed and a gap in the literature was identified with respect to research studying the effects of cognitive diversity. The link between cognitive diversity and educational background was then explored with a further focus on qualifications attained by board members. Lastly, measures of company financial performance were explored.

Considering the literature reviewed, the conceptual framework upon which the proposed research will be based has been formulated as depicted in Figure 1.

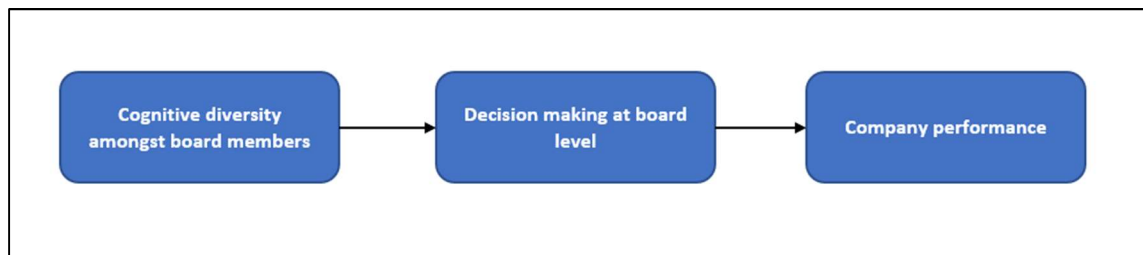


Figure 1. Conceptual framework of the research

The following chapter presents the hypotheses that have been formulated based on the findings from the literature review.

3. Research Hypotheses

3.1 Introduction

This chapter reiterates the purpose of the research and provides the hypotheses that have been formulated based on the literature review that was undertaken in Chapter 2.

3.2 Research Purpose

As described in chapter 1, the purpose of the research was to determine through empirical evidence the relationship between cognitive diversity (as measured by educational background) amongst board members and the financial performance of the companies sampled. This would be achieved by assessing whether there was a significant relationship between cognitive diversity amongst board members and corporate financial performance and the nature of the relationship between the variables. The author expected that there would be a significant positive relationship between the variables given the evidence provided by prior research as explored in Chapter 2.

3.3 Hypotheses

In accordance with the purpose of the research and the literature reviewed in Chapter 2, the following sets of hypotheses were developed which looked to assess the relationship between cognitive diversity among board members and company financial performance.

H₁: there is no correlation between cognitive diversity amongst board members and company financial performance

H_{1A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance

H_{1.1}: there is no correlation between cognitive diversity amongst board members and company financial performance in the Basic Materials industry

H_{1.1A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance in the Basic Materials industry

H_{1.2}: there is no correlation between cognitive diversity amongst board members and company financial performance in the Consumer Goods industry

H_{1.2A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance in the Consumer Goods industry

H_{1.3}: there is no correlation between cognitive diversity amongst board members and company financial performance in the Consumer Services industry

H_{1.3A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance in the Consumer Services industry

H_{1.4}: there is no correlation between cognitive diversity amongst board members and company financial performance in the Financials industry

H_{1.4A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance in the Financials industry

H_{1.5}: there is no correlation between cognitive diversity amongst board members and company financial performance in the Healthcare industry

H_{1.5A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance in the Healthcare industry

H_{1.6}: there is no correlation between cognitive diversity amongst board members and company financial performance in the Industrials industry

H_{1.6A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance in the Industrials industry

H_{1.7}: there is no correlation between cognitive diversity amongst board members and company financial performance in the Technology industry

H_{1.7A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance in the Technology industry

H_{1.8}: there is no correlation between cognitive diversity amongst board members and company financial performance in the Telecommunications industry

H_{1.8A}: there is a significant correlation between cognitive diversity amongst board members and company financial performance in the Telecommunications industry

3.4 Conclusion

The relevant hypotheses were formulated to test the variables in accordance with the purpose of the research. Chapter 4 presents the research methodology followed in testing the hypotheses.

4. Research Methodology

4.1 Introduction

This chapter aims to provide a detailed description of the research methodology that was undertaken to assess the hypotheses as formulated in Chapter 3. It addresses the choice of methodology, population under consideration, relevant units of analysis, the sampling method and the size of the resultant sample used for testing the proposed hypotheses, the measurement instruments that were used to conduct the required statistical tests, the data collection procedure, how the data was analysed and, the limitations of the research conducted.

4.2 Choice of Methodology

The research followed a highly structured approach which sort to establish a relationship at a point in time between the independent, cognitive diversity, and dependent, company financial performance, variables by testing a theoretical proposition, proposed conceptual framework as per Figure 1, with the emphasis being on obtaining quantifiable historic data that was analysed using statistical methods.

Given the above and according to Saunders, Lewis, and Thornhill (2009), the research can be described as a cross-sectional study of an explanatory nature which used an archival strategy to conduct quantitative research employing a deductive approach.

4.3 Population

A population can be described as any complete group that shares some common characteristics (Zikmund, Babin, Carr, & Griffin, 2013). For the purposes of this research, the population that was considered was all public companies listed on the Johannesburg Stock Exchange (JSE).

Listed companies are required to abide by certain stringent criteria which include the manner and form of their annual reporting (JSE, 2018). Listed public companies are also required to follow the accounting and reporting guidelines as contained in the International Financial Reporting Standards when compiling their annual integrated reports (IFRS, 2018). This provides a level of accuracy, consistency, and credibility to

the information presented specifically with regards to the financial data required for this research.

Additional benefits of focussing on listed companies is the availability of share price data and the requirement to disclose information about the board of directors in compliance with the Companies Act 2008 (Act 71 of 2008).

Therefore, as the research relied on the quality of the information contained in the integrated reports, share price data and information regarding the board of directors, the population as described aligned with the requirements of the research.

4.4 Unit of Analysis

The unit of analysis indicates what or who should provide the data and at what level of aggregation (Zikmund et al., 2013). Since the research was conducted using information about the qualifications attained by the board of directors and the financial data of publicly listed companies, the unit of analysis for measuring cognitive diversity were individual board members and the unit of analysis for measuring company performance were the individual companies listed on the JSE. This provided the requisite level of detail necessary to test the formulated hypotheses.

4.5 Sampling Method and Size

For the sample to be representative of the population statistically, a probability sampling method was used (Saunders & Lewis, Doing research in business and management, 2012). There are three types of probability sampling methods being simple random sampling, systematic random sampling, and stratified random sampling. The sample selected also needed to be representative of the population under consideration for the results to be extrapolated to the entire population. Therefore, simple random sampling, which ensures that each element in the population has an equal chance of being selected (Zikmund et al., 2013) was conducted.

A list of the companies listed on the main board of the JSE were extracted from Osiris. This list was exported into Microsoft Excel (Excel). Each company was assigned a number starting from one and increasing sequentially up to the total number of companies. The random number generator function in Excel was then used to create a

list of numbers between zero and the total number of companies. Companies were then selected using the vlookup function in Excel which matched the randomly generated numbers to the corresponding companies. A cross-check against the listed company data on IRESS was conducted to ensure that the sample contained only companies that were, in fact, listed on the main board of the JSE. Both Osiris and IRESS are subscription databases that were made accessible through the University of Pretoria with the assumption that the available data would be of a high quality and accuracy thus ensuring the integrity of the data used.

This provided an unbiased sample and accounted for company specific differences such as size (as measured by market capitalization), industry, nature of business, and so forth.

The sample size was further refined through the removal of companies where the necessary data pertaining to board member qualifications or the financial metrics required to calculate company financial performance could not be sourced from either the annual financial statements or the company websites.

The resultant sample size was then 122 companies representing companies across eight industries as per the industry classifications found on IRESS.

4.6 Measurement Instrument

There were two measures that were identified through the literature reviewed pertaining to diversity and company financial performance. Each of these measures required calculations based on the secondary data that was collected during the data collection process as detailed in section 4.7.

4.6.1 Measuring cognitive diversity (independent variable)

A list of qualifications was created by identifying the various qualifications obtained by board members. This information was sourced from the annual reports and, when not presented within the reports, from the respective company websites. The value assigned to each qualification was the count of the number of instances that a qualification appeared amongst members within a given company.

Past research into diversity made extensive use of Blau's index as an appropriate means of calculating the diversity of categorical variables (Andrevski et al., 2014; Cheong & Sinnakkanu, 2014; Franzoni & Rossi-Lamastra, 2017; Sanan, 2016) with Kilduff, Angelmar, and Mehra (2000) having specifically used it in measuring cognitive diversity. Thus, cognitive diversity was measured by calculating Blau's index using the data collected on qualifications attained by board members for the inputs.

This was calculated by applying the following formula:

$$B = (1 - \sum p_i^2) \quad (1)$$

where p_i is the fraction of individual qualifications compared to the total number of qualifications obtained by board members of the respective company (Kaczmarek et al., 2014). Higher values of B indicated higher levels of cognitive diversity.

4.6.2 Measuring company financial performance (dependent variable)

The literature reviewed regarding company financial performance established the use of market-based measures in assessing said performance. The most commonly used market-based measure identified through the literature was Tobin's q (Cheong & Sinnakkanu, 2014; Conyon & He, 2017; Darmadi, 2013; Frijns et al. 2016; Madanoglu & Karadag, 2016; Muchemwa et al., 2016; Scholtz & Kieviet, 2018; Singh et al., 2018).

Therefore, Tobin's q, defined as the ratio of a company's market value (MV) to book value of assets (BVA), was used as the appropriate measure of company financial performance. The benefit of using Tobin's q lies in its ability to capture the value of intangible intellectual capital which is not captured in traditional accounting systems (Wang, 2015).

MV was first calculated by applying the following formula:

$$MV = BVA - BVE + MVE \quad (2)$$

Where:

- i) BVA is the book value of assets
- ii) BVE is the book value of equity
- iii) MVE is the market value of equity

Thereafter Tobin's q was calculated by applying the following formula:

$$\text{Tobin's } q = \text{MV/BVA} \quad (3)$$

4.7 Data Collection

The research was conducted using secondary data. Many studies concerning company performance made use of secondary data obtained from stock exchanges (Kaczmarek et al., 2014), data vendors (Scholtz & Kieviet, 2018) and company annual reports. The benefit of using secondary data is that there is a relatively large amount of data available, it takes less time to find, it requires fewer resources to collect, and it can be combined with other forms of data to investigate phenomena more deeply (Ellram & Tate, 2016).

Data required to calculate the company's financial performance, Tobin's q, were gathered from the respective company annual integrated reports, financial data vendors (IRESS and Osiris), and a JSE company information database curated by Chris Muller and Mike Ward (GIBS University). The annual integrated reports and financial data vendors enabled the capturing of book value figures for assets and equity and the curated database allowed for the capturing of the required market value of equity figures.

The data relevant to the qualifications of the individual board members was manually captured and obtained from the integrated annual reports and the respective company websites. The qualification data was then combined and collated into tables in Excel to allow for ease of analysis. The data was also saved and stored to enable repeatability of the statistical tests conducted. This ensured the validity and reliability of the research outcomes.

4.8 Data Analysis

Once the original financial data had been collected it was then tabulated and summarised in Excel. A separate table was created to capture the qualifications attained by board members and summarised per company. The data analysis was conducted on the total sample as well as at the industry level.

4.8.1 Descriptive statistics

4.8.1.1 Board member qualifications

The total number of qualifications attained by board members was calculated by adding together the number of times each qualification was identified. The number of unique qualifications attained by board members was calculated by counting the number of different qualifications that were identified. Qualifications were also ordered by frequency so that the most common qualifications could be identified. The minimum, mean, maximum and, standard deviation of the total qualifications and unique qualifications data per sample were reported.

4.8.1.2 Company financial metrics

The financial metrics that were gathered were BVA, BVE and MVE. The minimum, mean and, maximum for each metric were reported.

4.8.2 Calculating cognitive diversity and company financial performance

4.8.2.1 Cognitive diversity

Blau's index was calculated by inputting the relevant data into Equation 1 to measure the degree of cognitive diversity present among board members. This was done by calculating the fraction of the total number of times that each qualification was present among board members against the total numbers of times that all qualifications appeared among board members for a given company. These fractions were then squared and summed together before being subtracted from one. The final figure calculated is then the value of Blau's index for the given company. Table 2 presents an example of the calculations.

Table 2. *Steps in calculating values for Blau's index.*

	BSc	BCom	MSc	CA	LLB	MA	BProc	MBA	Total
No. qualifications	2	2	2	8	1	3	1	2	21
Fraction	0.10	0.10	0.10	0.38	0.05	0.14	0.05	0.10	
Squared	0.01	0.01	0.01	0.15	0.00	0.02	0.00	0.01	0.21
Blau's index	0.79								

4.8.2.2 Company financial performance

Tobin's q was calculated by first inputting the relevant data into Equation 2. This output together with additional relevant data was then inputted into Equation 3 to measure company financial performance. This was done by first calculating the market value of the company by subtracting the book value of equity from the book value of assets and then adding the market value of equity. Thereafter the calculated market value was divided by the book value of assets. The final figure calculated is then the value of Tobin's q for the given company. Table 3 presents an example of the calculations.

Table 3. Steps in calculating values for Market Value and Tobin's q

Book Value Assets (BVA)	Book Value Equity (BVE)	Market value equity (MVE)	Market Value = BVA – BVE + MVE	Tobin's q = MV/BVA
1,165,979,000,000	119,060,000,000	154,282,146,071	1,201,201,146,071	1.03

The new data calculated for Blau's index and Tobin's q was then analysed using both Excel and a statistical software package namely, IBM SPSS. Descriptive (minimum, mean, maximum and, standard deviation) and statistical analyses were conducted on the newly calculated data.

4.8.3 Statistical analyses

4.8.3.1 Test for normality

A Shapiro-Wilk test was conducted to determine if the data calculated for Blau's index and Tobin's q were normally distributed. The following hypotheses were stated:

H_0 = the data is normally distributed

H_1 = the data is not normally distributed

The results of the test assisted in identifying whether to use parametric or non-parametric correlation tests of the variables.

4.8.3.2 Correlation

The strength of the linear association between two numeric variables can be measured through correlation analysis (Wegner, 2017). As the data used in the research was of a continuous nature, a correlation analysis was conducted to assess the relationship between cognitive diversity among board members and company financial performance.

The tests for normality identified that a non-parametric correlation test was needed and therefore Spearman's rho was calculated to assess the nature and strength of the relationship between the variables.

The values of the correlation co-efficient (r_s) lies between -1 and +1 with -1 indicating a strong negative association between the variables, 0 indicating no association between the variables and, +1 indicating a strong positive association between the variables (Taylor, 1990). The strength of the association was further described by applying the guidelines presented in Table 4.

