An analysis of director interlocks on the JSE - with reference to the top 40 listed companies

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DECLARATION

I <u>Justin Jeffrey Williams</u> the undersigned declare that this dissertation contains my own work except where specifically acknowledged. This research has not been previously accepted for any degree and is not being currently considered for any other degree at any other university. I further declare that the work has been passed through a plagiarism detection program as prescribed by the University.

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AN ANALYSIS OF DIRECTOR INTERLOCKS ON THE JSE - WITH REFERENCE TO THE TOP 40 LISTED COMPANIES

Abstract

Director interlocks have concerned shareholders, the public and legislators since the early 1900's. In 1914 the Clayton Act prohibited interlocking directorates among competing corporations in the USA. Research has been performed since the 1930's covering stock exchanges around the world, however very little information was available concerning director interlocks in South Africa. This paper analysed interlocking directorships of the Top 40 companies listed on the Johannesburg Stock Exchange using key metrics as per Newman and Conyon's Small World theory, comparing the results to research on Italian, French, German, UK and US companies performed in 2008 by Santella, Drago, Polo and Gagliardi. South Africa was found to be closest to Italy, between the low density models (UK and US) and the significantly higher density models (Germany and France), suggesting that rather than just the two camps, there is a continuum currently reflected as the UK, US, South Africa, Italy, France and Germany. The presence of directors with multiple directorships and having significant influence in the network suggests systemic collusion is possible. Analysis performed on the composition of JSE boards showed that many of the King III Code requirements (presence of Non-Executive Directors, split of Chairman from Chief Executive amongst others) are met while some, such as the annual rotation of one third of directors and the independence of directors is problematic. There is still much that can be learned through enhancing the research coverage to provide a factual basis for understanding the impact of legislation and governance codes on the South African network, as well as to perform holistic research covering the combined network formed by board on exchanges across the globe.

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1 Orientation

1.1 Introduction

The issue of interlocking directorships has been a matter of concern and an area of study for close to a hundred years and continues to be an area of close scrutiny as high levels of interlocks remain in the boards of the top companies across the most significant stock exchanges globally (Santella, *et al* 2008)

Very little research has been performed to date on the nature of interlocking directorships within the Johannesburg Stock Exchange of South Africa. This research paper serves to fill that void by extending the research into interlocks performed by Santella *et al* (2008) for the South African director network as at October 2008 as well as providing measures of some key metrics for the South African director network for the period 2004-2010.

Most of the director interlocks present are through Non-Executive Directors (NEDs). As the focus on corporate governance has increased in South Africa, largely driven by the King Codes, there has been a significant push to increase the level of NEDs across boards. Common thinking is that this increase in the number of NEDs will have a positive impact on the governance of board. There is an alternate view that there will also be a negative impact with the change increasing the density of the director interlocks due to the limited number of suitably qualified NEDs available in the "pool" and by virtue of the fact that NEDs sit on multiple board.

As a secondary objective, this research seeks to provide insight into the composition of the boards of directors by looking at the breakdown of executive, non-executive and independent directorships in alignment with the requirements of the King III Code to have the majority of the board being NEDs and the majority of NEDs being independent.

1.2 Motivation for the Study

One of the common features of corporate capitalism is the high degree of organisation and cohesion, in terms of its formal structural characteristics and the informal social patterns. "One of the major structural features integrating corporate capitalists is interlocking directorates, which have been shown to form a single, continuous, cohesive network." (Roy, 1983, p.143). Roy traces the origins of these features within the capitalist environment (of the USA) back to 1886, noting that by 1905 12% of all directors (380 of 3214) were interlocked (Roy, 1983). Concerns around interlocking directorships in companies in the USA led to the passing of the Clayton Act in 1914 to prohibit such relationships in competing firms (Dooley, 1969).

There is limited research and analysis available on the nature and extent of interlocked directorships, as well as the composition of the boards within South Africa. Andrews (2008) notes that in the late nineties, over 41% of boards had in excess of eight members, more than many other countries, and that many organisations provided each other with seats on the board (especially within big group structures and those with relationships with banks and other financial institutions) (Murray, 2000).

Some researchers suggest that South Africa's board representation patterns align to the UK's 'financial hegemony' network forms, others use "Chandler's relation-based personal capitalism" to describe the networks, while others prefer "Zeitlin's family-based kinecon groups" as the most appropriate description of the close knit relationships (Chabane, Goldstein & Roberts 2006; Murray 2000). These authors provide limited quantitative analysis on the subject to support these descriptions.

A number of international researchers have made use of the "small-world" model (Newman 2003) to evaluate interlocking director networks. Davis, Yoo and Baker (2003) as cited in Conyon and Muldoon (2006) looked at the network in the United States. Windolf and Beyer (1996) again compared the networks of Germany and Britain. Switzerland and the Netherlands were the topic of research for Heemskerk and Schnyder (2008) while Singapore was analysed by Conyon and Muldoon (2006).

The work of these researchers (amongst others) led Alfarano, Lux and Milakovic (2008) to rightly point out that it is not surprising that board and director networks are small world, i.e. the networks are highly clustered while having short average path lengths. They go on to quote Conyon and Muldoon (2006) who argues that this high clustering occurs by construction because directors who serve on the same board form a complete graph and that such are no more clubby than would be expected by chance, however, the high clustering resulting from interlocking directors who server on multiple boards is an unexpected characteristic (Alfarano *et al*, 2008).

No researchers have applied this model to the corporate boards of South Africa (JSE) although Conyon & Muldoon (2006) suggest that there is limited benefit in comparing a board interlock network to a random data set and confirming it is indeed a small world. This study seeks rather to compare the South African network to those present in other countries. The work done by Santella *et al* (2008) provided the broadest coverage of international director networks, is amongst the most recent, and provided a significant base against which to do the comparison. They compared the director networks across Italian, French, German, UK and US companies.

Corporate governance policy statements emanating from the UK such as the Cadbury Report (1992), Greenbury (1995) and Hampel (1998) have focussed attention on the board of directors' monitoring responsibilities, and in particular, highlighted the special contribution that NEDs can make to this process (Young, 2000). In South Africa, first with the King II Code and now King III and the Companies Act 2008, there are also suggestions and requirements laid out with respect to the composition of the board. Key recommendations of these reports are that boards should contain sufficient numbers of NEDs to help ensure managerial accountability to shareholders, the NEDs should be seen to be independent, and that the Chair should be independent of the CEO. King III increases the requirement to say that the majority of directors should be NEDs and the majority of NEDs should be independent. This study will analyse the top 40 companies to determine compliance with these requirements.

The conclusions presented by this study are of interest to a number of stakeholders interested in the nature of the relationships between the boards of companies, including:

- Shareholders;
- Directors;
- Employees and Unions;
- Regulators; and
- The general public.