Table 4. *Criteria for describing the strength of a correlation*

Coefficient value	Strength of the association
$ r < 0.35$	Low/weak correlation
$0.35 < r < 0.67$	Modest/moderate correlation
$0.67 < r < 0.90$	High/strong correlation
$ r > 0.9$	Very high correlation

Note: adapted from "Interpretation of the Correlation Coefficient: A Basic Review," by R. Taylor, 1990, *Journal of diagnostic medical sonography*, 6 (1).

The results of the correlations provided insights into the nature and strength of the relationship between cognitive diversity and company financial performance.

The statistical tests were conducted at the 5% level of significance which meant that the results generated were considered significant for $p < 0.05$.

4.9 Limitations

The cross-sectional nature of the study may not provide deep enough insight into the long-term effects of cognitive diversity amongst board members.

Using an archival strategy provided insights from an historical perspective but did not account for future changes that could impact the results of the study.

International Financial Reporting Standards could be interpreted differently amongst companies as it allowed for differences in the classification of certain items on their financial statements and thus created the potential for inconsistency of the financial results.

The population studied may not be representative of all companies across South Africa in general and thus the results of the study may only be applicable to publicly listed companies.

The measurement instruments used could be limiting due to the underlying assumptions mentioned previously. This could create difficulties in drawing comparisons across similar studies.

The qualification data of board members may be out-dated and more recent data may be difficult to access or obtain.

The use of educational background as a proxy for cognitive diversity may be an over simplification and additional variables may need to be incorporated.

4.10 Conclusion

The research methodology employed was described for the collection of all necessary data required for the calculation of the stipulated metrics and the identified statistical tests. The results obtained from following the methodology are presented in Chapter 5.

5. Results

5.1 Introduction

The following chapter sets out to present the results of the research as directed by the methodology described in Chapter 4. It begins with a description of the sample obtained, provides a view of the transformations computed to obtain the respective representative variables for cognitive diversity and company financial performance and presents the results of the statistical tests conducted to test the proposed hypotheses as formulated in Chapter 3.

5.2 Sample Obtained

The original list of JSE listed companies obtained from Osiris contained 291 entries. A random sample of companies was extracted from this list employing the procedure as described in section 4.5. This resulted in a sample of 175 companies. A check was then run to ensure that only companies that were listed on the main board of the JSE were in fact represented on the list. In addition, companies that were delisted or suspended from trading as well as those where there was insufficient information available were removed. The resultant sample that was used then consisted of 122 companies. The companies were representative of eight different industries as defined by IRESS.

Table 5. *Number of companies per industry*

JSE Industry classification	Companies per industry	
	Count	% of sample
Basic Materials	15	12%
Consumer Goods	9	7%
Consumer Services	20	16%
Financials	37	30%
Healthcare	3	2%
Industrials	29	24%
Technology	6	5%
Telecommunications	3	2%
Total	122	100%

Table 5 shows that the largest proportion of companies fell within the Financials industry with 37 companies representing 30% of the sample and the Industrials industry with 29 companies representing 24% of the sample. The smallest proportion of companies fill within the Healthcare and Telecommunications industries with 3 companies each representing 2% of the sample.

5.2.1 Board member qualifications

The qualifications obtained by board members were identified primarily through the annual integrated reports. Where board members qualification data was not found in the integrated annual reports then a search through the company's website was conducted and the required information was extracted accordingly. This data was captured manually into Excel.

Table 6. Summarised qualification data per industry

Sample	Number of qualifications per company			
	Maximum	<i>M</i>	Minimum	<i>SD</i>
Total	49	20	5	8.1
Basic Materials	45	21	10	9.5
Consumer Goods	30	22	13	5.6
Consumer Services	32	20	10	6.2
Financials	49	21	5	10.4
Healthcare	24	22	20	2.1
Industrials	37	18	7	6.6
Technology	28	15	10	6.4
Telecommunications	22	19	15	3.8

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company was five and the maximum number of qualifications that were obtained by board members of a company was 49 ($M = 20$, $SD = 8.1$).

Table 7. Summarised unique qualifications per industry

Sample	Number of unique qualifications per company				
	Total	Maximum	<i>M</i>	Minimum	<i>SD</i>
Total	117	20	11	4	3.9
Basic Materials	40	18	11	6	3.3
Consumer Goods	53	19	14	7	4.3
Consumer Services	56	18	12	4	3.6
Financials	76	20	11	4	4.4
Healthcare	29	19	14	11	4.2
Industrials	56	17	10	4	3.3
Technology	33	17	10	7	3.8
Telecommunications	22	15	12	10	2.9

As depicted in Table 7, there were 117 unique qualifications identified across all companies within the sample with board members of a company having obtained a minimum of four and a maximum of 20 unique qualifications ($M = 11$, $SD = 3.9$).

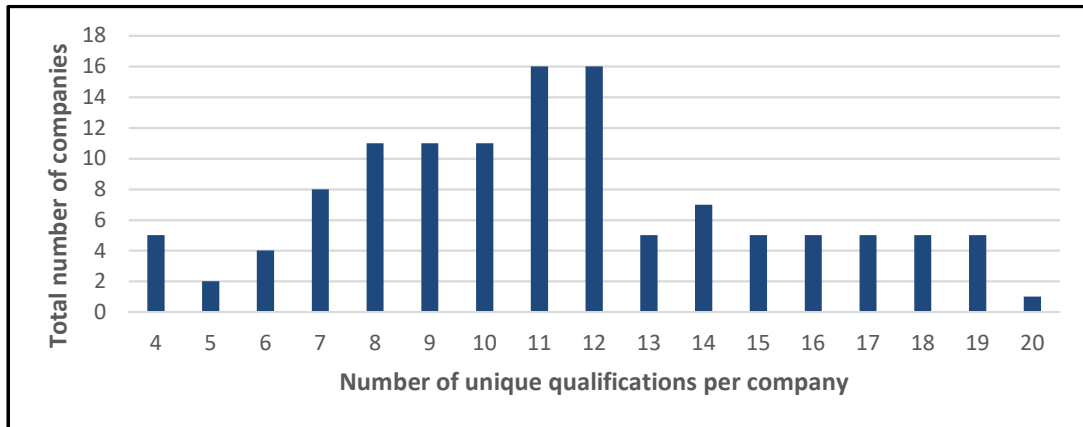


Figure 2. Unique qualifications per company for the total sample

Further, Figure 2 shows that there were five companies having the minimum number of unique qualifications obtained amongst board members and that there was one company having the maximum number of unique qualifications obtained amongst board members. Most of the companies (84 companies representing 69% of the sample) had a total of 12 or less unique qualifications obtained amongst board members.

Table 8. Qualification appearing most frequently per industry

Sample	Qualification	Frequency	Number of companies
Total	CA	478	119
Basic Materials	CA	58	15
Consumer Goods	CA	31	9
Consumer Services	CA	70	20
Financials	CA	160	35
Healthcare	CA	17	3
Industrials	CA	121	29
Technology	BCom	15	5
Telecommunications	CA	9	3

Additionally, Table 8 shows that the Chartered Accountant qualification appeared most frequently having been identified a total of 478 times across the sample with 119 companies that had at least one board member with the qualification.

5.2.1.1 Basic Materials industry

There was a total of 15 companies from the sample that were classified within the Basic Materials industry as shown in Table 5.

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company within the industry was 10 and the maximum number of qualifications that were obtained by board members of a company within the industry was 45 ($M = 21$, $SD = 9.5$).

As depicted in Table 7, there were 40 unique qualifications identified across all companies within the industry with board members of a company having obtained a minimum of six and a maximum of 18 unique qualifications ($M = 11$, $SD = 3.3$).

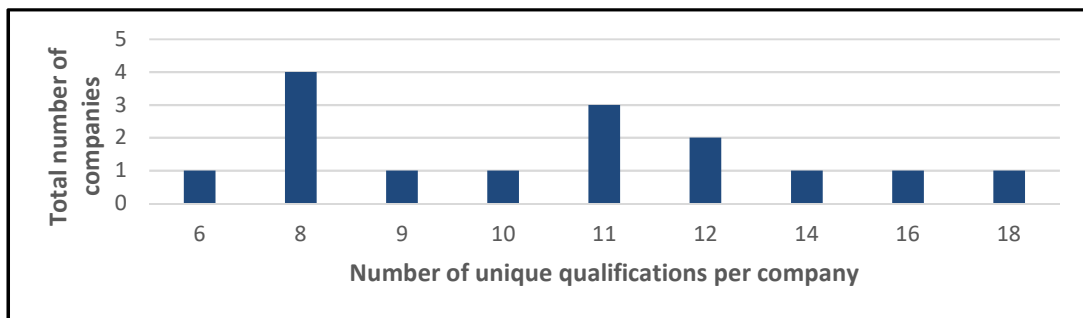


Figure 3. Unique qualifications per company for the Basic Materials industry sample

Further, Figure 3 shows that there was one company having the minimum number of unique qualifications obtained amongst board members and that there was one company having the maximum number of unique qualifications obtained amongst board members.

Additionally, Table 8 shows that the Chartered Accountant qualification appeared most frequently having been identified a total of 58 times across the sample with every company having at least one board member with the qualification.

5.2.1.2 Consumer Goods industry

There was a total of nine companies from the sample that were classified within the Consumer Goods industry as shown in Table 5.

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company within the industry was 13 and the maximum number of

qualifications that were obtained by board members of a company within the industry was 30 ($M = 22$, $SD = 5.6$).

As depicted in Table 7, there were 53 unique qualifications identified across all companies within the industry with board members of a company having obtained a minimum of seven and a maximum of 19 unique qualifications ($M = 14$, $SD = 4.3$).

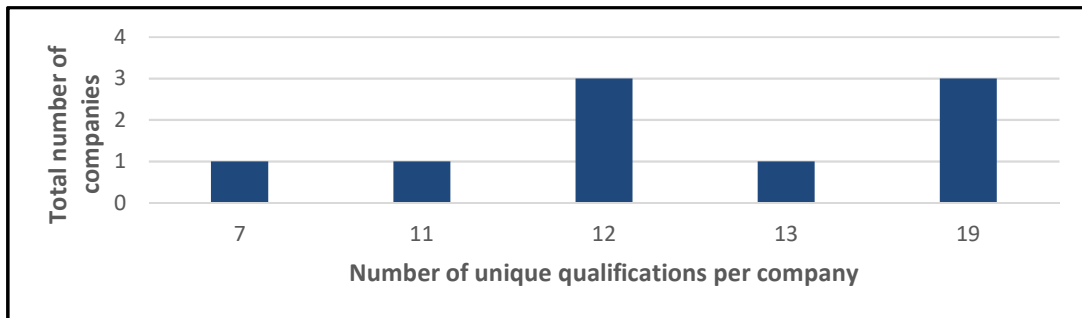


Figure 4. Unique qualifications per company for the Consumer Goods industry

Further, Figure 4 shows that there was one company having the minimum number of unique qualifications obtained amongst board members and that there were three companies having the maximum number of unique qualifications obtained amongst board members.

Additionally, Table 8 shows that the Chartered Accountant qualification appeared most frequently having been identified a total of 31 times across the sample with every company having at least one board member with the qualification.

5.2.1.3 Consumer Services industry

There was a total of 20 companies from the sample that were classified within the Consumer Services industry as shown in Table 5.

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company within the industry was 10 and the maximum number of qualifications that were obtained by board members of a company within the industry was 32 ($M = 20$, $SD = 6.2$).

As depicted in Table 7, there were 56 unique qualifications identified across all companies within the industry with board members of a company having obtained a minimum of four and a maximum of 18 unique qualifications ($M = 12$, $SD = 3.6$).

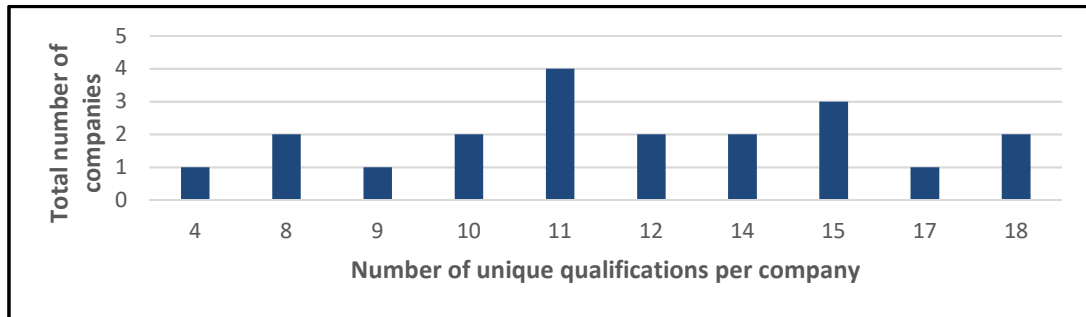


Figure 5. Unique qualifications per company for the Consumer Services industry

Further, Figure 5 shows that there was one company having the minimum number of unique qualifications obtained amongst board members and that there were two companies having the maximum number of unique qualifications obtained amongst board members.

Additionally, Table 8 shows that the Chartered Accountant qualification appeared most frequently having been identified a total of 70 times across the sample with every company having at least one board member with the qualification.

5.2.1.4 Financials industry

There was a total of 37 companies from the sample that were classified within the Financials industry as shown in Table 5.

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company within the industry was five and the maximum number of qualifications that were obtained by board members of a company within the industry was 49 ($M = 21$, $SD = 10.4$).

As depicted in Table 7, there were 76 unique qualifications identified across all companies within the industry with board members of a company having obtained a minimum of four and a maximum of 20 unique qualifications ($M = 11$, $SD = 4.4$).

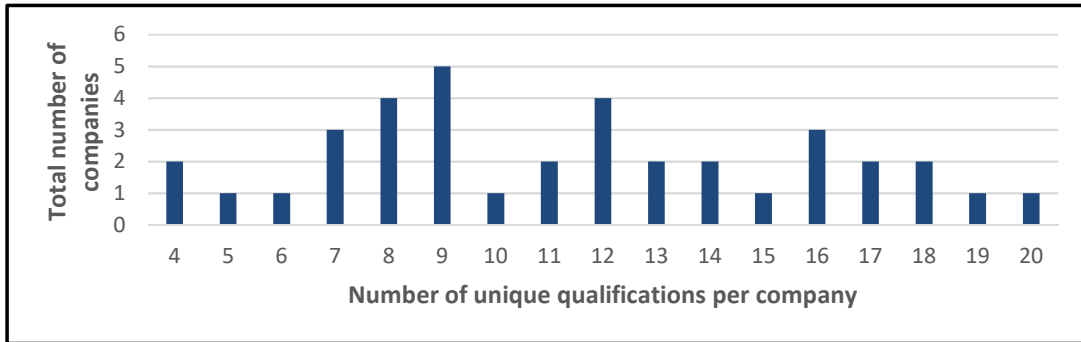


Figure 6. Unique qualifications per company for the Financials industry

Further, Figure 6 shows that there were two companies having the minimum number of unique qualifications obtained amongst board members and that there was one company having the maximum number of unique qualifications obtained amongst board members.

Additionally, Table 8 shows that the Chartered Accountant qualification appeared most frequently having been identified a total of 160 times across the sample with 35 companies having at least one board member with the qualification.

5.2.1.5 Healthcare industry

There was a total of three companies from the sample that were classified within the Healthcare industry as shown in Table 5.

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company within the industry was 20 and the maximum number of qualifications that were obtained by board members of a company within the industry was 24 ($M = 22$, $SD = 2.1$).

As depicted in Table 7, there were 29 unique qualifications identified across all companies within the industry with board members of a company having obtained a minimum of 11 and a maximum of 19 unique qualifications ($M = 14$, $SD = 4.2$).

Additionally, Table 8 shows that the Chartered Accountant qualification appeared most frequently having been identified a total of 17 times across the sample with every company having at least one board member with the qualification.

5.2.1.6 Industrials industry

There was a total of 29 companies from the sample that were classified within the Industrials industry as shown in Table 5.

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company within the industry was seven and the maximum number of qualifications that were obtained by board members of a company within the industry was 37 ($M = 18$, $SD = 6.6$).

As depicted in Table 7, there were 56 unique qualifications identified across all companies within the industry with board members of a company having obtained a minimum of four and a maximum of 17 unique qualifications ($M = 10$, $SD = 3.3$).

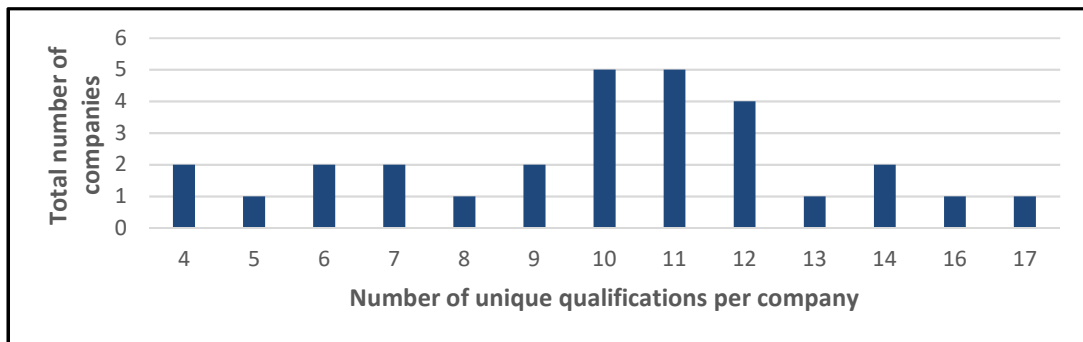


Figure 7. Unique qualifications per company for the Industrials industry

Further, Figure 7 shows that there were two companies having the minimum number of unique qualifications obtained amongst board members and that there was one company having the maximum number of unique qualifications obtained amongst board members.

Additionally, Table 8 shows that the Chartered Accountant qualification appeared most frequently having been identified a total of 121 times across the sample with every company having at least one board member with the qualification.

5.2.1.7 Technology industry

There was a total of six companies from the sample that were classified within the Technology industry as shown in Table 5.

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company within the industry was 10 and the maximum number of qualifications that were obtained by board members of a company within the industry was 28 ($M = 15$, $SD = 6.4$).

As depicted in Table 7, there were 33 unique qualifications identified across all companies within the industry with board members of a company having obtained a minimum of seven and a maximum of 17 unique qualifications ($M = 10$, $SD = 3.8$)

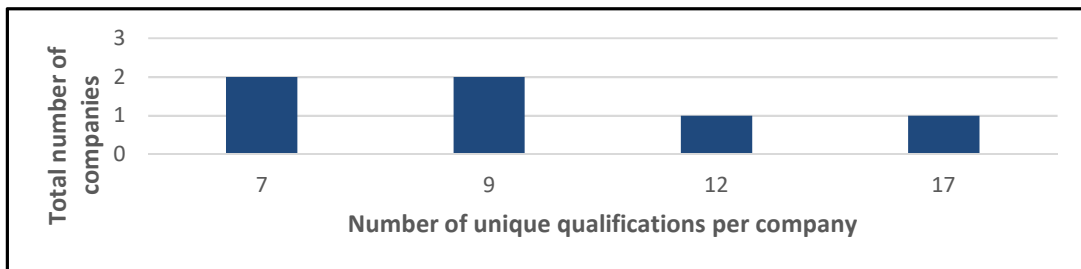


Figure 8. Unique qualifications per company for the Technology industry

Further, Figure 8 shows that there were two companies having the minimum number of unique qualifications obtained amongst board members and that there was one company having the maximum number of unique qualifications obtained amongst board members

Additionally, Table 8 shows that the Bachelor of Commerce qualification appeared most frequently having been identified a total of 15 times across the sample with five companies having at least one board member with the qualification.

5.2.1.8 Telecommunications industry

There was a total of three companies from the sample that were classified within the Telecommunications industry as shown in Table 5.

As depicted in Table 6, the minimum number of qualifications that were obtained by board members of a company within the industry was 15 and the maximum number of

qualifications that were obtained by board members of a company within the industry was 22 ($M = 19$, $SD = 3.8$).

As depicted in Table 7, there were 22 unique qualifications identified across all companies within the industry with board members of a company having obtained a minimum of 10 and a maximum of 15 unique qualifications ($M = 12$, $SD = 2.9$).

Additionally, Table 8 shows that the Chartered Accountant qualification appeared most frequently having been identified a total of 9 times across the sample with every company having at least one board member with the qualification.

5.2.2 Company financial metrics

The financial metrics that were required for calculating company financial performance, Tobin's q, included BVA, BVE and MVE. These metrics were extracted from the annual integrated reports, a financial data vendor (IRESS) and the curated database as described in section 4.7. The data was then captured into a table in Excel. A complete list of the financial data per company is presented in Appendix A.

Table 9. Summarised financial data for the total sample

Financial Metrics	Maximum ('000 000)	Mean ('000 000)	Minimum ('000 000)	Above Mean		Below Mean	
				Count	%	Count	%
BVA	2 027 928	73 383	64	13	11%	109	89%
BVE	190 017	14 434	- 1 520	28	23%	94	77%
MVE	1 268 523	36 339	18	21	17%	101	83%

As depicted in Table 9, values for BVA ranged from a minimum of approximately R64 million to a maximum of approximately R2.02 trillion with a mean of approximately R73.38 billion of which 13 companies (11%) had a BVA above the mean and 109 companies (89%) had a BVA below the mean.

Values for BVE ranged from a minimum of approximately negative R1.52 billion to a maximum of approximately R190.01 billion with a mean of approximately R14.43 billion of which 28 companies (23%) had a BVE above the mean and 94 companies (77%) had a BVE below the mean.

Values for MVE ranged from a minimum of approximately R18 million to a maximum of approximately R1.26 trillion with a mean of approximately R36.33 billion of which 21

companies (17%) had an MVE above the mean and 101 companies (83%) had an MVE below the mean.

5.2.2.1 Basic Materials industry

A complete list of the financial data per company within the industry is presented in Appendix B.

Table 10. *Summarised financial data for the Basic Materials industry*

Financial metrics	Maximum ('000 000)	Mean ('000 000)	Minimum ('000 000)	Above Mean		Below Mean	
				Count	%	Count	%
BVA	80 814	27 632	64	6	40%	9	60%
BVE	49 232	17 093	27	6	40%	9	60%
MVE	122 112	25 435	18	5	33%	10	67%

As depicted in Table 10, values for BVA ranged from a minimum of approximately R64 million to a maximum of approximately R80.81 billion with a mean of approximately R27.63 billion of which six companies (40%) had a BVA above the mean and nine companies (60%) had a BVA below the mean.

Values for BVE ranged from a minimum of approximately R27 million to a maximum of approximately R49,23 billion with a mean of approximately R17.09 billion of which six companies (40%) had a BVE above the mean and nine companies (60%) had a BVE below the mean.

Values for MVE ranged from a minimum of approximately R18 million to a maximum of approximately R122.11 billion with a mean of approximately R25.43 billion of which five companies (33%) had an MVE above the mean and 10 companies (67%) had an MVE below the mean.

5.2.2.2 Consumer Goods industry

A complete list of the financial data per company within the industry is presented in Appendix C.

Table 11. *Summarised financial data for the Consumer Goods industry*

Financial metrics	Maximum ('000 000)	Mean ('000 000)	Minimum ('000 000)	Above Mean		Below Mean	
				Count	%	Count	%
BVA	29 115	10 883	960	3	33%	6	67%
BVE	17 061	5 894	771	3	33%	6	67%
MVE	72 477	15 611	928	2	22%	7	78%

As depicted in Table 11, values for BVA ranged from a minimum of approximately R960 million to a maximum of approximately R29.11 billion with a mean of approximately R10.88 billion of which three companies (33%) had a BVA above the mean and six companies (67%) had a BVA below the mean.

Values for BVE ranged from a minimum of approximately R771 million to a maximum of approximately R17.06 billion with a mean of approximately R5.89 billion of which three companies (33%) had a BVE above the mean and six companies (67%) had a BVE below the mean.

Values for MVE ranged from a minimum of approximately R928 million to a maximum of approximately R72.47 billion with a mean of approximately R15.61 billion of which two companies (22%) had an MVE above the mean and seven companies (78%) had an MVE below the mean.

5.2.2.3 Consumer Services industry

A complete list of the financial data per company within the industry is presented in Appendix D.

Table 12. *Summarised financial data for the Consumer Services industry*

Financial metrics	Maximum ('000 000)	Mean ('000 000)	Minimum ('000 000)	Above Mean		Below Mean	
				Count	%	Count	%
BVA	55 723	16 428	226	7	35%	13	65%
BVE	27 749	7 159	0,306	5	25%	15	75%
MVE	1 268 523	82 583	87	3	15%	17	85%

As depicted in Table 12, values for BVA ranged from a minimum of approximately R226 million to a maximum of approximately R55.72 billion with a mean of approximately R16.42 billion of which seven companies (35%) had a BVA above the mean and 13 companies (65%) had a BVA below the mean.

Values for BVE ranged from a minimum of approximately R0,30 million to a maximum of approximately R27.74 billion with a mean of approximately R7.15 billion of which five companies (25%) had a BVE above the mean and 15 companies (75%) had a BVE below the mean.

Values for MVE ranged from a minimum of approximately R87 million to a maximum of approximately R1,26 trillion with a mean of approximately R82.58 billion of which three companies (15%) had an MVE above the mean and 17 companies (85%) had an MVE below the mean.

5.2.2.4 Financials Industry

A complete list of the financial data per company within the industry is presented in Appendix E.

Table 13. *Summarised financial data for the Financials industry*

Financial metrics	Maximum ('000 000)	Mean ('000 000)	Minimum ('000 000)	Above Mean		Below Mean	
				Count	%	Count	%
BVA	2 027 928	200 598	580	6	16%	31	84%
BVE	190 017	27 628	56	13	35%	24	65%
MVE	316 826	42 553	78	10	27%	27	73%

As depicted in Table 13, values for BVA ranged from a minimum of approximately R580 million to a maximum of approximately R2.02 trillion with a mean of approximately R200,59 billion of which six companies (16%) had a BVA above the mean and 31 companies (84%) had a BVA below the mean.

Values for BVE ranged from a minimum of approximately R56 million to a maximum of approximately R190.01 billion with a mean of approximately R27.62 billion of which 13 companies (35%) had a BVE above the mean and 24 companies (65%) had a BVE below the mean.

Values for MVE ranged from a minimum of approximately R78 million to a maximum of approximately R316.82 billion with a mean of approximately R42.55 billion of which 10 companies (27%) had an MVE above the mean and 27 companies (73%) had an MVE below the mean.

5.2.2.5 Healthcare Industry

Table 14. *Financial data for the Healthcare industry*

Company	BVA (‘000 000)	BVE (‘000 000)	MVE (‘000 000)
A	14,486	5,296	9,433
B	116,300	43,100	131,042
C	28,112	8,862	34,814

As depicted in Table 14, values for BVA ranged from a minimum of approximately R14.48 billion to a maximum of approximately R116.30 billion. Values for BVE ranged from a minimum of approximately R5.29 billion to a maximum of approximately R43,10 billion. Values for MVE ranged from a minimum of approximately R9.43 billion to a maximum of approximately R131.04 billion.

5.2.2.6 Industrials industry

A complete list of the financial data per company within the industry is presented in Appendix G.

Table 15. *Summarised financial data for the Industrials industry*

Financial metrics	Maximum (‘000 000)	Mean (‘000 000)	Minimum (‘000 000)	Above Mean		Below Mean	
				Count	%	Count	%
BVA	68 853	12 528	98	9	31%	20	69%
BVE	23 044	4 844	- 1 520	11	38%	18	62%
MVE	52 852	7 332	30	9	31%	20	69%

As depicted in Table 15, values for BVA ranged from a minimum of approximately R98 million to a maximum of approximately R68.85 billion with a mean of approximately R12.52 billion of which nine companies (31%) had a BVA above the mean and 20 companies (69%) had a BVA below the mean.

Values for BVE ranged from a minimum of approximately negative R1.52 billion to a maximum of approximately R23.04 billion with a mean of approximately R4.84 billion of

which 11 companies (38%) had a BVE above the mean and 18 companies (62%) had a BVE below the mean.

Values for MVE ranged from a minimum of approximately R30 million to a maximum of approximately R52.85 billion with a mean of approximately R7.33 billion of which nine companies (31%) had an MVE above the mean and 20 companies (69%) had an MVE below the mean.

5.2.2.7 Technology industry

A complete list of the financial data per company within the industry is presented in Appendix H.

Table 16. *Summarised financial data for the Technology industry*

Financial metrics	Maximum ('000 000)	Mean ('000 000)	Minimum ('000 000)	Above Mean		Below Mean	
				Count	%	Count	%
BVA	16 719	4 411	202	2	33%	4	67%
BVE	8 561	2 104	146	1	17%	5	83%
MVE	16 172	3 614	188	1	17%	5	83%

As depicted in Table 16, values for BVA ranged from a minimum of approximately R202 million to a maximum of approximately R16.71 billion with a mean of approximately R4.41 billion of which two companies (33%) had a BVA above the mean and four companies (67%) had a BVA below the mean.

Values for BVE ranged from a minimum of approximately R146 million to a maximum of approximately R8.56 billion with a mean of approximately R2.10 billion of which one company (17%) had a BVE above the mean and five companies (83%) had a BVE below the mean.

Values for MVE ranged from a minimum of approximately R188 million to a maximum of approximately R16.17 billion with a mean of approximately R3.61 billion of which one company (17%) had an MVE above the mean and five companies (83%) had an MVE below the mean.