1.3 Focus of the Study

This study will focus on the top forty companies on the JSE. For this sample of companies for the period 2004-2010 the researcher will calculate key statistics on the boards (size, executive, non-executive, independent and unaffiliated directors). The interlocking director network for these forty companies will be mapped and analysed (including key measures such as size and density) as at 1 October 2008 to allow comparisons to be drawn to the director networks of other key international stock exchanges.

1.4 Problem Statement of the Study

For many years, people have debated the merits of interlocking directorships, with the detractors highlighting the pitfalls of collusion, while the supporters promoted the less sinister motivations of co-optation and monitoring, the provision of legitimacy to the reputation of firms, and the advancement of careers of the directors themselves (Mizruchi, 1996).

Focus then moved on to ways in which to measure the nature and extent of the interlocks through models such as the "Small World" model put forward by Newman (2003) and this has been applied by various researches across a number of countries around the globe.

Whilst the existing research provides insight into the interlocks present on stock exchanges around the world it has not been applied to the JSE, leaving opinions on the South African position based on simple calculations, intuition, speculation and assumption rather than insight grounded in research linked to a proven model. Unless more thorough and

comparable research is performed through the use of an accepted model, limited understanding will continue to manifest itself in relation to the true nature and extent of interlocks on the JSE.

By applying the small world model to the directorate interlocks of the JSE a deeper understanding of the position in South Africa can be obtained directly through the key metrics on this South African network as well as by providing data to allow comparisons be drawn to other stock exchanges around the world.

The King II report (Institute of Directors South Africa, 2002) promoted the increased use of non-executive directors on the boards of directors. The limited data and studies available on the boards of directors makes it difficult to tell whether the recommendations of King in this regard have been complied with by companies in South Africa. King III was published in late 2009 and is applicable from March 2010 (SAICA (IoDSA), 2010). This report enhances the requirements for NEDs and independent NEDs.

During the data collection phase of the research the status of each director (executive vs non-executive vs independent) and the chair was captured to allow the statistics to be prepared and compared for the sample of companies.

1.5 Objectives

This study aimed to contribute to the body of knowledge on director interlocks in South Africa by:

- Collecting the data on the Boards of directors of the top 40 JSE companies and mapping out the interlocking director network;
- Analysing the interlocking director network of the top 40 companies listed on the JSE to allow relative comparison to be performed to the networks of key stock exchanges from other countries around the world; and
- Analysing the composition of the board of directors of the top 40 companies listed on the JSE over a period of time to measure compliance with the requirements of King II and King III.

1.6 Research Questions

The director network of Germany is described as one of "Co-operative capitalism" whereas Britain is one of "Competitive capitalism" (Windolf & Beyer, 1996, p. 205). The first research question explores the South African network and it's similarities to those of the UK and Germany.

Hypothesis 1: The interlocking director network of the JSE top 40 companies compares more closely to that of the UK than that of Germany in terms of network density and average path lengths.

King II suggests that the board should be balanced, having both executive and non-executive directors, preferably with sufficient non-executives being independent. The chairperson should preferably be an independent non-executive director. (IoDSA, 2002)

This is further extended by King III, which goes on to provide that much stricter criteria, replacing balance and sufficiency with the stronger term 'majority'. King III Principle 2.18 states that "the board should comprise a balance of power, with a majority of non-executive directors. The majority of non-executive directors should be independent" (IoDSA, 2009).

Hypothesis 2: There is majority of NEDs on boards in the Top 40 listed companies on the JSE.

Hypothesis 3: There is majority of independent directors amongst the NEDs on boards in the Top 40 listed companies on the JSE.

The concept of unaffiliated non-executive directors provides an alternate measure of director independence. It is defined by Weir & Laing (2001, p.90) as "the percentage of the total board that are non-executive directors and who have served on the board for less than

four years." The thinking is that the longer a director serves, the more difficult it becomes to maintain impartiality, whereas a newly appointed NED should be far more easily able to adopt a more independent approach to their decision making.

Hypothesis 4: There is a majority of unaffiliated non-executives amongst the independent directors on boards in the Top 40 listed companies on the JSE.

"Duality occurs when an individual holds the two most powerful posts on the board of directors, namely those of CEO and Chairman. Independent non-executive chairmen are more likely to provide objective opinions on proposals, be more effective decision monitors and be more likely to promote shareholder interests" (Weir & Lang, 2001, p.88). King III while not directly using the term duality supports this notion. King specifically states that the board should elect a chairman who is an independent non-executive director, and then goes on to assert that the CEO of the company should not also fulfil the role of chairman of the board (King III Principle 2.16) (IoDSA,2009)

Hypothesis 5: The majority of Top 40 listed companies on the JSE have independent non-executive directors as Chairman of the board

1.7 Research Method

The research was performed through a quantitative study. Given the nature of study and the data being investigated this was considered to be more appropriate than a qualitative study. With the number of organisations and individuals included in the study, a lack of access to all these high profile organisations and individuals would have hindered the ability of the researcher to obtain sufficient data to make meaningful findings and recommendations.

The population of data being covered included all companies listed on the main board of the Johannesburg Stock Exchange, excluding the alternate board (Alt-X). The sample was restricted to the top 40 companies at a point in time (04/03/2009) although the data collected about these 40 companies extended from June 2004 to June 2010. The sample size of 40 was chosen for reasons of comparability and because of lack of access to reliable

data. This is discussed further in Chapter Three. The data gathered was entered into a Microsoft Access database and analysed using a number of tools, including specialist network analysis tools Ucinet, NetDraw and NodeXL.

The matters of validity, reliability and generalisation are addressed in Chapter Three.

1.8 Research Programme

This dissertation has six chapters. Chapter One introduces the subject of the research by giving background and stating the problem to be investigated. The research method and the outline of the research programme are included.

Chapter Two provides an in-depth literature study of corporate interlocks and board composition, both internationally and on the Johannesburg Stock Exchange (South Africa). The questions posed in the general aims of the research are answered, through the findings in the literature search. The literature search provides insight into the nature and impact of director interlocks globally, although provides little insight into the position in South Africa.

Chapter Three describes the quantitative research design used in the empirical investigation, with Chapter Four presenting the results thereof. The results are discussed in Chapter Five, with recommendations and conclusions presented in Chapter Six, along with implications of the research and recommendations for future study.

1.9 Limitations of the Study

The study is limited to a sample of the 40 companies listed on the Johannesburg Stock Exchange (JSE) with the highest market capitalisation, selected by taking the market capitalisation value of the companies as provided by the FTSE at 04/03/2009 (FTSE 2009b). The director network used for comparison to those prepared in the Santella study was extracted based on the directorships in effect at 01/10/2008 (to obtain best comparability). This date differs from the date on which the top 40 companies was selected

by five months, although both are well within the overall coverage of the period June 2004 to June 2010 for which directorship information has been obtained.