5.2.2.8 Telecommunications industry

Table 17. *Financial data for the Telecommunications industry*

Company	BVA (‘000 000)	BE (‘000 000)	MVE (‘000 000)
D	8 690	5 004	10 589
E	936	74	1 527
F	131 365	70 652	263 496

As depicted in Table 17, values for BVA ranged from a minimum of approximately R936 million to a maximum of approximately R131.36 billion. Values for BVE ranged from a minimum of approximately R74 million to a maximum of approximately R70.65 billion. Values for MVE ranged from a minimum of approximately R1.52 billion to a maximum of approximately R263.49 billion.

5.3 Data transformations

5.3.1 Blau’s index

Blau’s index was calculated to measure the level of cognitive diversity amongst board members. The count of the number of times each unique qualification appeared amongst board members of a company was used in deriving the inputs into Equation 1 to calculate Blau’s index for each company. A complete list of the calculated value of Blau’s index per company is presented in Appendix A.

Table 18. *Summarised values of Blau’s index per industry*

Sample	Maximum	M	Minimum	No. of companies		SD
				Above Mean	Below Mean	
Total	.98	.87	.28	78	44	0.10
Basic Materials	.95	.86	.66	9	6	0.09
Consumer Goods	.94	.89	.82	5	4	0.05
Consumer Services	.95	.90	.78	13	7	0.05
Financials	.98	.85	.28	26	11	0.14
Healthcare	.90	.86	.81	2	1	0.05
Industrials	.98	.89	.62	19	9	0.07
Technology	.96	.93	.83	4	2	0.05
Telecommunications	.94	.91	.87	2	1	0.03

Table 18 shows that overall, the values of Blau’s index ranged from a minimum of .28 to a maximum of .98 ($M = .87$, $SD = 0.10$) of which 78 companies (64%) had a Blau’s index above the mean and 44 companies (36%) had a Blau’s index below the mean.

5.3.1.1 Basic Materials industry

A complete list of the calculated value of Blau's index per company within the industry is presented in Appendix B.

Table 18 shows that within the industry, the values of Blau's index ranged from a minimum of .66 to a maximum of .95 ($M = .86$, $SD = 0.09$) of which nine companies (60%) had a Blau's index above the mean and six companies (40%) had a Blau's index below the mean.

5.3.1.2 Consumer Goods industry

A complete list of the calculated value of Blau's index per company within the industry is presented in Appendix C.

Table 18 shows that within the industry, the values of Blau's index ranged from a minimum of .82 to a maximum of .94 ($M = .89$, $SD = 0.05$) of which five companies (56%) had a Blau's index above the mean and four companies (44%) had a Blau's index below the mean.

5.3.1.3 Consumer Services industry

A complete list of the calculated value of Blau's index per company within the industry is presented in Appendix D.

Table 18 shows that within the industry, the values of Blau's index ranged from a minimum of .78 to a maximum of .95 ($M = .90$, $SD = 0.05$) of which 13 companies (65%) had a Blau's index above the mean and seven companies (35%) had a Blau's index below the mean.

5.3.1.4 Financials industry

A complete list of the calculated value of Blau's index per company within the industry is presented in Appendix E.

Table 18 shows that within the industry, the values of Blau's index ranged from a minimum of .28 to a maximum of .98 ($M = .85$, $SD = 0.14$) of which 26 companies (70%) had a Blau's index above the mean and 11 companies (30%) had a Blau's index below the mean.

5.3.1.5 Healthcare industry

A complete list of the calculated value of Blau's index per company within the industry is presented in Appendix F.

Table 18 shows that within the industry, the values of Blau's index ranged from a minimum of .81 to a maximum of .90 ($M = .86$, $SD = 0.05$).

5.3.1.6 Industrials industry

A complete list of the calculated value of Blau's index per company within the industry is presented in Appendix G.

Table 18 shows that within the industry, the values of Blau's index ranged from a minimum of .62 to a maximum of .98 ($M = .89$, $SD = 0.07$) of which 19 companies (66%) had a Blau's index above the mean and nine companies (31%) had a Blau's index below the mean. There was one company (3%) that had a Blau's index equal to the mean.

5.3.1.7 Technology industry

A complete of the calculated value of Blau's index per company within the industry is presented in Appendix H.

Table 18 shows that within the industry, the values of Blau's index ranged from a minimum of .83 to a maximum of .96 ($M = .93$, $SD = 0.05$).

5.3.1.8 Telecommunications industry

A complete list of the calculated value of Blau's index per company within the industry is presented in Appendix I.

Table 18 shows that within the industry, the values of Blau's index ranged from a minimum of .87 to a maximum of .94 ($M = .91$, $SD = 0.03$).

5.3.2 Tobin's q

Tobin's q was calculated to measure company financial performance. The values obtained for BVE, BVA and MVE per company were used in calculating MV as per Equation 2. MV and BVA were then inputted into Equation 3 to calculate Tobin's q. A complete list of the calculated values of MV and Tobin's q per company is presented in Appendix A.

Table 19. Summarised values of Tobin's q per industry

Sample	Maximum	M	Minimum	No. of companies		SD
				Above Mean	Below Mean	
Total	36.06	1.71	0.25	25	97	3.45
Basic Materials	2.23	1.10	0.57	7	8	0.47
Consumer Goods	3.31	1.62	0.94	4	5	0.80
Consumer Services	36.06	3.64	0.27	3	17	7.72
Financials	1.90	1.02	0.25	21	16	0.36
Healthcare	1.92	1.65	1.29	2	1	0.33
Industrials	15.24	1.66	0.52	3	26	2.65
Technology	1.75	1.25	0.79	4	2	0.35
Telecommunications	2.55	2.22	1.64	2	1	0.50

Table 19 shows that the values of Tobin's q ranged from a minimum of 0.25 to a maximum of 36.06 ($M = 1.71$, $SD = 3.45$) of which 25 companies (20%) had a Tobin's q above the mean and 97 companies (80%) had a Tobin's q below the mean.

5.3.2.1 Basic Materials industry

A complete list of the calculated value of MV and Tobin's q per company within the industry is presented in Appendix B.

Table 19 shows that the values of Tobin's q ranged from a minimum of 0.57 to a maximum of 2.23 ($M = 1.10$, $SD = 0.47$) of which seven companies (47%) had a Tobin's q above the mean and eight companies (53%) had a Tobin's q below the mean.

5.3.2.2 Consumer Goods industry

A complete list of the calculated value of MV and Tobin's q per company within the industry is presented in Appendix C.

Table 19 shows that the values of Tobin's q ranged from a minimum of 0.94 to a maximum of 3.31 ($M = 1.62$, $SD = 0.80$) of which four companies (44%) had a Tobin's q above the mean and five companies (56%) had a Tobin's q below the mean.

5.3.2.3 Consumer Services industry

A complete list of the calculated value of MV and Tobin's q per company within the industry is presented in Appendix D.

Table 19 shows that the values of Tobin's q ranged from a minimum of 0.27 to a maximum of 36.06 ($M = 3.64$, $SD = 7.72$) of which three companies (15%) had a Tobin's q above the mean and 17 companies (85%) had a Tobin's q below the mean.

5.3.2.4 Financials industry

A complete list of the calculated value of MV and Tobin's q per company within the industry is presented in Appendix E.

Table 19 shows that the values of Tobin's q ranged from a minimum of 0.25 to a maximum of 1.90 ($M = 1.02$, $SD = 0.36$) of which 21 companies (57%) had a Tobin's q above the mean and 16 companies (43%) had a Tobin's q below the mean.

5.3.2.5 Healthcare industry

A complete list of the calculated value of MV and Tobin's q per company within the industry is presented in Appendix F.

Table 19 shows that the values of Tobin's q ranged from a minimum of 1.29 to a maximum of 1.92 ($M = 1.65$, $SD = 0.33$) of which two companies (67%) had a Tobin's q above the mean and one company (33%) had a Tobin's q below the mean.

5.3.2.6 Industrials industry

A complete list of the calculated value of MV and Tobin's q per company within the industry is presented in Appendix G.

Table 19 shows that the values of Tobin's q ranged from a minimum of 0.52 to a maximum of 15.24 ($M = 1.66$, $SD = 2.65$) of which three companies (10%) had a Tobin's q above the mean and 26 companies (90%) had a Tobin's q below the mean.

5.3.2.7 Technology industry

A complete list of the calculated value of MV and Tobin's q per company within the industry is presented in Appendix H.

Table 19 shows that the values of Tobin's q ranged from a minimum of 0.79 to a maximum of 1.75 ($M = 1.25$, $SD = 0.35$) of which four companies (67%) had a Tobin's q above the mean and two companies (33%) had a Tobin's q below the mean.

5.3.2.8 Telecommunications industry

A complete list of the calculated value of MV and Tobin's q per company within the industry is presented in Appendix I.

Table 19 shows that the values of Tobin's q ranged from a minimum of 1.64 to a maximum of 2.55 ($M = 2.22$, $SD = 0.50$) of which two companies (67%) had a Tobin's q above the mean and one company (33%) had a Tobin's q below the mean.

5.4 Results of the Statistical Tests

The descriptive statistics presented regarding the values of Blau's index and Tobin's q around the mean indicated that the data may not be normally distributed. A test for normality was therefore conducted on the samples. A Shapiro-Wilk test was conducted as the sample sizes were relatively small. Should the results for either variable indicate that the data did not follow a normal distribution then the normality assumption for parametric tests would no longer be satisfied and thus non-parametric tests would need to be conducted to test the hypotheses. The complete results of the normality tests are presented in Appendix J.

Table 20. Summarised results of the Shapiro-Wilk test for normality

Sample	Shapiro-Wilk p-value	
	Blau's index	Tobin's q
Total	.000	.000
Basic Materials	.027	.088
Consumer Goods	.337	.056
Consumer Services	.002	.000
Financials	.000	.318
Healthcare	.476	.488
Industrials	.000	.000
Technology	.011	.851
Telecommunications	.576	.160

Note: $p > .05$ indicates a normal distribution

Table 20 shows that data for the Consumer Goods industry ($p = .337$ and $p = .056$) and Healthcare industry ($p = .476$ and $p = .488$) were the only sets of data to satisfy the normality assumption. The rest of the sets of data demonstrated non-normal distributions. Also, Table 5 shows that the sample sizes for the Consumer Goods, Healthcare, Technology, and Telecommunications industries were not adequate for testing. Thus, a non-parametric test was selected for the remaining samples. This led to the selection of the Spearman's correlation to test the hypotheses.

5.4.1 The relationship between cognitive diversity and company financial performance

H₁: there is no correlation between cognitive diversity amongst board members and company financial performance

H_{1A}: there is a positive correlation between cognitive diversity amongst board members and company financial performance

A Spearman's correlation was conducted between Blau's index and Tobin's q to test the relationship between cognitive diversity amongst board members and company financial performance. The complete results of the correlation tests are presented in Appendix K.

Table 21. Summarised results of the Spearman's correlations

Sample	n	Correlation	
		r _s	P-value
Total	122	-.230	.011
Basic Materials	15	-.021	.940
Consumer Services	20	-.085	.721
Financials	37	-.564	.000
Industrials	29	-.259	.174

Note: $p > .05$ indicates a significant correlation

As shown in Table 21, the result for the total sample demonstrated that there was a weak negative correlation between the two variables that was significant, ($r_s(120) = -.230, p = .011$).

The result for the Basic Materials industry sample demonstrated that there was a weak negative correlation between the two variables that was not significant, ($r_s(13) = -.021, p = .940$).

The result for the Consumer Services industry demonstrated that there was a weak negative correlation between the two variables that was not significant, ($r_s(18) = -.085, p = .721$).

The result for the Financials industry sample demonstrated that there was a moderate negative correlation between the two variables that was significant, ($r_s(35) = -.564, p < .001$).

The result for the Industrials industry sample demonstrated that there was a weak negative correlation between the two variables that was not significant, ($r_s(27) = -.259$, $p = .174$).

5.5 Conclusion

The results obtained from the sampling and statistical testing have been presented. The Consumer Goods, Healthcare, Technology, and Telecommunications industries sample sizes were too small and thus could not be tested statistically. The data sets were shown to display non-normal distributions and thus a non-parametric test, Spearman's correlation, was selected to test the hypotheses. Significant correlation results were found for the total sample and Financials industry while those for the, Basic Materials industry, Consumer Services industry, and Industrials industry was found to be not significant. A discussion of these results follows in chapter 6.

6. Discussion of Results

6.1 Introduction

This chapter discusses the results presented in Chapter 5. The descriptive statistical results are discussed further. The inferential statistics are then discussed in relation to the literature reviewed in Chapter 2.

6.2 Samples Achieved

The final sample size that was achieved in following the methodology set out in Chapter 4 consisted of 122 companies spread across eight industries as depicted in Table 5. There were four industries where the sample sizes were considered insufficient and thus proved inadequate for statistical testing.

These were The Consumer Goods industry with nine companies, the Healthcare industry with three companies, the Technology industry with six companies and, the Telecommunications industry with three companies. This resulted in the related hypotheses not being tested although these results were included in the total sample.

6.3 Descriptive Statistics

This section discusses the results of the descriptive statistics for the sample discussed in the previous section. It is split into two subsections which focus on the qualification data and the financial data respectively.

6.3.1 Board member qualifications

In analysing the qualifications as depicted in Table 6, board members in the financial industry represented both the highest (with a board accounting for a total of 49 qualifications) and lowest (with a board accounting for a total of five qualifications) number of qualifications obtained when comparing across industries. It was further found that board members in the financial industry represented 76 unique qualifications obtained which was the highest across the industries.

Further interrogation of the unique qualification data revealed that the Chartered Account (CA) qualification appeared most frequently among board members in seven of the eight

industries. In most cases the difference between frequencies of appearance with the second most frequent qualification was considerable. The exception was the Technology industry where the Bachelor of Commerce qualification appeared most frequently however, this was closely followed by the CA qualification. In addition, the CA qualification was identified among board members for 119 of the 122 companies in the sample. The dominance of the CA qualification may have resulted in a dominant thinking pattern permeating through the board even though moderate to high levels of cognitive diversity were measured among board members.

Though certain qualifications were identified more frequently than others, the large number of unique qualifications identified among board members of the different companies provided an adequate degree of variability which then impacted the degree of variability in cognitive diversity that was calculated.

6.3.1.1 Measuring cognitive diversity – Blau's index

Blau's index was used as a measure of diversity across the literature. Research conducted by Andrevski et al. (2014); Cheong and Sinnakkanu (2014); Franzoni and Rossi-Lamastra (2017); Kilduff et al. (2000) and Sanan (2016) used Blau's index to measure diversity of the variables relevant to each of the studies. It was on this basis that Blau's index was considered as a suitable instrument for measuring diversity. The results provided a measure of the degree of diversity within a variable. In the context of this research it was applied as a means of measuring the degree of cognitive diversity amongst board members.

An understanding of what the values represent is imperative to interpreting the results. Values for Blau's index range between 0 and 1 due to the way in which they are calculated. On the one end values closer to 0 represent low levels of diversity with 0 indicating that all board members are the same and on the other end values closer to 1 represent high levels of diversity with 1 indicating that all board members are different (Kilduff et al., 2000).

The results displayed in Table 18 show that cognitive diversity among board members was broadly distributed with results ranging between .28 and .98 across the total sample. In addition, board members were considered relatively highly cognitively diversified as indicated by an overall sample mean Blau's index of .87.

At the industry level, Table 18 depicts that seven out of the eight industries demonstrated relatively moderate to high levels of cognitive diversity with minimum Blau's Index values above .6. The exception being the financials industry which consisted of the least cognitively diverse group of board members with a minimum Blau's index of .28. On average, companies within the financials industry had board members who were relatively highly cognitively diversified as indicated by a mean Blau's index of .85. Companies within the financials industry also displayed the largest range of .7 between the maximum and minimum results. Further, the most cognitively diverse groups of board members were found within both the industrials and financial industries with a maximum Blau's index of .98.

This indicates that cognitive diversity is present and varies among board members across the sample. Thus, the presence of and variability in cognitive diversity among board members was established.

6.3.2 Company financial metrics

The metrics used in calculating the financial performance of the companies consisted of BVA, BVE and, MVE. The data was collected from credible sources as described in Chapter 4. The collated data was then analysed using Excel and has been described in the previous chapter.

6.3.2.1 Measuring company financial performance – Tobin's q

The literature reviewed substantiated the use of market-based measures over accounting-based measures in assessing the financial performance of a company. Market-based measures were deemed less susceptible to manipulation when compared to accounting-based measures and thus allowed for greater comparisons across companies.

A commonly used market-based measure that was identified across the literature was Tobin's q. Research conducted by Cheong and Sinnakkanu (2014), Conyon and He (2017), Darmadi (2013), Frijns et al. (2016), Madanoglu and Karadag (2016), Muchemwa et al. (2016), Scholtz and Kieviet (2018), and Singh et al. (2018) used Tobin's q as a measure of a company's financial performance. In addition, its ability to capture the value

of intangible intellectual capital (Wang, 2015) collectively formed the basis for selecting Tobin's q as a suitable instrument for measuring a company's financial performance.

The values obtained for MV, by applying Equation 2, and BVA were then inputted into Equation 3 to obtain values for Tobin's q. As shown in Table 19, values for Tobin's q fell within a broad range between 0.25 and 36.06. However, most companies had values between 0.25 and 3.5. Further, the mean of 1.71 indicated that on average companies were valued at 70% over their book value of assets.

6.4 Inferential Statistics

This section discusses the results of the correlations presented in Chapter 5 that were conducted to test the hypotheses formulated in Chapter 3.

6.4.1 The relationship between cognitive diversity and company financial performance

H₁: there is no correlation between cognitive diversity amongst board members and company financial performance

H_{1A}: there is a correlation between cognitive diversity amongst board members and company financial performance

The results depicted in Table 21 read in conjunction with the criteria in Table 4 indicated that there was a weak negative correlation between cognitive diversity among board members and company financial performance for the total sample ($r_s(120) = -.230, p = .011$). The initial finding seemed to support prior research by Frijns et al. (2016) and Shehata et al. (2017) which found that there is a negative relationship between diversity and company financial performance.

Further inspection of the significance of the correlation ($p = .011$) revealed that the result was significant at the 5% level of significance and thus H₁ was rejected in favour of H_{1A}. This led to the conclusion that there is a significant negative correlation between cognitive diversity among board members and company financial performance within the total sample. This finding further supported prior research mentioned previously.

The sub hypotheses H_{1.1} to H_{1.8} were formulated to assess the relationship between cognitive diversity and company financial performance for each of the eight industries identified.

However, as noted previously, four of the eight industries had insufficient sample sizes to conduct the correlations and thus H_{1.2}, H_{1.5}, H_{1.7} and, H_{1.8} could not be tested. Therefore, no conclusions could be drawn for the affected industries. This meant that only hypotheses H_{1.1}, H_{1.3}, H_{1.4} and, H_{1.6} could be tested.

H_{1.1}: there is no correlation between cognitive diversity amongst board members and company financial performance within the Basic Materials industry

H_{1.1A}: there is a correlation between cognitive diversity amongst board members and company financial performance within the Basic Materials industry

The results depicted in Table 21 read in conjunction with the criteria in Table 4 indicated that there was a weak negative correlation between cognitive diversity and company financial performance within the Basic Materials industry ($r_s(13) = -.021, p = .940$). The initial finding seemed to support prior research by Frijns et al. (2016) and Shehata et al. (2017) which found that there is a negative relationship between diversity and company financial performance.

Further inspection of the significance of the correlation ($p = .940$) revealed that the result was not significant at the 5% level of significance and thus failed to reject H_{1.1}. This led to the conclusion that there is no correlation between cognitive diversity among board members and company financial performance within the Basic Materials industry. This finding then supported prior research by Schneid et al. (2016) which also found that there was no significant relationship between diversity and company financial performance which contradicted the initial finding.

H_{1.3}: there is no correlation between cognitive diversity amongst board members and company financial performance within the Consumer Services industry

H_{1.3A}: there is a correlation between cognitive diversity amongst board members and company financial performance within the Consumer Services industry

The results depicted in Table 21 read in conjunction with the criteria in Table 4 indicated that there was a weak negative correlation between cognitive diversity and company financial performance within the Consumer Services industry ($r_s(18) = -.085, p = .721$).

The initial finding seemed to support prior research by Frijns et al. (2016) and Shehata et al. (2017) which found that there is a negative relationship between diversity and company financial performance.

Further inspection of the significance of the correlation ($p = .721$) revealed that the result was not significant at the 5% level of significance and thus failed to reject $H_{1.3}$. This led to the conclusion that there is no correlation between cognitive diversity among board members and company financial performance within the Consumer Services industry. This finding then supported prior research by Schneid et al. (2016) which also found that there was no significant relationship between diversity and company financial performance which contradicted the initial finding.

$H_{1.4}$: there is no correlation between cognitive diversity amongst board members and company financial performance within the Financials industry

$H_{1.4A}$: there is a correlation between cognitive diversity amongst board members and company financial performance within the Financials industry

The results depicted in Table 21 read in conjunction with the criteria in Table 4 indicated that there was a moderate negative correlation between cognitive diversity and company financial performance within the Financials industry ($r_s(35) = -.564, p < .001$). The initial finding seemed to support prior research by Frijns et al. (2016) and Shehata et al. (2017) which also found negative relationships between diversity and company financial performance.

Further inspection of the significance of the correlation ($p < .001$) revealed that the result was significant at the 5% level of significance and thus $H_{1.4}$ was rejected in favour of $H_{1.4A}$. This led to the conclusion that there is a significant negative correlation between cognitive diversity among board members and company financial performance within the Financials industry. This finding further supported prior research mentioned previously.

$H_{1.6}$: there is no correlation between cognitive diversity amongst board members and company financial performance within the Industrials industry

$H_{1.6A}$: there is a correlation between cognitive diversity amongst board members and company financial performance within the Industrials industry

The results depicted in Table 21 read in conjunction with the criteria in Table 4 indicated that there was a weak negative correlation between cognitive diversity among board

members and company financial performance within the Industrials industry ($r_s(27) = -.259, p = .174$). The initial finding seemed to support prior research by Frijns et al. (2016) and Shehata et al. (2017) which found that there is a negative relationship between diversity and company financial performance.

Further inspection of the significance of the correlation ($p = .174$) revealed that the result was not significant at the 5% level of significance and thus failed to reject $H_{1.6}$. This led to the conclusion that there is no correlation between cognitive diversity and company financial performance within the Industrials industry. This finding then supported prior research by Schneid et al. (2016) which also found that there is no significant relationship between diversity and company financial performance and contradicted the initial finding.

In summary, the findings indicate that there is a negative relationship between cognitive diversity among board members and company financial performance.

Prior research found that improved levels of education had a positive impact on cognition (Dahmann, 2017; Johnson et al., 2013) and that in dealing with complex decisions it was found that diversity among team members enabled better outcomes (Mangelsdorf, 2018) and therefore deemed better at performing financially (Nelson, 2014). The benefits of diversity were further supported by Andrevski et al. (2014); Ayub and Jehn (2018); Cheong and Sinnakkanu (2014); Conyon and He (2017); Estelyi and Nisar (2016); Iturralde et al. (2016); Mazibuko and Govender (2017); Nielsen and Nielsen (2013); Ntim (2015); O'Sullivan et al. (2016) and Richard et al. (2013) who found that a significant positive relationship existed between diversity and company financial performance. Therefore, the contradictory findings discussed of negative relationships between cognitive diversity among board members and company financial performance were unexpected.

Further, the significant negative relationships between cognitive among board members and company financial performance for the total sample and Financials industry provided evidence in support of prior research by Frijns et al. (2016) and Shehata et al. (2017).

Frijns et al. (2016) found that the negative relationship was more concentrated among independent board members. This may explain the negative relationships found in the research as South African companies corporate governance practices are guided by the King IV Code which stipulates that the governing body should comprise a majority of independent non-executive members (Institute of Directors Southern Africa, 2017).

The South African context posed its own challenges as certain racial groups were historically excluded from economic activity with the result that most board members were older white males. Company boards experienced a dramatic shift in their composition with the introduction of democracy and legislation targetted at promoting racial diversity and inclusion. This resulted in board's consisting of new members from diverse races, age groups and genders. Shehata et al. (2017) found that age diveristy and gender diversity were negatively related to company financial performance. While Andrevski et al. (2014); Cheong and Sinnakkanu (2014); Mazibuko and Govender (2017) and Richard et al. (2013) found that racial diveristy was positively related to company financial performance. Therefore it would seem that the negative effects of gender and age diveristy on company financial performance may have been more pronounced amongst the sample and thus negated the positive effects of racial and cognitive diversity.

Additionally, the increased conflict and reduced communication among board members stemming from increased diversity may have also contributed to the negative relationships between the variables (Cheong & Sinnakkanu, 2014).

Controlling for these variables may have resulted in different results. This is elaborated upon in the following chapter.

6.5 Conclusion

The discussion explored the results presented in the preceding chapter further revealing additional insights. The findings supported some of the prior research while contradicting others. Thus, the mixed results further contributed to the ambiguity surrounding the effect of diversity and company financial performance. Significant results were found for the total sample and Financials industry with the results for the remaining industries considered not significant. The implications of this were then discussed. The overall objective of the research which was to assess the relationship between cognitive diversity among board members and company financial performance has thus been met.

7. Conclusion

The research began with an introduction to the problem identified and followed with an in-depth literature review which provided the basis of the hypotheses that were formulated for testing. A detailed description of the methodology was then discussed followed by a presentation of the results obtained. These results were then discussed further in the context of prior research.

7.1 Principal Findings

The sampling method used to identify companies from which to gather data, while proving sufficient at the combined level, was found to have resulted in sample sizes in certain industries that were too small for testing. Thus, the hypotheses for the Consumer Goods industry, Healthcare industry, Technology industry and Telecommunications industry could not be tested.

The research findings indicated a negative relationship between cognitive diversity among board members and company financial performance for the samples that could be tested. Further, significant negative relationships between the variables were found for the total sample and financials industry. These findings were unexpected, and possible reasons were discussed considering prior research.

7.2 Implications for Management

Business needs to be cognisant of the negative impact that cognitive diversity could have on the board of directors, and its effect on the performance of the company. In as much as previous research points towards the benefits of increasing cognitive diversity, such as improved innovation (Cheong & Sinnakkanu, 2014; Nelson, 2014) and more effective decision making (Reynolds & Lewis, 2017), there are potential negative consequences as demonstrated by this study. By becoming aware of and in seeking to understand the drivers of these negative consequences, companies can be better prepared to deal with them appropriately. This could lead to the design and implementation of relevant measures in the form of programmes or processes to mitigate the impact of these negative consequences. Doing so would allow companies to continue harnessing the benefits that cognitive diversity brings to an organisation.

In a time where innovation is moving at an ever-increasing pace, the importance of creativity has never been greater. Cognitive diversity fosters and enhances creativity among teams (Hillman, 2015) and should therefore be promoted and managed in a manner that adds value to the organisation. In addition, the rapid advancements in technology as witnessed in what is commonly termed the 4th Industrial Revolution necessitates that board members are adequately skilled and educated to understand and deal with these changes. If this is not managed appropriately, boards run the risk of being ill-equipped to deal with the vast amounts of new information necessary for making strategic decisions in this new business environment. This may result in decisions being taken that are not in the long-term interests of the company and could result in their eventual collapse.

It must be noted that the need to learn and adapt to the changing business landscape is not a new phenomenon, as evidenced by the collapse of industry leaders such as Kodak (Shih, 2016), Blockbuster Video (Davis & Higgins, 2013) and Pan Am (Sipika & Smith, 1993) among many others. The failure to truly capture the impact of new technologies has had board members of these companies making decisions that ultimately led to their destruction.

Given that ensuring the sustainable performance of the company is core to the role of board members (Institute of Directors Southern Africa, 2017) it can be inferred that ensuring that board members are adequately skilled to tackle the challenges posed by these advancements is aligned with good corporate governance practices. It is essential for boards to embrace cognitive diversity, but at the same time, it is crucial to manage the negative consequences of this diversity.

Companies would therefore need to ensure that their board member nomination and selection criteria considers the impact that new board members would have, including the degree of cognitive diversity among board members. The need for diversification would also need to be made evident to stakeholders, and initiatives to educate stakeholders on the risks and benefits thereof should be implemented.

7.3 Limitations of the Research

Several limitations have been identified that affected the research. These limitations consider both those posed in Chapter 4 as well as those that were unearthed in conducting the research.

The cross-sectional nature of the research meant that the effect of changes in cognitive diversity and its relationship with company financial performance could not be assessed.

Using an archival strategy provided valuable insights from an historical perspective, but did not account for any future changes which could have impacted on the variables, and thus yielded a different set of results.

International Financial Reporting Standards are open to interpretation and could therefore be interpreted differently by companies when drafting their financial statements. They allow for differences in the classification of certain items on their financial statements, and thus create the potential for inconsistency of the financial results.

The sample sizes achieved for certain industries were not adequate for testing, and prevented any conclusions being drawn about the relationship between cognitive diversity among board members and company financial performance within the affected industries.