The original intention had been to make use of the Companies and Intellectual Property Registration Office (CIPRO) (subsequently renamed Companies and Intellectual Property Commission) database to obtain the directorship information. This data was downloaded via McGregors BFA (from the CIPRO database). A comparison of a sample of director data from this database to the annual reports of the relevant companies led to the conclusion that the CIPRO database was not accurate and complete. This view was supported by commentary in the press (Mawson, 2010; Harris, 2011). As an alternative the annual reports of the sample companies were used as a primary data source. The information had to be manually extracted and captured to supplement and correct the initial dataset by capturing the appointment and resignation dates for the directors, as well as classification of type of directorship. The study was limited to the top 40 companies only, partly as a result of the required director information not being available electronically.

The date selected for which directorship information was commonly available across all companies in the sample was 1 October 2008. This aligns to the Santella study where information was collected from the periods 31 Dec 2007 (Italy) to 2nd September 2008 (USA). The information on the companies and directors was extracted from annual financial statements of the companies covering the period 2004-2010 as applicable. Annual Reports were obtained from the McGregors BFA Library database and from the websites of the companies themselves.

This date was the first for which information was available for all of the companies in the sample as Reinet Investments Manager S.A.(one of the Top 40 Companies in 2008) was only established in October 2008 and all four directors were appointed at this date. Reinet and all four of its directors have been included in the sample. Two of the Reinet directors have links to other organisations.

The disclosure of information relating to the independence of directors is not uniform and this information was not available for all companies despite the requirements of King II

and King III. A more detailed study could contact the company secretaries to obtain further information relating to the independence status of the directors.

The above reasons, in additional to inherent limitations in the data structures used for the capturing of the data have resulted in a less than perfect data set. Further expansion on these limitations is presented in Chapter Four.

1.10 Clarification of the Key Concepts

1.10.1 Director Interlocks

For the purposes of this research a very board definition of interlocks is used, being that two companies are considered interlocked if there is a common director on the two boards. Interlocks are created by both inside (executive) and outside (non-executive) directors (Mizruchi, 1996, p.272)

1.10.2 Small-World Theory

A specific case of a social network (a small world) characterised by two properties, namely:

- A high network clustering, being the propensity for boards to be connected if they share a mutual neighbour (a director); and
- Distances between boards are relatively short, with any two boards being connected through a small number of steps.

The presence (or not) of a small-world depends primarily on the standards to which the chosen calculated statistics (e.g. the clustering coefficient) are compared (Conyon & Muldoon, 2005).

1.10.3 Board of Directors

The board of directors is fundamental to corporate governance – it is a legal requirement for incorporation and is the prime decision making body in the public corporation. "Boards of directors are an economic institution that, in theory, helps to solve the agency problems inherent in managing an organisation." (Hermalin & Weisbach, 2003, p.7).

1.10.4 Director

Within the context of the Companies Act, the term 'director' means a "member of the board of a company, as contemplated in section 66, or an alternate director of a company" (Companies Act 2008, p.24). Section 66 does not expand the definition of director, although it does lay out the process for the appointment and termination of directions, and provide specific reasons for disqualification from acting as a director. It also lays down the minimum number of directors that a public company must have (three). Further opinion offers that 'director' includes an "alternate director, and (a) a prescribed officer; or (b) a person who is a member of a committee of a board of a company, or of the audit committee of a company, irrespective of whether or not the person is also a member of the company's board" (Van Velden Pike & Partners, 2010, p.3).

The Companies Act (South Africa: Office of the President, 2008) makes no mention of the Chairman of the Board, nor of non-executive or independent directors. No mention is made of alternate directors in the King III report.

1.10.5 Executive Director

The key measure of an executive director is their involvement in the management of the company and/or being in the full-time salaried employment of the company (or subsidiary). This is found in Annex 1.1 of the King III report (IoDSA, 2009), and is not defined in the King III Code.

An executive director is defined in Chapter Five of the Act as follows. ''Executive Director'' means the person appointed under section 200 (Companies Act 2008, p.214). This is in the chapter covering fundamental transactions, takeovers and offers, and does not align to the definition of executive director used within this research. The King III definition as above is therefore the one used.

The classification of directors as executive, for the purposes of this study, has been done on the basis of the description of the position as per the annual report of the companies concerned, and has not been confirmed by any third party sources.

1.10.6 Non-executive Director

The definition of non-executive directors varies across the globe and even within countries. For the purpose of this study the definition provided in Annex 1.2 of the King III report (IoDSA, 2009) is used.

The key measure of a non-executive director is that they are not involved in the management of the company. While non-executive directors play an important role in providing judgment independent of management on company matters, they must remain independent of management on all issues including "strategy, performance, sustainability, resources, transformation, diversity, employment equity, standards of conduct and evaluation of performance" (King III, IoDSA, 2009). They should also meet from time to time, without the presence of the executive directors, to consider the performance of executive management.

The classification of directors as non-executive, for the purposes of this study, has been done on the basis of the description of the position as per the annual report of the companies concerned, and has not been confirmed by any third party sources.

1.10.7 Independent Non-executive Director

The definition of non-executive directors varies across the globe and even within countries. For the purpose of this study the definition provided in Annex 1.3 of the King III report (IoDSA, 2009) is used.

The King III report recognises that independence is more about perception (or state of mind) than fact, and requires that independent non-executive directors be independent in fact and in the perception of a reasonably informed outsider. Their independence should be assessed annually by the board, and the King III code goes on to require that if serving for

more than 9 years they should be subjected to a rigorous review of independence and performance by the board.

In addition to the principle based definition above, the King III report lists a number of exclusions summarised as: not representing an influential shareholder, not having more than a 5% direct or indirect shareholding, not having been in employ of company (or group) in preceding three financial years, nor have immediate family who has been employed as an executive in the preceding three years. Furthermore, they must not have been a professional advisor (other than as director), must be free from any business or other relationship which could be seen to interfere with independence, and must not receive any remuneration contingent on company performance (IoDSA, 2009).

The classification of non-executive directors between dependent and independent has been done on the basis of the description of the position as per the annual report of the companies concerned, and has not been confirmed by any third party sources.

1.10.8 Unaffiliated Non-executive Director

Unaffiliated directors are a subset of independent non-executive directors to whom a stricter measure of director independence can be applied. The classification of independent non-executive directors between affiliated and unaffiliated is done on the basis of length of tenure. Directors who are non-executive and have served for less than four years are considered unaffiliated (Weir & Laing, 2001). The period of tenure is taken from the disclosed appointment date in the annual financials of the companies being analysed. "Unaffiliated directors" is not a term used in King III or the Companies Act, 2008.

1.11   Summary

The existence of interlocking directorships is an age-old concern that can be traced back to the late 1800's and early 1900's. The concern was so great at that time that legislation was passed to control it in the USA. The debate has continued through time and researchers have put forward both benefits and pitfalls of such interlocking directorships.

The position in South Africa is a more unknown quantity, with very limited research available on the current position, and none that allows direct comparability to the director interlock of networks other stock exchanges. The small world theory has been used for such research across the globe and provides the tool for this comparable research to be performed.

In the following chapter the literature search investigates the prior research around director interlocks, corporate governance and the small world theory. The consequences and implications of interlocks are explored and expounded upon.

2 Literature Review

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2.1 Introduction

This chapter provides a report on the literature search undertaken on director interlocks and board composition. The study on interlocks focuses on two main areas, that of interlocking directorships in general and the outcomes of the interlocks, then on the use of the small world theory in relation to interlocking directorships around the world. The study on board composition looks at the board composition from the perspective of changes as a result of corporate governance codes, focussing on the presence of NEDs and independent directors, as well as the duality of the CEO and chair.

2.2 Interlocking Directorships

There is much debate in the literature as to the benefits and pitfalls of directors holding multiple positions. These include emotive writings very much against such relationships such as the plea to President Wilson quote below:

"The practice of interlocking directorates is the root of many evils. It offends laws human and divine. Applied to rival corporations, it tends to the suppression of competition and to violation of the Sherman law. Applied to corporations which deal with each other, it tends to disloyalty and to violation of the fundamental law that no man can serve two masters. In either event it leads to inefficiency; for it removes incentive and destroys soundness of judgement." Louis Brandeis, advisor to President Wilson, as cited by Dooley (1969, p.314). Elimination of competition, collusion and conflict of interest are clearly of concern.

On the other hand, there are those who support the argument that there can be benefits from having directors sitting on multiple boards. Harris and Shimizu (2004) argue that interlocking directors provide benefits to the companies on whose boards they sit through their ability to make informed contributions, stating that their results "are consistent with the argument that (interlocked) directors absorb environmental uncertainty by providing

information" Harris and Shimizu (2004, p.777). There are a number of other arguments both for and against director interlocks which are explored in the next section before moving on to the small world theory, which provides a means of objectively measuring the extent of relationships.

2.2.1 Outcomes of Interlocking Directorships

Mizruchi (1996) in his widely cited review of research on interlocks summarises four general aims, covering both positive and negative outcomes:

- Collusion;
- Co-optation and monitoring;
- The provision of legitimacy to the reputation of firms; and
- The advancement of careers of the directors themselves.

2.2.1.1 Collusion and Self Interest

Critics of large corporates argue that interlocks between these organisations (particularly competitors) restrict competition. Congressional investigations of interlocks in the United States date back to the early 1900's and have been concerned primarily with the effect of interlocks on the operation (and restriction) of the free market. Section 8 of the Clayton Act of 1914 expressly prohibits interlocks between firms deemed to be competing in the same markets. This legislation led to a sharp drop in the number of interlocks among leading US firms (Mizruchi, 1996).

The fact that interlocks continue to occur within industry sectors around the world suggests that some interlocks may be established with the aim of restricting competition. There is however little evidence that interlocks are an effective way of doing this, or that they are necessary to reduce competition. Mizruchi (1996) goes on to suggest that this is the reason that research on the anticompetitive nature of interlocks has almost ceased.

In their research comparing the networks of Germany and Britain, Windolf and Beyer (1996, p.205) conclude that although significant networks exist in both markets, the

networks are very different. The network in Germany is one of "'co-operative capitalism' whereas the Britain exemplifies 'competitive capitalism'".

Current thinking from a governance perspective is that the majority of directors should be external and independent. In this context independence is seen as independent of the organisation. The appointment of external directors who sit on other boards is inevitable but it may not always be positively viewed. Devos, Prevost and Puthenpurackal (2009, p.884) found that there was a decline in stock price on the announcement of new director where it create interlocks, suggesting that "shareholders view the presence of interlocked directors as an indication of weak monitoring and entrenched management."

2.2.1.2 Co-optation and Monitoring

Co-optation can be defined as the absorption of potentially disruptive elements into an organisation's decision-making structure (Selznick (1949) as cited by Mizruchi, 1996). The idea that interlocks reflect attempts by organisations to reduce (co-opt) sources of environmental (external) uncertainty is a more positive interpretation of company interlocks and has been much researched.

One of the key ways in which co-optation is achieved is through reducing resource uncertainty. Lang & Lockhart (1990) and Sheard (1993) found that inter-firm dependence contributed to the existence of interlocks and that interlocks are associated with inter-firm resource dependence.

While monitoring can be a positive influence, excessive control (still classed under monitoring interlocks) can have a negative impact. When comparing the interlocks of boards in the Netherlands and Belgium, Meeusen & Cuyvers (1985) found positive correlation between financial interlocks and profitability, but negative associations between profitability and "holding" interlocks (control or influence involving ownership) in Belgium.

It is very difficult to differentiate between monitoring (or influence-driven), and co-optation interlocks. In both cases, the interlock follows resource dependence flows.

The existence of a dependent firm provides the opportunity to exercise power over that firm. One form of this manifests through the monitoring function that board representation provides. From an organisation point of view, the desire to monitor is stronger where the dependent firm is performing poorly, but from the perspective of outside directors it seems a moot point that they (NEDs) would prefer to join the boards of well-performing firms as involvement with a company that is performing well would advance their careers. An organisation's need or desire to monitor a poorly performing firm in order to possibly avert financial loss and turn it into a "well-performing' company may exist concurrently with an individual's preference to sit on the boards of well-performing companies. With the promulgation of the Companies Act (South Africa. Office of the President, 2008) the duties of directors have become far more onerous and it is a risk to become associated with a firm that is not performing well, unless the appropriate precautions against liability are taken.

According to Mizruchi (1996) several studies have found that unprofitable firms are more likely to interlock and that bankers often join a board when the firm is in financial difficulty, thereby increasing the level of interlocking.

2.2.1.3 Provision of Legitimacy

Mizruchi (1996) states that although the concept of legitimacy has always played an important role in organisational theory, the legitimacy model has not received much attention from researchers. The existing literature on board appointments certainly implies, however, that the quest for legitimacy underlies the formation of many interlocks.

It is universally accepted that boards of directors have an important role to play with respect to the reputation of a firm (Selznick 1957, Parsons 1960). When investors decide whether to make an investment in a company, they will and should consider the strength and the quality of the company's management in assessing the viability of the company. Most listed companies provided detailed biographies of their directors in their annual

reports and on their websites in order to allow potential investors to make such an assessment.

By appointing individuals with ties to other important organisations, the company signals to potential investors that it is a legitimate enterprise worthy of their trust. Another aspect of co-optation is that it may be an attempt to gain the legitimacy necessary for the acquisition of resources. Most listed companies provide details of their directors other company ties in their annual reports or on their websites. This need for legitimacy increases the likelihood of interlocking.

2.2.1.4 Advancement of Careers

Interlocks occur between organisations through individuals. The firm appointing the individual as a NED makes an organisational-level decision to invite the person. The NED's decision to join may be the decision either of the company in which the individual may be involved either by virtue of being an employee or director, of the individual themselves, or a combination of both.