The data obtained of board members qualifications was potentially inaccurate; not all qualifications were displayed as there are no requirements, legal or otherwise, currently in place for such disclosure. Furthermore, some companies had no data concerning board member qualifications, and had to be removed from the sample. An interrogation of the unique qualification data revealed the dominance of the CA qualification, which could have also impacted the findings. Additionally, the different naming conventions of qualifications across institutions created the potential of artificially increasing the number of truly unique qualifications. This had a direct impact on the measurement of Blau's index as a proxy for cognitive diversity.

The research did not control for the effect of other diversity variables which have been shown to affect company financial performance.

7.4 Recommendations for Future Research

Future research could look to address the limitations mentioned in the previous section. It is suggested that researchers consider conducting a longitudinal study across the entire population to account for the exogenous variables that affect company financial

performance. This would also allow for assessing the relationship between changes in cognitive diversity and company financial performance.

Researchers should consider using alternative sets of variables as proxies for cognitive diversity and company financial performance, which may be more precise.

Researchers should consider studying the combination of qualifications among board members and company performance. This may lead to creating a better understanding of the combination of qualifications that yield the best results.

A qualitative study could be conducted using in-depth interviews to assess cognitive diversity within boards in terms of the effect on decision making and team dynamics.

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Appendices

Appendix A Total sample data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Biau's Index	Total unique qualifications	Total qualifications
ABS GROUP LIMITED	Financials	1 165 979 000 000	119 060 000 000	154 282 146 071	1 201 201 146 071	1.03	0.79	8	21
ACSION LIMITED	Financials	7 964 923 000	6 017 295 000	2 764 719 832	4 712 347 832	0.59	0.97	7	4
ADAPTIT HOLDINGS LTD	Technology	1 086 447 000	668 537 000	1 486 818 098	1 904 728 098	1.75	0.96	7	10
ADCORP HOLDINGS LTD	Industrials	4 530 798 000	1 602 589 000	1 903 315 424	4 831 524 424	1.07	0.84	12	23
ADVTECH LTD	Consumer Services	5 558 800 000	2 880 100 000	9 172 609 731	11 851 309 731	2.13	0.93	17	21
AECI LTD	Basic Materials	15 971 000 000	9 356 000 000	12 182 308 300	18 797 908 300	1.18	0.92	11	17
AFRICAN EQUITY EMPOWERMENT INVESTMENTS LTD	Financials	2 822 153 000	2 038 120 000	1 719 688 019	2 503 721 019	0.89	0.96	12	14
AFRICAN MEDIA ENTERTAINMENT LTD	Consumer Services	348 549 000	261 882 000	370 865 430	457 532 430	1.31	0.92	8	14
AFRICAN PHOENIX INVESTMENTS LTD	Financials	2 018 000 000	1 826 000 000	899 013 320	1 091 013 320	0.54	0.90	8	17
AFRICAN RAINBOW MINERALS LTD	Basic Materials	32 246 000 000	24 040 000 000	18 438 804 150	26 644 804 150	0.83	0.66	18	45
ALVIVA HOLDINGS LTD	Technology	4 749 422 000	2 020 223 000	3 277 746 249	6 006 945 249	1.26	0.95	9	13
ANDULELA INVESTMENT HOLDINGS LTD	Financials	694 833 000	123 331 000	78 880 352	650 382 352	0.94	0.97	6	8
ANGLO AMERICAN PLATINUM LTD	Basic Materials	80 814 000 000	41 001 000 000	95 321 759 426	135 134 759 426	1.67	0.90	8	16
ARB HOLDINGS LTD	Industrials	1 522 569 000	1 069 808 000	1 480 500 000	1 935 261 000	1.27	0.95	5	8
ARCELORMITTAL SA LTD	Basic Materials	31 196 000 000	8 058 000 000	4 404 291 523	27 542 291 523	0.88	0.88	11	21
ASCENDIS HEALTH LTD	Healthcare	14 486 617 000	5 296 342 000	9 433 727 491	18 624 002 491	1.29	0.87	11	20
ASPEN PHARMACARE HOLDINGS LTD	Healthcare	116 300 000 000	43 100 000 000	131 042 541 614	204 242 541 614	1.76	0.81	13	23
ASSORE LTD	Basic Materials	25 321 531 000	22 624 952 000	27 203 820 020	29 900 399 020	1.18	0.92	11	18
ASTRAL FOODS LTD	Consumer Goods	5 356 262 000	3 032 988 000	7 372 042 283	9 695 316 283	1.81	0.93	19	23
ATTACQ LTD	Financials	27 322 191 000	13 903 613 000	12 714 649 926	26 133 227 926	0.96	0.89	9	15
BALWIN PROPERTIES LTD	Financials	3 631 122 000	2 311 906 000	2 663 166 219	3 982 382 219	1.10	0.90	9	17
BAUBA PLATINUM LTD	Basic Materials	302 582 000	27 094 000	246 363 162	521 851 162	1.72	0.94	9	14
BID CORPORATION LTD	Consumer Services	54 445 941 000	23 671 520 000	100 359 648 315	131 134 069 315	2.41	0.86	10	17
BLUE LABEL TELECOMS LTD	Telecommunications	8 690 270 000	5 004 442 000	10 589 791 959	14 275 619 959	1.64	0.94	10	15
BOWLER METCALF LTD	Industrials	758 540 000	661 247 000	557 096 816	654 389 816	0.86	0.94	6	11
CALGRO M3 HOLDINGS LTD	Industrials	3 226 468 000	1 167 682 000	1 826 292 914	3 885 078 914	1.20	0.96	10	12
CAXTON CTP PUBLISHERS AND PRINTERS	Consumer Services	7 228 747 000	5 729 123 000	4 747 169 520	6 246 799 520	0.86	0.94	8	13
CITY LODGE HOTELS LTD	Consumer Services	2 350 860 000	934 311 000	6 105 785 418	7 522 334 418	3.20	0.92	10	17
CLICKS GROUP LTD	Consumer Services	9 721 115 000	3 300 350 000	36 600 182 438	43 020 947 438	4.43	0.93	12	17
CLOVER INDUSTRIES LTD	Consumer Goods	6 048 143 000	2 879 683 000	3 158 325 274	6 326 785 274	1.05	0.88	11	20
COGNITION HOLDINGS LTD	Technology	202 525 000	146 849 000	207 799 855	263 475 855	1.30	0.92	7	13
COMAIR LTD	Consumer Services	5 918 440 000	1 542 171 000	2 417 053 955	6 792 776 955	1.15	0.78	15	31
CONSOLIDATED INFRASTRUCTURE GROUP	Industrials	7 011 627 000	3 839 348 000	2 839 379 519	6 011 658 519	0.86	0.90	10	17
CSG HOLDINGS LTD	Industrials	1 017 282 000	641 457 000	618 180 101	994 005 101	0.98	0.89	11	18
DELTA EMD LTD	Basic Materials	107 406 000	95 352 000	49 165 553	61 219 553	0.57	0.95	6	10
E MEDIA HOLDINGS LTD	Consumer Services	7 357 557 000	5 558 961 000	191 430 732	1 990 026 732	0.27	0.94	9	14
ECSPONENT LTD	Financials	1 214 817 000	1 017 482 000	106 752 840	304 087 840	0.25	0.95	7	10
EFFICIENT GROUP LTD	Financials	580 958 000	267 998 000	362 371 892	675 331 892	1.16	0.76	12	26
ENX GROUP LTD	Industrials	9 650 864 000	2 715 250 000	2 887 030 832	9 822 644 832	1.02	0.84	14	22
EOH HOLDINGS LTD	Technology	16 719 983 000	8 561 604 000	16 172 786 569	24 331 165 569	1.46	0.83	17	28
EXTRACT GROUP LIMITED	Industrials	1 267 000 000	- 1 520 000 000	30 414 180	2 817 414 180	2.22	0.86	7	16
EXXARO RESOURCES LTD	Basic Materials	62 552 000 000	39 365 000 000	58 289 847 525	81 476 847 525	1.30	0.77	16	34
FAMOUS BRANDS LTD	Consumer Services	5 905 791 000	1 632 027 000	12 297 224 505	16 570 988 505	2.81	0.95	11	15
FINBOND GROUP LTD	Financials	3 309 286 000	1 170 732 000	2 528 777 186	4 667 331 186	1.41	0.88	11	20

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Biau's Index	Total unique qualifications	Total qualifications
FIRSTRAND LTD	Financials	1 217 707 000 000	117 184 000 000	264 487 359 247	1 365 010 359 247	1.12	0.28	20	49
FORTRESS REIT LTD A	Financials	62 065 981 000	45 112 563 000	20 166 686 569	37 120 104 569	0.60	0.91	17	23
GAIA INFRASTRUCTURE CAPITAL LTD	Financials	586 718 000	58 058 000	330 906 000	859 566 000	1.47	0.88	11	21
GEMGROW PROPERTIES LTD A	Financials	4 943 671 000	3 846 011 000	454 581 149	1 552 241 149	0.31	0.92	5	12
GRINDROD LTD	Consumer Services	34 948 970 000	14 197 482 000	10 408 852 736	31 160 340 736	0.89	0.82	15	26
GROWTHPOINT PROPERTIES LTD	Financials	126 857 000 000	78 754 000 000	70 709 564 007	118 812 564 007	0.94	0.87	13	22
HOSKEN CONSOLIDATED INVESTMENTS LTD	Financials	70 535 765 000	37 749 555 000	13 165 757 819	45 951 965 819	0.65	0.96	8	11
HUGE GROUP LTD	Telecommunications	936 492 000	74 453 000	1 527 738 070	2 389 777 070	2.55	0.87	10	21
HULAMINI LTD	Basic Materials	7 230 066 000	4 648 677 000	1 965 520 541	4 546 909 541	0.63	0.77	12	29
HULISANI LTD	Financials	584 315 000	412 524 000	450 000 180	621 791 180	1.06	0.94	7	11
IMPALA PLATINUM HOLDINGS LTD	Basic Materials	73 481 000 000	49 232 000 000	27 076 583 229	51 325 583 229	0.70	0.77	11	28
IMPERIAL HOLDINGS LTD	Industrials	68 853 000 000	20 702 000 000	32 383 536 941	80 534 536 941	1.17	0.62	17	37
INVESTEC LTD	Financials	57 616 844 000	5 124 158 000	28 673 494 816	81 166 180 816	1.41	0.75	15	34
INVICTA HOLDINGS LTD	Industrials	10 314 845 000	5 089 771 000	5 478 984 269	10 704 058 269	1.04	0.91	9	16
JASCO ELECTRONICS HOLDINGS LTD	Technology	731 261 000	249 401 000	188 041 737	669 901 737	0.92	0.96	12	14
JSE LTD	Financials	38 687 969 000	3 626 381 000	13 365 249 984	48 426 837 984	1.25	0.85	17	30
KAAP AGRIL LTD	Consumer Services	3 386 131 000	1 582 634 000	3 693 679 795	5 497 176 795	1.62	0.91	15	22
KAP INDUSTRIAL HOLDINGS LTD	Industrials	26 978 000 000	11 348 000 000	21 643 680 870	37 273 680 870	1.38	0.87	10	18
KUMBA IRON ORE LTD	Basic Materials	62 466 000 000	45 546 000 000	122 112 455 323	139 032 455 323	2.23	0.86	14	25
LEWIS GROUP LTD	Consumer Services	6 784 700 000	5 448 500 000	4 013 904 484	5 350 104 484	0.79	0.94	11	14
LIBERTY HOLDINGS LTD	Financials	444 127 000 000	30 391 000 000	35 612 161 272	449 348 161 272	1.01	0.79	16	32
LONG 4 LIFE LTD	Financials	5 144 377 000	4 523 863 000	4 938 255 507	5 588 769 507	1.08	0.65	7	26
MASSMART HOLDINGS LTD	Consumer Services	32 316 100 000	6 391 400 000	30 300 481 535	56 225 181 535	1.74	0.94	12	16
MAZOR GROUP LTD	Industrials	324 857 000	258 282 000	164 027 163	230 602 163	0.71	0.95	4	8
MERAFE RESOURCES LTD	Basic Materials	6 355 447 000	4 635 525 000	3 740 949 330	5 460 871 330	0.86	0.91	8	14
METAIR INVESTMENTS LTD	Consumer Goods	8 105 218 000	4 475 537 000	4 278 196 549	7 907 877 549	0.98	0.94	13	17
METROFILE HOLDINGS LTD	Industrials	98 107 000	647 643 000	2 045 159 260	1 495 623 260	15.24	0.81	11	24
MIX TELEMATICS LTD	Industrials	1 993 325 000	1 517 181 000	4 466 664 872	4 942 808 872	2.48	0.90	10	17
MURRAY AND ROBERTS HOLDINGS LTD	Industrials	14 203 000 000	6 605 200 000	5 812 701 062	13 410 501 062	0.94	0.90	13	21
MUSTEK LTD	Technology	2 980 199 000	978 461 000	351 090 000	2 352 828 000	0.79	0.95	9	13
NAMPAK LTD	Industrials	25 229 900 000	9 681 100 000	12 133 518 390	27 682 318 390	1.10	0.83	11	24
NASPERS LTD	Consumer Services	35 451 000 000	25 691 000 000	1 268 523 137 659	1 278 283 137 659	36.06	0.84	14	27
NEDBANK GROUP LTD	Financials	983 314 000 000	88 539 000 000	127 565 692 875	1 022 340 692 875	1.04	0.60	18	41
NETCARE LTD	Healthcare	28 112 000 000	8 862 000 000	34 814 872 740	54 064 872 740	1.92	0.90	19	24
NIVEUS INVESTMENTS LTD	Financials	1 627 613 000	1 400 212 000	967 601 400	1 195 002 400	0.73	0.96	8	11
NOVUS HOLDINGS LTD	Industrials	3 773 482 000	2 790 759 000	1 590 782 639	2 573 505 639	0.68	0.91	11	19
NU-WORLD HOLDINGS LTD	Consumer Goods	1 370 388 000	1 014 246 000	928 505 065	1 284 647 065	0.94	0.93	7	13
OCEANA GROUP LTD	Consumer Goods	10 043 225 000	3 756 629 000	11 157 868 259	17 444 464 259	1.74	0.90	12	18
OMNIA HOLDINGS LTD	Basic Materials	15 402 000 000	7 483 000 000	10 280 527 968	18 199 527 968	1.18	0.81	8	22
PIONEER FOOD GROUP LTD	Consumer Goods	12 972 445 000	8 052 265 000	26 313 532 424	31 233 712 424	2.41	0.86	19	29
PPC LTD	Industrials	16 206 000 000	7 888 000 000	12 495 315 639	20 813 315 639	1.28	0.89	14	19
PREMIER FISHING BRANDS LTD	Consumer Goods	960 963 000	771 097 000	1 079 000 000	1 268 866 000	1.32	0.83	10	30
PRIMESERV GROUP LTD	Industrials	172 247 000	122 686 000	79 237 646	128 798 646	0.75	0.93	10	15
PSG GROUP LTD	Financials	90 421 000 000	30 802 000 000	50 340 245 370	109 959 245 370	1.22	0.85	10	21

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total qualifications
PUTPROP LTD	Financials	766 919 000	56 202 000	250 164 762	960 881 762	1,25	0,98	4	5
RAUBEX GROUP LTD	Industrials	7 139 671 000	4 197 968 000	4 129 360 818	7 071 063 818	0,99	0,89	9	17
REBOBIS PROPERTY FUND LTD	Financials	22 646 054 000	11 847 850 000	7 001 247 975	17 799 451 975	0,79	0,91	12	18
REDEFINE PROPERTIES LTD	Financials	91 492 611 000	53 786 185 000	60 229 557 145	97 935 983 145	1,07	0,92	9	15
RESILIENT REIT LTD	Financials	46 540 814 000	32 232 145 000	48 849 417 844	63 158 086 844	1,36	0,79	13	26
REUNERT LTD	Industrials	10 089 000 000	7 243 000 000	12 482 448 097	15 328 448 097	1,52	0,89	12	21
RMB HOLDINGS LIMITED	Financials	43 634 000 000	43 518 000 000	82 937 564 058	83 053 564 058	1,90	0,55	14	36
SABVEST LTD	Financials	2 650 813 000	2 303 945 000	392 766 492	739 634 492	0,28	0,95	9	14
SANLAM LTD	Financials	733 583 000 000	63 437 000 000	188 483 047 122	858 629 047 122	1,17	0,87	19	29
SANTAM LTD	Financials	38 728 000 000	7 924 000 000	30 744 693 596	61 548 693 596	1,59	0,90	14	22
SANTOVA LTD	Industrials	964 376 000	416 172 000	448 638 526	996 842 526	1,03	0,94	11	14
SASFIN HOLDINGS LTD	Financials	12 622 643 000	1 659 225 000	1 579 540 465	12 542 958 465	0,99	0,94	9	14
SHOPRITE HOLDINGS LTD	Consumer Services	55 723 000 000	27 749 000 000	119 632 352 266	147 606 352 266	2,65	0,80	18	32
SOUTH OCEAN HOLDINGS LTD	Industrials	884 894 000	471 953 000	43 786 062	456 727 062	0,52	0,92	4	10
SPANJAARD LTD	Basic Materials	64 356 000	40 936 000	18 321 413	41 741 413	0,65	0,95	8	12
SPUR CORPORATION LTD	Consumer Services	991 169 000	837 176 000	3 048 314 021	3 202 307 021	3,23	0,91	11	18
Stadio Holdings Limited	Consumer Services	1 698 252 000	1 414 671 000	6 326 738 263	6 610 319 263	3,89	0,93	14	19
STANDARD BANK GROUP LTD	Financials	2 027 928 000 000	190 017 000 000	316 826 009 947	2 154 737 009 947	1,06	0,70	18	42
SUN INTERNATIONAL LTD	Consumer Services	24 436 000 000	306 000	6 595 399 294	31 031 093 294	1,27	0,87	18	27
SUPER GROUP LTD	Industrials	24 872 751 000	9 855 335 000	13 250 252 515	28 267 668 515	1,14	0,90	12	20
SYGNIA LIMITED	Financials	45 381 536 000	608 184 000	1 374 457 751	46 147 809 751	1,02	0,94	16	19
THE BIDVEST GROUP LTD	Industrials	51 391 198 000	23 044 323 000	52 852 995 727	81 199 870 727	1,58	0,72	16	31
TIGER BRANDS LIMITED	Consumer Goods	23 979 200 000	17 061 200 000	72 477 564 690	79 395 564 690	3,31	0,82	12	25
TONGAAT HULETT LTD	Consumer Goods	29 115 000 000	12 009 000 000	13 734 186 235	30 840 186 235	1,06	0,91	12	20
TORRE INDUSTRIES LTD	Industrials	1 392 000 000	922 000	766 153 686	2 157 231 686	1,55	0,92	12	18
TRANS HEX GROUP LTD	Basic Materials	980 639 000	251 799 000	196 329 792	925 169 792	0,94	0,94	10	15
TRANSACTION CAPITAL LTD	Financials	13 074 000 000	3 772 000 000	9 304 738 334	18 606 738 334	1,42	0,77	16	31
TRANSPACO LTD	Industrials	923 504 000	561 225 000	882 913 273	1 245 192 273	1,35	0,98	6	7
TRENCOR LTD	Industrials	52 313 000 000	12 435 000 000	8 499 264 528	48 377 264 528	0,92	0,87	8	16
TSOGO SUN HOLDINGS LTD	Consumer Services	33 780 000 000	14 194 000 000	26 774 856 101	46 360 856 101	1,37	0,93	4	10
VERIMARK HOLDINGS LTD	Consumer Services	226 367 000	167 546 000	87 554 713	146 375 713	0,65	0,84	11	22
VODACOM GROUP LTD	Telecommunications	131 365 000 000	70 652 000 000	263 496 807 458	324 209 807 458	2,47	0,92	15	22
VUKILE PROPERTY FUND LTD	Financials	23 327 142 000	15 851 391 000	17 170 688 110	24 646 439 110	1,06	0,91	12	18
WILSON BAYLY HOLMES-OVCON LTD	Industrials	16 233 945 000	5 440 400 000	8 845 977 059	19 639 522 059	1,21	0,96	7	11

Appendix B

Basic materials industry data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total Qualifications
AECI LTD	Basic Materials	15 971 000 000	9 356 000 000	12 182 908 300	18 797 908 300	1,18	0,92	11	17
AFRICAN RAINBOW MINERALS LTD	Basic Materials	32 246 000 000	24 040 000 000	18 438 804 150	26 644 804 150	0,83	0,66	18	45
ANGLO AMERICAN PLATINUM LTD	Basic Materials	80 814 000 000	41 001 000 000	95 321 759 426	135 134 759 426	1,67	0,90	8	16
ARCELORMITTAL SA LTD	Basic Materials	31 196 000 000	8 058 000 000	4 404 291 523	27 542 291 523	0,88	0,88	12	21
ASSORE LTD	Basic Materials	25 321 531 000	22 624 952 000	27 203 820 020	29 900 399 020	1,18	0,92	11	18
BAUBA PLATINUM LTD	Basic Materials	302 582 000	27 094 000	246 363 162	521 851 162	1,72	0,94	9	14
DELTA EMD LTD	Basic Materials	107 406 000	95 352 000	49 165 553	61 219 553	0,57	0,95	6	10
EXXARO RESOURCES LTD	Basic Materials	62 552 000 000	39 365 000 000	58 289 847 525	81 476 847 525	1,30	0,77	16	34
HULAMIN LTD	Basic Materials	7 230 066 000	4 648 677 000	1 965 520 541	4 546 909 541	0,63	0,77	12	29
IMPALA PLATINUM HOLDINGS LTD	Basic Materials	73 481 000 000	49 232 000 000	27 076 583 229	51 325 583 229	0,70	0,77	11	28
KUMBA IRON ORE LTD	Basic Materials	62 466 000 000	45 546 000 000	122 112 455 323	139 032 455 323	2,23	0,86	14	25
MERAFE RESOURCES LTD	Basic Materials	6 355 447 000	4 635 525 000	3 740 949 330	5 460 871 330	0,86	0,91	8	14
OMNIA HOLDINGS LTD	Basic Materials	15 402 000 000	7 483 000 000	10 280 527 968	18 199 527 968	1,18	0,81	8	22
SPANJAARD LTD	Basic Materials	64 356 000	40 936 000	18 321 413	41 741 413	0,65	0,95	8	12
TRANS HEX GROUP LTD	Basic Materials	980 639 000	251 799 000	196 329 792	925 169 792	0,94	0,94	10	15

Appendix C

Consumer goods industry data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total qualifications
ASTRAL FOODS LTD	Consumer Goods	5 356 262 000	3 032 988 000	7 372 042 283	9 695 316 283	1,81	0,93	19	23
CLOVER INDUSTRIES LTD	Consumer Goods	6 048 143 000	2 879 683 000	3 158 325 274	6 326 785 274	1,05	0,88	11	20
METAIR INVESTMENTS LTD	Consumer Goods	8 105 218 000	4 475 537 000	4 278 196 549	7 907 877 549	0,98	0,94	13	17
NU-WORLD HOLDINGS LTD	Consumer Goods	1 370 388 000	1 014 246 000	928 505 065	1 284 647 065	0,94	0,93	7	13
OCEANA GROUP LTD	Consumer Goods	10 043 225 000	3 756 629 000	11 157 868 259	17 444 464 259	1,74	0,90	12	18
PIONEER FOOD GROUP LTD	Consumer Goods	12 972 445 000	8 052 265 000	26 313 532 424	31 233 712 424	2,41	0,86	19	29
PREMIER FISHING BRANDS LTD	Consumer Goods	960 963 000	771 097 000	1 079 000 000	1 268 866 000	1,32	0,83	19	30
TIGER BRANDS LIMITED	Consumer Goods	23 979 200 000	17 061 200 000	72 477 564 690	79 395 564 690	3,31	0,82	12	25
TONGAAT HULETT LTD	Consumer Goods	29 115 000 000	12 009 000 000	13 734 186 235	30 840 186 235	1,06	0,91	12	20

Appendix D

Consumer services industry data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total qualifications
ADVTECH LTD	Consumer Services	5 558 800 000	2 880 100 000	9 172 609 731	11 851 309 731	2,13	0,93	17	21
AFRICAN MEDIA ENTERTAINMENT LTD	Consumer Services	348 549 000	261 882 000	370 865 430	457 532 430	1,31	0,92	8	14
BID CORPORATION LTD	Consumer Services	54 445 941 000	23 671 520 000	100 359 648 315	131 134 069 315	2,41	0,86	10	17
CAXTON CTP PUBLISHERS AND PRINTERS	Consumer Services	7 228 747 000	5 729 123 000	4 747 169 520	6 246 793 520	0,86	0,94	8	13
CITY LODGE HOTELS LTD	Consumer Services	2 350 860 000	934 311 000	6 105 785 418	7 522 334 418	3,20	0,92	10	17
CLICKS GROUP LTD	Consumer Services	9 721 115 000	3 300 350 000	36 600 182 438	43 020 947 438	4,43	0,93	12	17
COMAIR LTD	Consumer Services	5 918 440 000	1 542 717 000	2 417 053 955	6 792 776 955	1,15	0,78	15	31
E MEDIA HOLDINGS LTD	Consumer Services	7 357 557 000	5 558 961 000	191 430 732	1 990 026 732	0,27	0,94	9	14
FAMOUS BRANDS LTD	Consumer Services	5 905 791 000	1 632 027 000	12 297 224 505	16 570 988 505	2,81	0,95	11	15
GRINDROD LTD	Consumer Services	34 948 970 000	14 197 482 000	10 408 852 736	31 160 340 736	0,89	0,82	15	26
KAAP AGRI LTD	Consumer Services	3 386 131 000	1 582 634 000	3 693 679 795	5 497 176 795	1,62	0,91	15	22
LEWIS GROUP LTD	Consumer Services	6 784 700 000	5 448 500 000	4 013 904 484	5 350 104 484	0,79	0,94	11	14
MASSMART HOLDINGS LTD	Consumer Services	32 316 100 000	6 391 400 000	30 300 481 535	56 225 181 535	1,74	0,94	12	16
NASPERS LTD	Consumer Services	35 451 000 000	25 691 000 000	1 268 523 137 659	1 278 283 137 659	36,06	0,84	14	27
SHOPRITE HOLDINGS LTD	Consumer Services	55 723 000 000	27 749 000 000	119 632 352 266	147 606 352 266	2,65	0,80	18	32
SPUR CORPORATION LTD	Consumer Services	991 169 000	837 176 000	3 048 314 021	3 202 307 021	3,23	0,91	11	18
Stadio Holdings Limited	Consumer Services	1 698 252 000	1 414 671 000	6 326 738 263	6 610 319 263	3,89	0,93	14	19
SUN INTERNATIONAL LTD	Consumer Services	24 436 000 000	306 000	6 595 399 294	31 031 093 294	1,27	0,87	18	27
TSOGO SUN HOLDINGS LTD	Consumer Services	33 780 000 000	14 194 000 000	26 774 856 101	46 360 856 101	1,37	0,93	4	10
VERIMARK HOLDINGS LTD	Consumer Services	226 367 000	167 546 000	87 554 713	146 375 713	0,65	0,84	11	22