According to Zajac (1988), individuals join boards for reasons other than inter-organisational alliances. These reasons include financial remuneration, prestige, and the establishment of contacts (building their personal network) that may prove useful in securing subsequent employment. The creation of organisational interlocks may therefore be an unintended consequence of individual decisions that actually has little to do with the desire to link organisations.

The research of Stokman *et al* (1990) covering 20 years of appointment of new directors amongst large Dutch companies shows that the vast majority were drawn from a relatively small pool of persons with high levels of experience and expertise. This suggests that the directors were chosen for individual characteristics rather than organisational ties, supporting the work of Zajac (1988).

In his study of the inner circle, Useem (1986) explores similar ideas. In asking executives why they had appointed specific outsiders to the board and enquiring of directors how and why they had joined the several boards on which they served, it became apparent that resource-exchange considerations were of minor, though not negligible importance (Useem 1986, p.45). Useem (1986, pp. 47-48) suggests instead companies try to achieve an optimal "business scan" of contemporary corporate practices and the general business environment. Individuals who sit on multiple boards provide this. An executive interviewed during his research told him: "You're damn right it's helpful to be on several boards. It extends the range of your network and acquaintances, and your experience. That's why you go on a board, to get something as well as give. You get a more cosmopolitan view- on economic matters, regional differences, and international questions these days. It just broadens your experience, the memory bank that you have to test things against."

From the perspective of the host organization, outside directors are chosen as individuals for a three main reasons (Mace, 1971 as cited by Mizruchi, 1996). Organisations want board members who:

- add prestige to the organisation (through association with the prestigious positions they hold in other firms),
- are capable of providing input and advice, often on issues specific to pre-existing strategies, and
- are "good citizens" known by reputation to be both conscientious and noncontroversial.

Mace (1971) goes on to suggest that those most likely to be good citizens are people known to the Chief Executive and other management, including other associates of the CEO. Non-executive directors are therefore regularly selected from within a relatively small group of individuals. This certainly would seem to run counter to the considerations of the independence of directors.

These findings suggest that interlocks provide benefits to both the company appointing the director as well as the independent director, that is not directly related to the specific

relation formed, but is instead related to the people involved. The career advancement arguments are complementary rather than alternates to the inter-organisational ones described above.

2.2.2 Small-World Theory

The small world theory originated through studies of the relationships between parties in a social network. These studies date back to the 1920's and 1930's with the work of Moreno (1934) on friendship patterns and the "southern woman study" of Davis *et al* (as cited by Newman, 2003).

Newman through his interpretation of the theory provided a mechanism to evaluate the interlocking director networks. He suggests measuring the elongation of the network (path lengths) and the density of connections (clustering).

The principles laid down in the work of Newman have since been used for the evaluation of networks in Singapore by Conyon & Muldoon (2006), Switzerland and The Netherlands by Heemskerk & Schnyder (2009), as well as France, Germany, Italy, the UK and US by Santella *et al* (2008).

Santella *et al* (2008) in their small world analysis of a number of markets found evidence of differences in the nature of the small world networks that support the work of Windolf & Beyer (1996). They found that the network in the UK is much more elongated (has longer path lengths) than that of Germany, and there are many more cut-off points (the network is less densely connected), where the removal of single links would splinter the network. This provides support to the assertion that networks differ in nature between countries, but supports the use of the small-world model to evaluate the nature of the interlocking networks.

2.3 Board Composition

2.3.1 Overview of General Factors

The composition and size of boards are influenced by a number of competing factors. There is a need to have a diverse portfolio of experienced individuals on the board, having understanding of all the different areas in the business, from accounting, risk, information technology, through operational, safety, human resources as well as strategic areas. This pushes the board size larger, yet, the larger the board, the less likely the members can work effectively together, have effective meetings and take quick and appropriate decisions for the organisation. There is also the separation between the oversight and management functions. Governance codes push for a reduced executive component on the board and require shorter periods of non-executive membership, with rotation, all of which succeeds in enhancing the independence of the board, but strips the board of continuity, institutional knowledge and depth of experience in relation to the organisation and situations which may arise infrequently.

2.3.2 South African Position

2.3.2.1 Ownership and Management Concentration

There is limited research available on the nature and extent of interlocked directorships within South Africa. Andrews (2008, p.14) notes that in the late 90's over 41% of South African boards had more than eight members, a greater number than many other countries, and many companies provided seats on each other's boards, particularly in large corporate groups and often involved relationships with banks and other financial institutions.

The concentration of ownership and management could be attributed to various historical trends, such as:

- the UK tradition of "financial hegemonies" or dominance of a few major corporations (Scott, 2000);
- the development of personal capitalism which implies the concentration of ownership in a small group of individuals (Lloyd-Jones, Maltby, Lewis, & Matthews, 2011); and

- "kinecon groups" or "intertwined family and corporate structures" (Pels, 1998: 181), where "small groups of families, relatives, friends interlace the directorial boards of enterprises" (Lengyel, 1987, n.p.)

In her research on the concentration of ownership, Nenova (2005) found that around the world there are generally consolidations of ownership occurring, from Asia, through Brazil, Turkey and Columbia. By way of contrast, Nenova (2005) found that the South African economy was historically dominated by six mining finance houses, such as the Anglo American/De Beers grouping which controlled 10 of the 20 largest JSE companies by market capitalization until about 1989. These high levels of concentration of ownership in the late 80's would lead one to expect a high level of interlocks and dense networks should the small world model have been applied to the structure at that time. However, "ownership concentration has decreased drastically since the early 1990s" with shareholder pressure leading to the unbundling of complex management and ownership structures, and the release of non-core holdings to shareholders, as well as the buy-out of minorities.

These changes would at face value be expected to have reduced the level of directorate interlocks within the JSE. There is however limited empirical research to support this assertion.

2.3.2.2 Impact of BBBEE

A common argument for a small number of directors holding many times more directorships and the existence of a close knit director community is that quality directors are in short supply and therefore overboarding and interlocks are a result of necessity. Black directors are even more in short supply. The CA(SA) qualification is the most commonly sought after qualification for directors, with approximately 30% of directors on the JSE holding the qualification (Andrews, 2008). The profiles of black directors are important in seeing where future potential directors may come from, and in highlighting the problems in finding such people. There is a significant shortage in the number of black Chartered Accountants (CA's) in the country as clearly shown in the numbers obtained from The South African Institute of Chartered Accountants website statistics (SAICA

2009) summarised in Table 2.1 below. Black African CA's account for just 1 196 of 28 275, or 4.2%. The total for all non-whites is 14.5%.

Classification	Number of CA's	% of total
Black	1196	4.23%
Coloured	599	2.12%
Indian	2260	7.99%
White	24174	85.50%
Unknown	46	0.16%
Total	28275	100.00%

Table 2.1 SAICA Race Statistics - February 2009 (SAICA 2009)

Table 2.2 below shows that the proportion of black executive CA's is even higher than the average, suggesting a higher standard being placed on black executives. This is clearly not sustainable given the limited number of black professionals available coupled with the drive to increase the number of black directors.

Proportion of black non-executive directors	32%
Proportion of black non-executive directors from elite professions	65% (47% CA's)
Proportion of black executive directors	18%
Proportion of black executive directors from elite professions	75% (55% CA's)
Proportion of black directors from big organisation background	90%

Table 2.2 Profiles of Black Directors (Andrews 2008, p.63)

"These profiles are important because they suggest that South African firms may be changing the racial profile of their boards (gradually) but are appointing members that in every other respect look like they did in the past. The inner circle of decision-makers is still drawn from trusted professional networks like SAICA and on the strength of established acceptance by other big organizations" (Andrews, 2008, p.61).

The Black Economic Empower Commission presented their report to President Mbeki in April 2001. This report had a number of recommendations include that "Blacks should own 25% of the shares of companies listed on the JSE, with at least 40% of executive and nonexecutive directors being black within ten years" (Southall 2004, p.14). This target would seem far off given that, in 2008, just 18% of executive directors were black (per Table 2.2), and would certainly increase the pressure to have black directors accepting multiple directorships.

In their 2004 analysis of black directorships, Wu *et al* (2009) note that the number of black directorships has increased from less than 15 in 1992, to around 100 by 1997, and 307 by December 2003. In looking at the interlock rates of these directors they note that 75% of black directors hold just 1 position. No comparison is provided for the equivalent non-black directors.

No. of board positions held	No. of black directors	Percentage	Directorships
8	1	0.33%	8
6	2	0.67%	12
5	5	1.67%	25
4	2	0.67%	8
3	15	5.02%	45
2	49	16.39%	98
1	225	75.25%	225
Totals	299	100.00%	421

Table 2.3 Number of Board Positions held by Black Directors, adapted from Wu *et al* (2009,p.8.)

By June 2006 there were 403 black individuals holding 556 board positions. (Bridge 2007), and by 2010 this had risen to 951, of which 703 are non-executive directorships. "The number of black people holding directorships went from 362 to 770 during the same period, of which 157 are decision-making, hands-on executive directorships" (Sibanyoni, 2010, n.p.). It should, however, be noted that one person can hold more than one directorship so this is not 770 people.

2.3.2.3 Corporate Governance

Mervyn King, cited in Slater (n.d.), states that there are four fundamental duties that are required of all directors:

- Duty of good faith;
- Duty of care;
- Duty of skill; and
- Duty of diligence.

"If a county does not have a reputation for strong corporate governance practices, capital will flow elsewhere... All enterprises in that country – regardless of how steadfast a particular company's practice may be – suffer the consequences. It serves us right to remember that no market has a divine right to investors' capital." (Levitt, 2000, n.p.).

Slater (n.d.) cites a McKinsey & Co study published in 2000 where it was found that institutional investors are willing to pay a premium for shares in a well governed company, and this premium increases for emerging markets, rising from 18% for the UK to 27% for Indonesia.

The King II Code added considerably to the role of the non-executive director, recommending that NED's should constitute the majority of a board. In addition, King II placed more emphasis on their independence, entrusting them with "the authority to seek information from management, and obliging the board to disclose its processes and decisions"(Ahwireng-Obeng *et al*, 2005,p.1).

Ahwireng-Obeng *et* al (2005) state that the composition and size of the board are fundamental to a company's success, as if a board is too large, discussions become unwieldy and decision-making is impaired. The concern of King (IoDSA, 2002) was that while there should be a majority of non-executive directors with sufficient independence, it was also essential that this should not create a situation where directors rely exclusively on information-based knowledge provided to them by the CEO and other managers. Directors should be proactive in seeking evidence and advice from other reliable sources.

Ahwireng-Obeng *et al* (2005) posit that the optimal size of the board appears to be between eight and ten members with a good mix of experience, skills and knowledge, allowing for robust debate that is essential to good decision-making. This supports observations by Fleming (1998) and Dean & Kenny (1999) in relation to the impact of the size of the board on non-executive director effectiveness.

A crucial issue is the mix of executive and non-executive directors. King III (IoDSA, 2009) maintains that the board should comprise mostly non-executive directors, and ideally they should also be independent. These independent non-exec directors should, in any event, be in the majority to ensure that no single person or group of persons exercises majority control (IoDSA, 2002). Problems have been identified with regard to executive directors generally supporting the CEO's position on an issue possibly through fear of reprisals if they do not. It should be noted that, in research published in 2009 on data from 3 566 companies over the period 2001 to 2003 in an attempt to answer the question "Are interlocked directors effective monitors?" Devos *et al* (2009) concluded that the presence of interlocked directors is indicative of poor governance and entrenched managers.

The ideal of having a majority of non-executive directors on the board should be tempered, though, by consideration of the fact that executive directors have an intimate knowledge of company operations which an independent director is unlikely to have. What is essential is that non-executive directors, in ensuring good corporate governance, should work alongside executive directors in monitoring management on behalf of shareholders. Davies (2000, p.8) states that "the injection of a strong element of independent non-executive directors onto the board supposes that the board will perform a monitoring role as against the company's management as well as a role of setting the company's strategy. In this schema a continuous element of monitoring of management is provided by the non-executive directors who supplement the necessarily episodic monitoring which is provided by the shareholders collectively."

Regrettably, strong opposition to board monitoring from dominant CEOs sometimes becomes a problem unless the reputational incentives are strong enough to induce NEDs to

insist on being able to do this in order to be able to provide some degree of accountability to the shareholders.

Andreasson (2009,p.10) states that "South Africa stands out among emerging markets as a particularly significant case in which to investigate how processes of corporate governance reform unfold. It is Africa's largest and most sophisticated economy". It has more advanced financial institutional structures than those found in many other emerging markets. It is noted that South African corporate governance and corporate culture is rooted in British traditions of "gentlemen's agreements and emphasis on principles and cultivation of personal relationships" (Andreasson,2009,p.10) which seem to resonate with South African directors and executives.

Andreasson (2009,p.23) states that "legislating honesty and ethics has, according to King, been attempted "since the days of Moses" with generally rather poor results". An overly regulated approach, indeed, appears not to be favoured by most architects of South Africa's corporate governance system. This would result in a prescriptive "comply or else" regime (as found in the US, based on the Sarbanes-Oxley legislation) as opposed to a principles-based "comply or explain" regime (as found in the UK). The debate about which approach should be used in South Africa was quelled with the publication of the King III Code of Corporate Governance in 2009, in which a "comply or explain" approach is advocated. This is a less costly and onerous approach for South African businesses in an environment that has, in the main, "responded relatively well to the economic and political challenges associated with the transition from apartheid and re-integration into a competitive world economy" (Andreasson,2009,p.24).