Appendix E

Financials industry data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total qualifications
ABSA GROUP LIMITED	Financials	1 165 979 000 000	119 060 000 000	154 282 146 071	1 201 201 146 071	1,03	0,79	8	21
ACSION LIMITED	Financials	7 964 923 000	6 017 295 000	2 764 719 832	4 712 347 832	0,59	0,97	4	7
AFRICAN EQUITY EMPOWERMENT INVESTMENTS LTD	Financials	2 822 153 000	2 038 120 000	1 719 688 019	2 508 721 019	0,89	0,96	12	14
AFRICAN PHOENIX INVESTMENTS LTD	Financials	2 018 000 000	1 826 000 000	899 013 320	1 091 013 320	0,54	0,90	8	17
ANDULELA INVESTMENT HOLDINGS LTD	Financials	694 833 000	123 331 000	78 880 352	650 382 352	0,94	0,97	6	8
ATTACQ LTD	Financials	27 322 191 000	13 903 613 000	12 714 649 926	26 133 227 926	0,96	0,89	9	15
BALWIN PROPERTIES LTD	Financials	3 631 122 000	2 311 906 000	2 663 166 219	3 982 382 219	1,10	0,90	9	17
ECSPONENT LTD	Financials	1 214 817 000	1 017 482 000	106 752 840	304 087 840	0,25	0,95	7	10
EFFICIENT GROUP LTD	Financials	580 958 000	267 998 000	362 371 892	675 331 892	1,16	0,76	12	26
FINBOND GROUP LTD	Financials	3 309 286 000	1 170 732 000	2 528 777 186	4 667 331 186	1,41	0,88	11	20
FIRSTRAND LTD	Financials	1 217 707 000 000	117 184 000 000	264 487 359 247	1 365 010 359 247	1,12	0,28	20	49
FORTRESS REIT LTD A	Financials	62 065 981 000	45 112 563 000	20 166 686 569	37 120 104 569	0,60	0,91	17	23
GAIA INFRASTRUCTURE CAPITAL LTD	Financials	586 718 000	58 058 000	330 906 000	859 566 000	1,47	0,88	11	21
GEMGROW PROPERTIES LTD A	Financials	4 943 671 000	3 846 011 000	454 581 149	1 552 241 149	0,31	0,92	5	12
GROWTHPOINT PROPERTIES LTD	Financials	126 857 000 000	78 754 000 000	70 709 564 007	118 812 564 007	0,94	0,87	13	22
HOSKEN CONSOLIDATED INVESTMENTS LTD	Financials	70 535 763 000	37 749 555 000	13 165 757 819	45 951 965 819	0,65	0,96	8	11
HULISANI LTD	Financials	584 315 000	412 524 000	450 000 180	621 791 180	1,06	0,94	7	11
INVESTEC LTD	Financials	57 616 844 000	5 124 158 000	28 673 494 816	81 166 180 816	1,41	0,75	15	34
JSE LTD	Financials	38 687 969 000	3 626 381 000	13 365 249 984	48 426 837 984	1,25	0,85	17	30
LIBERTY HOLDINGS LTD	Financials	444 127 000 000	30 391 000 000	35 612 161 272	449 348 161 272	1,01	0,79	16	32
LONG 4 LIFE LTD	Financials	5 144 377 000	4 523 863 000	4 938 255 507	5 558 769 507	1,08	0,65	7	26
NEDBANK GROUP LTD	Financials	983 314 000 000	88 539 000 000	127 565 692 875	1 022 340 692 875	1,04	0,60	18	41
NIVEUS INVESTMENTS LTD	Financials	1 627 613 000	1 400 212 000	967 601 400	1 195 002 400	0,73	0,96	8	11
PSG GROUP LTD	Financials	90 421 000 000	30 802 000 000	50 340 245 370	109 959 245 370	1,22	0,85	10	21
PUTPROP LTD	Financials	766 919 000	56 202 000	250 164 762	960 881 762	1,25	0,98	4	5
REBOSIS PROPERTY FUND LTD	Financials	22 646 054 000	11 847 850 000	7 001 247 975	17 799 451 975	0,79	0,91	12	18
REDEFINE PROPERTIES LTD	Financials	91 492 611 000	53 786 185 000	60 229 557 145	97 935 983 145	1,07	0,92	9	15
RESILIENT REIT LTD	Financials	46 540 814 000	32 232 145 000	48 849 417 844	63 158 086 844	1,36	0,79	13	26
RMB HOLDINGS LIMITED	Financials	43 634 000 000	43 518 000 000	82 937 564 058	83 053 564 058	1,90	0,55	14	36
SABVEST LTD	Financials	2 650 813 000	2 303 945 000	392 766 492	739 634 492	0,28	0,95	9	14
SANLAM LTD	Financials	733 583 000 000	63 437 000 000	188 483 047 122	858 629 047 122	1,17	0,87	19	29
SANTAM LTD	Financials	38 728 000 000	7 924 000 000	30 744 693 596	61 548 693 596	1,59	0,90	14	22
SASFIN HOLDINGS LTD	Financials	12 622 643 000	1 659 225 000	1 579 540 465	12 542 958 465	0,99	0,94	9	14
STANDARD BANK GROUP LTD	Financials	2 027 928 000 000	190 017 000 000	316 826 009 947	2 154 737 009 947	1,06	0,70	18	42
SYGNIA LIMITED	Financials	45 381 536 000	608 184 000	1 374 457 751	46 147 809 751	1,02	0,94	16	19
TRANSACTION CAPITAL LTD	Financials	13 074 000 000	3 772 000 000	9 304 738 334	18 606 738 334	1,42	0,77	16	31
VUKILE PROPERTY FUND LTD	Financials	23 327 142 000	15 851 391 000	17 170 688 110	24 646 439 110	1,06	0,91	12	18

Appendix F

Healthcare industry data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total qualifications
ASCENDIS HEALTH LTD	Healthcare	14 486 617 000	5 296 342 000	9 433 727 491	18 624 002 491	1,29	0,87	11	20
ASPEN PHARMACARE HOLDINGS LTD	Healthcare	116 300 000 000	43 100 000 000	131 042 541 614	204 242 541 614	1,76	0,81	13	23
NETCARE LTD	Healthcare	28 112 000 000	8 862 000 000	34 814 872 740	54 064 872 740	1,92	0,90	19	24

Appendix G

Industrials industry data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV - BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total qualifications
ADCORP HOLDINGS LTD	Industrials	4 530 798 000	1 602 589 000	1 903 315 424	4 831 524 424	1,07	0,84	12	23
ARB HOLDINGS LTD	Industrials	1 522 569 000	1 069 808 000	1 480 500 000	1 933 261 000	1,27	0,95	5	8
BOWLER METCALF LTD	Industrials	758 540 000	661 247 000	557 096 816	654 389 816	0,86	0,94	6	11
CALGRO M3 HOLDINGS LTD	Industrials	3 226 468 000	1 167 682 000	1 826 292 914	3 885 078 914	1,20	0,96	10	12
CONSOLIDATED INFRASTRUCTURE GROUP	Industrials	7 011 627 000	3 839 348 000	2 839 379 519	6 011 658 519	0,86	0,90	10	17
CSG HOLDINGS LTD	Industrials	1 017 282 000	641 457 000	618 180 101	994 005 101	0,98	0,89	11	18
ENX GROUP LTD	Industrials	9 650 864 000	2 715 250 000	2 887 030 832	9 822 644 832	1,02	0,84	14	22
EXTRACT GROUP LIMITED	Industrials	1 267 000 000	- 1 520 000 000	30 414 180	2 817 414 180	2,22	0,86	7	16
IMPERIAL HOLDINGS LTD	Industrials	68 853 000 000	20 702 000 000	32 383 536 941	80 534 536 941	1,17	0,62	17	37
INVICTA HOLDINGS LTD	Industrials	10 314 845 000	5 089 771 000	5 478 984 269	10 704 058 269	1,04	0,91	9	16
KAP INDUSTRIAL HOLDINGS LTD	Industrials	26 978 000 000	11 348 000 000	21 643 680 870	37 273 680 870	1,38	0,87	10	18
MAZOR GROUP LTD	Industrials	324 857 000	258 282 000	164 027 163	230 602 163	0,71	0,95	4	8
METROFILE HOLDINGS LTD	Industrials	98 107 000	647 643 000	2 045 159 260	1 495 623 260	15,24	0,81	11	24
MIX TELEMATICS LTD	Industrials	1 993 325 000	1 517 181 000	4 466 664 872	4 942 808 872	2,48	0,90	10	17
MURRAY AND ROBERTS HOLDINGS LTD	Industrials	14 203 000 000	6 605 200 000	5 812 701 062	13 410 501 062	0,94	0,90	13	21
NAMPAK LTD	Industrials	25 229 900 000	9 681 100 000	12 133 518 390	27 682 318 390	1,10	0,83	11	24
NOVUS HOLDINGS LTD	Industrials	3 773 482 000	2 790 759 000	1 590 782 639	2 573 505 639	0,68	0,91	11	19
PPC LTD	Industrials	16 206 000 000	7 888 000 000	12 495 315 639	20 813 315 639	1,28	0,89	14	19
PRIMESERV GROUP LTD	Industrials	172 247 000	122 686 000	79 237 646	128 798 646	0,75	0,93	10	15
RAUBEX GROUP LTD	Industrials	7 139 671 000	4 197 968 000	4 129 360 818	7 071 063 818	0,99	0,89	9	17
REUNERT LTD	Industrials	10 089 000 000	7 243 000 000	12 482 448 097	15 328 448 097	1,52	0,89	12	21
SANTOVA LTD	Industrials	964 376 000	416 172 000	448 638 526	996 842 526	1,03	0,94	11	14
SOUTH OCEAN HOLDINGS LTD	Industrials	884 894 000	471 953 000	43 786 062	456 727 062	0,52	0,92	4	10
SUPER GROUP LTD	Industrials	24 872 751 000	9 855 335 000	13 250 252 515	28 267 668 515	1,14	0,90	12	20
THE BIDVEST GROUP LTD	Industrials	51 391 198 000	23 044 323 000	52 852 995 727	81 199 870 727	1,58	0,72	16	31
TORRE INDUSTRIES LTD	Industrials	1 392 000 000	922 000	766 153 686	2 157 231 686	1,55	0,92	12	18
TRANSPACO LTD	Industrials	923 504 000	561 225 000	882 913 273	1 245 192 273	1,35	0,98	6	7
TRENCOR LTD	Industrials	52 313 000 000	12 435 000 000	8 499 264 528	48 377 264 528	0,92	0,87	8	16
WILSON BAYLY HOLMES-OVCON LTD	Industrials	16 233 945 000	5 440 400 000	8 845 977 059	19 639 522 059	1,21	0,96	7	11

Appendix H Technology industry data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total qualifications
ADAPTIT HOLDINGS LTD	Technology	1 086 447 000	668 537 000	1 486 818 098	1 904 728 098	1,75	0,96	7	10
ALVIVA HOLDINGS LTD	Technology	4 749 422 000	2 020 223 000	3 277 746 249	6 006 945 249	1,26	0,95	9	13
COGNITION HOLDINGS LTD	Technology	202 525 000	146 849 000	207 799 855	263 475 855	1,30	0,92	7	13
EOH HOLDINGS LTD	Technology	16 719 983 000	8 561 604 000	16 172 786 569	24 331 165 569	1,46	0,83	17	28
JASCO ELECTRONICS HOLDINGS LTD	Technology	731 261 000	249 401 000	188 041 737	669 901 737	0,92	0,96	12	14
MUSTEK LTD	Technology	2 980 199 000	978 461 000	351 090 000	2 352 828 000	0,79	0,95	9	13

Appendix I

Telecommunications industry data

Company Name	Industry	BV Assets (BVA)	BV Equity (BVE)	MV Equity (MVE)	MV = BVA - BVE + MVE	Tobin's q (MV/BVA)	Blau's Index	Total unique qualifications	Total qualifications
BLUE LABEL TELECOMS LTD	Telecommunications	8 690 270 000	5 004 442 000	10 589 791 959	14 275 619 959	1,64	0,94	10	15
HUGE GROUP LTD	Telecommunications	936 492 000	74 453 000	1 527 738 070	2 389 777 070	2,55	0,87	10	21
VODACOM GROUP LTD	Telecommunications	131 365 000 000	70 652 000 000	263 496 807 458	324 209 807 458	2,47	0,92	15	22

Appendix J

Shapiro-Wilk test results

Table J1. *Shapiro-Wilk results for the total sample*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.336	122	.000	.228	122	.000
Blau's Index	.164	122	.000	.753	122	.000

a. Lilliefors Significance Correction

Table J2. *Shapiro-Wilk results for the basic materials industry*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.166	15	.200 [*]	.898	15	.088
Blau's Index	.212	15	.068	.863	15	.027

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table J3. *Shapiro-Wilk results for the consumer goods industry*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.203	9	.200 [*]	.839	9	.056
Blau's Index	.192	9	.200 [*]	.918	9	.377

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table J4. *Shapiro-Wilk results for the consumer services industry*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.409	20	.000	.364	20	.000
Blau's Index	.287	20	.000	.827	20	.002

a. Lilliefors Significance Correction

Table J5. *Shapiro-Wilk results for the financials industry*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.138	37	.073	.966	37	.318
Blau's Index	.212	37	.000	.774	37	.000

a. Lilliefors Significance Correction

Table J6. *Shapiro-Wilk results for the healthcare industry*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.287	3	.	.930	3	.488
Blau's Index	.289	3	.	.927	3	.476

a. Lilliefors Significance Correction

Table J7. *Shapiro-Wilk results for the industrials industry*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.408	29	.000	.306	29	.000
Blau's Index	.190	29	.009	.815	29	.000

a. Lilliefors Significance Correction

Table J8. *Shapiro-Wilk results for the technology industry*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.187	6	.200*	.964	6	.851
Blau's Index	.331	6	.039	.723	6	.011

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table J9. *Shapiro-Wilk results for the telecommunications industry*

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tobin's q (MV/BVA)	.355	3	.	.819	3	.160
Blau's Index	.269	3	.	.949	3	.567

a. Lilliefors Significance Correction

Appendix K

Spearman's correlation test results

Table K1. *Spearman's correlation results for the total sample*

Correlations			Tobin's q (MV/BVA)	Blau's Index
Spearman's rho	Tobin's q (MV/BVA)	Correlation Coefficient	1.000	-.230*
		Sig. (2-tailed)	.	.011
		N	122	122
	Blau's Index	Correlation Coefficient	-.230*	1.000
		Sig. (2-tailed)	.011	.
		N	122	122

*. Correlation is significant at the 0.05 level (2-tailed).

Table K2. *Spearman's correlation results for the basic materials industry sample*

Correlations			Tobin's q (MV/BVA)	Blau's Index
Spearman's rho	Tobin's q (MV/BVA)	Correlation Coefficient	1.000	-.021
		Sig. (2-tailed)	.	.940
		N	15	15
	Blau's Index	Correlation Coefficient	-.021	1.000
		Sig. (2-tailed)	.940	.
		N	15	15

Table K3. *Spearman's correlation results for the consumer services industry sample*

Correlations			Tobin's q (MV/BVA)	Blau's Index
Spearman's rho	Tobin's q (MV/BVA)	Correlation Coefficient	1.000	-.085
		Sig. (2-tailed)	.	.721
		N	20	20
	Blau's Index	Correlation Coefficient	-.085	1.000
		Sig. (2-tailed)	.721	.
		N	20	20

Table K4. Spearman's correlation results for the financials industry sample

Correlations			Tobin's q (MV/BVA)	Blau's Index
Spearman's rho	Tobin's q (MV/BVA)	Correlation Coefficient	1.000	-.564**
		Sig. (2-tailed)	.	.000
		N	37	37
	Blau's Index	Correlation Coefficient	-.564**	1.000
		Sig. (2-tailed)	.000	.
		N	37	37

** . Correlation is significant at the 0.01 level (2-tailed).

Table K5. Spearman's correlation results for the industrials industry sample

Correlations			Tobin's q (MV/BVA)	Blau's Index
Spearman's rho	Tobin's q (MV/BVA)	Correlation Coefficient	1.000	-.259
		Sig. (2-tailed)	.	.174
		N	29	29
	Blau's Index	Correlation Coefficient	-.259	1.000
		Sig. (2-tailed)	.174	.
		N	29	29

Appendix L
Ethical clearance approval letter

**Gordon
Institute
of Business
Science**
University
of Pretoria

28 June 2018

Khan Sarfaraaz

Dear Sarfaraaz

Please be advised that your application for Ethical Clearance has been approved.

You are therefore allowed to continue collecting your data.

Please note that approval is granted based on the methodology and research instruments provided in the application. If there is any deviation change or addition to the research method or tools, a supplementary application for approval must be obtained

We wish you everything of the best for the rest of the project.

Kind Regards

GIBS MBA Research Ethical Clearance Committee