The resultant South African approach to corporate governance is outlined below. This model includes:

- a single-tiered Board structure where only shareholders are represented;
- an actively traded stock exchange that leads "emerging markets" and ensures the pivotal role of the financial markets;

- a banking system that doesn't play a dominant role, in which banks don't control and direct clients and are not actively involved; and

- support of a "market-driven economic policy in which industrial policy plays a lesser role", evident in the government's Growth, Employment and Redistribution (GEAR) macro-economic policy framework (Andreasson,2009,p.11).

2.3.2.4 King III

The King III Code is a key guiding document for companies and directors operating within South Africa. King III (IoDSA, 2009) lays down a number of key principles which shape the makeup of the board. Some of the key principles which are relevant to this research area are listed below:

- The board should elect a chairman (COB) who is an independent non-executive director. "The CEO of the company should not also fulfil the role of chairman of the board" (King III Principle 2.16);

- The board should have a balance of power, with a majority of the directors being non-executive. The majority of these should be independent. (King III Principle 2.18);

- Every board should have a minimum of two executive directors, the CEO and the director responsible for finance. (King III Practice 2.18.5);

- A minimum of one third of the non-executive directors should rotate every year. (King III Practice 2.18.6); and

- Independent non-executive directors with more than nine years of service should have a thorough review of their independence and performance by the board. (King III Practice 2.18.8).

In the King III Code, the criteria for "independence" of directors have been expanded upon and to be considered independent a director must:

- have no direct or indirect interest in the company (and its group) which exceeds 5% of the group's total number of issued shares;

- have no direct or indirect interest in the company which is material to their personal wealth; and

- not receive any remuneration contingent upon the performance of the company (including share options).

King III does not comment on maximum number of posts a director can hold however the draft Code laid out the perspective: "In view of the time and dedication required to fulfil the above obligations properly, it is important that non-executive directors do not hold any more directorships than is reasonably considered appropriate in order for them to provide the care, skill and diligence that is required from a board member. They should therefore honestly apply their minds to their workloads and abilities to discharge their duties." (IoDSA, 2009). If one considers that time needed for Board meetings (including preparation and attendance) averages between 125 and 250 hours a year (Steinberg, 2011), it seems ludicrous to think that someone could take up more than one or two directorships and hold down a full time job at the same time, yet there have been instances where people have held up to 70 directorships (Carter, 2007; George, 2012).

King III says that a company must disclose the significant directorships of each board member (IoDSA, 2009) and in Principle 1.19 (of the draft code) that "the board should appoint an effective and ethical chief executive officer and that CEOs should carefully apply their minds, in consultation with the chairman, to whether it would be appropriate to take on non-executive directorships outside of the primary company or group so served, but should not become chairman of a major company outside of the group."

King III practice 2.16.8 suggests that the chairman (of the board), together with the board, should consider the number of outside chairmanships held by the Chairman (IoDSA, 2009).

2.4 Key Board Composition Metrics

The composition of company boards has been the subject of much attention from governance bodies around the world. In the UK policy statements including the Cadbury Report (1992), Greenbury (1995) and Hampel (1998) have focussed attention on the board of directors' monitoring responsibilities, and in particular, highlighted the special

contribution that NEDs can make to this process (Young, 2000, p.1). In South Africa, first with the King II code (IoDSA, 2002) and now King III (IoDSA, 2009) and the Companies Act (South Africa: Office of the President, 2008), there are also suggestions and requirements laid out with respect to the composition of the board.

These reports and codes focus particularly on the number of non-executive directors, their independence, and the independence of the COB from the CEO. Some key board metrics are explored in further detail below.

2.4.1 Total Number of Directors (Board Size)

Large corporations (in the United States) tend to have boards with ten or more members with the size of boards having increased steadily since the 1950s (Mizruchi, 1996,p.272). The makeup of the board is a mix of inside and outside directors, normally comprising of the CEO and other top officers, retired officers and in some cases representatives of key shareholders.

The average sizes of boards vary significantly between different countries. An analysis of the data from research performed comparing the board networks of the UK, US, Germany and Italy shows that the board sizes vary from 12.9 in the UK to 23.3 in Germany (Santella *et al*, 2008).

2.4.2 Duality

Duality occurs when on individual holds the two most powerful posts on the board of directors, namely those of CEO and Chairman. There is a common view, supported by corporate governance codes such as Cadbury and King which suggests that the combining of those roles provides too much power to one individual and that this must be bad for an organisation.

According to Weir and Laing (2001), independent non-executive chairmen are more likely to be objective with their opinions on proposals, be more effective in their monitoring of decisions and be more likely to put shareholder interests first.

Duality is seen as a sign of an overly powerful CEO, which when combined with a lack of effective board monitoring could have a negative impact on company performance (Daily & Dalton, 1993, pp.65-81). In the South African context duality is considered undesirable and King III is quite clear on this matter. It specifically states that the board should elect a chairman of the board who is an independent non-executive director. King III Principle 2.16 requires that the CEO should not also be appointed in the role of chairman of the board (IoDSA, 2009).

There is however mixed evidence as to whether duality is indeed a cause for concern. Research on UK firms was performed by Dahya *et al* (2009) that found that splitting the combined title of CEO and Chairman of the Board (COB) in conformance with the Cadbury recommendation did not show any improvement in operating performance after adopting of this key recommendation. There was also no significant share price response to the announcement of a split between the roles. Furthermore, they found that companies who always joined the titles of CEO and COB reported operating earnings that were at similar levels to companies that separated the positions, if not higher. Finally, they concluded that government coercing the separation of the positions through legislation was not always beneficial (Dahya *et al*, 2009).

2.4.3 Executive Directors

An executive director is defined as "a working director of an organisation who is usually also a full-time employee, and has a specified decision making role as director of finance, marketing, operations" (Business dictionary, 2012, n.p.). The measure of the duty of care required from executive directors is greater than that of non-executives', but both are equally liable under the Companies Act (South Africa: Office of the President, 2008).

The separation of ownership and management may lead to what is commonly known as the "agency problem" where shareholders delegate their responsibility for managing the company to executive staff resulting in a "struggle to control and monitor the actions of the managers" (their so-called agents) (Solomon, 2011, n.p.) who may act contrary to the

wishes of the shareholders if they have unbridled discretion. A generally used solution to the agency problem posed by the separation of ownership and control is to provide management with shares in the business to help align management interests with shareholder interest (Young, 2000, p.1320). This has often been done in executive remuneration packages which may include share options – this practice is a hotly debated one with many recent outcries about excessive remuneration (Theunissen, 2010) of CEOs, Chairmen and executive directors, especially in South Africa where there are huge inequities in income between CEOs who may earn millions of Rand per year and workers at the bottom of the ladder. However Young (2000) speculated that the appointment of additional NEDs may reduce the need for managers to hold an equity stake in the company.

It is interesting to note that despite the pressures to reduce the number of executive directors, there are specific requirements in the South African context that a minimum of two executive directors should be present on the board, these being the CEO and the director responsible for finance. (King III Practice 2.18.5) (IoDSA, 2009).

2.4.4 Proportion of Outside (Non-executive) Directors

The corporate governance codes are increasing the requirement for a high proportion of NEDs. Both King II and King III specifically states that the majority of board members should be NEDs (King III practice 2.18.1) (IoDSA, 2009).

It is expected that all else being equal, an increase in the number of NEDs would affect the balance of power on the board, shifting the balance towards the non-executive block (Young, 2000). However, Fich & Shivdasani (2006) found that boards in which a majority of outside directors hold three or more directorships are generally noted for weak governance. The research performed by Fich & Shivdasani (2006) suggests that less effective boards are more likely to be interlocked since they found that 'busy' boards are associated with weak governance.

King III has further requirements in Practice 2.18.6 for the non-executive directors, specifically requiring that at least one third of the non-executive directors should rotate every year (IoDSA, 2009). This applies to both the independent and non-independent directors as no differentiation is made between the two in this section of the code. This would appear to be a positive move, since several studies have found that the share price reaction to outside director appointments is overwhelmingly positive (Rosenstein & Wyatt, 1990; Shivdasani & Yermack, 1999).

2.4.5 Proportion of Independent Directors

The definition of independent directors is not a clear one in the global context. While the King III report provides a definition in Annex 1.3 (IoDSA, 2009) this is not exactly the same as those used by the UK and the US. As discussed in section 2.3.2.4, King III does provide some guidance in stating that independent directors should not have a material interest in the company, relative to company shares in issue or their own personal wealth, and must have no contingent remuneration.

In addition to the above criteria, Practice 2.18.8 (IoDSA, 2009) requires that any independent non-executive directors serving more than 9 years should be subjected to a rigorous review of their independence and performance by the board if they are to continue beyond that term.

The lack of consistency in definition is confirmed by Clark (2007,p. 77) who suggests that the term "independent director" is a broad concept that has various concrete manifestations, and goes on to argue that the manifestations serve different purposes and should not be confused with each other. He also argues that the whole purpose of having independent directors has not been thoroughly researched. This has led to the development of inconsistent rules, particularly with respect to the effect of director shareholdings.

King III Practice 2.18.2 (IoDSA, 2009) expands on the previous requirement of the majority of the board being NEDs to require that the majority of the NEDs also be

independent. Principle 2.16 also requires the COB to be an independent non-executive director who is not the CEO.

As of 2001, approximately seventy-five percent of NYSE-listed companies already had a majority of independent directors such majorities (Lublin, 2002). Business Roundtable surveyed 150 of its members in 2003, and found that 80% had boards that were at least 75% independent, and that 90% had boards that were at least two-thirds independent.

The literature review did not reveal any research of statistics in this regard for the South African environment.

2.4.6 Proportion of Unaffiliated Directors

The concept of unaffiliated directors is not a widely used one and introduces a stricter alternate measure of independent directors. As discussed in the definition of key terms, the classification is done on the basis of length of tenure, with four years being suggested as the cutoff by Weir and Lang (2001). This is significantly stricter than the King III requirements for independent directors, which while it does not enforce a maximum term, does suggest in Practice 2.18.8 that "any independent non-executive directors serving more than 9 years should be subjected to a rigorous review of his independence and performance by the board." (IoDSA, 2009).

Historically the term unaffiliated director has been used in other contexts. Going back as far as 1940, the Investment Company Act was one of the first pieces of legislation to hint at the concept. This Act required that every mutual fund would have one or more unaffiliated directors who would serve as watchdogs over the shareholders' interests (Mundheim, 1967). Section 10 of the Act required that at least 40% of the directors of a mutual fund must be persons who are neither officers nor employees of the fund nor affiliated with the fund's investment adviser or its affiliates. A majority of the directors must be persons who are not investment bankers or principal underwriters or regular brokers of the fund or affiliated persons of such investment banker, underwriter or broker (54 Stat. 806, 1940). These directors became known as the unaffiliated directors.

No research is present in the South African context either on the length of terms of service of NEDs or independent directors, nor into the presence of unaffiliated directors. This concept may be relevant in the consideration of "related parties" as defined in the Companies Act (South Africa: Office of the President, 2008).

2.5 Summary

The concerns and debate around the presence of interlocking directorships dates back to the late 1800's and even though attempts have been made over the years to curtail these they are still present world-wide. In fact the trend has been strengthened interlocks in many parts of the world. While the concerns raised are supported through research, there are also benefits to these interlocks which are also supported. Research shows that there can be both co-operative and competitive capitalism supported through these networks, and that these are highlighted through small-world analysis. There is very limited research available around the interlocking directorates present within the JSE and no prior research making use of the small-world analysis.

3 Research Methodology

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3.1 Introduction

The review of prior work performed in Chapter Two identified the small world model as an effective model to evaluate the interlocking directorships within a group of companies. This model has been used effectively across the globe (Conyon & Muldoon, 2006; Heemskerk & Schnyder, 2008; Santella *et al*, 2008).

3.2 Aim and Objectives of the Study

The objective of the study is to apply the small world model to the top 40 companies on the JSE to allow comparisons to be made between the interlocking director networks in South Africa to those of other key countries across the globe.

3.3 Conceptual Framework

The small world theory used in this study is that described by Newman (2003) and Jackson (2006). A simple overview of the small world theory first requires a description of the key terminology (Conyon & Muldoon, 2006):

- A *network* (or *graph*) is composed of a set of *vertices* and *edges*. The vertex is the fundamental unit of the network, and vertices are connected by edges. Two vertices are considered to be adjacent if they are connected by an edge.
- The number of edges connecting to a vertex is called the *degree* and is considered to be a measure of local *centrality* in the network.
- The *connected component* is all other vertexes which are connected to the original vertex by edges.
- A *geodesic* is the shortest path that connects two vertices; and
- the *distance* between the vertices is the number of edges in the geodesic connecting them.

Two key statistics of a small world are *average path length* (*L*) and *clustering* (C_Δ).
Conyon & Muldoon (2006) defined them as follows:

► Short average path lengths – randomly chosen vertices turn out to be unexpectedly
close to each other.

► Clustering (a measure of network density) – the propensity of one's neighbours to
know each other in their own right.

The data to be analysed is represented graphically as a bipartite graph and as unipartite
projections (as shown in
Figure 3.1). The top half of the graph (network) shows the relationship between the
corporate boards (1-4) and the company directors (A-K). The board projection removes the
intermediate directors and just shows the inter-connectedness of the boards is presented on
the projection bottom left. The equivalent projection showing just the interconnectedness
of directors is the projection bottom right.
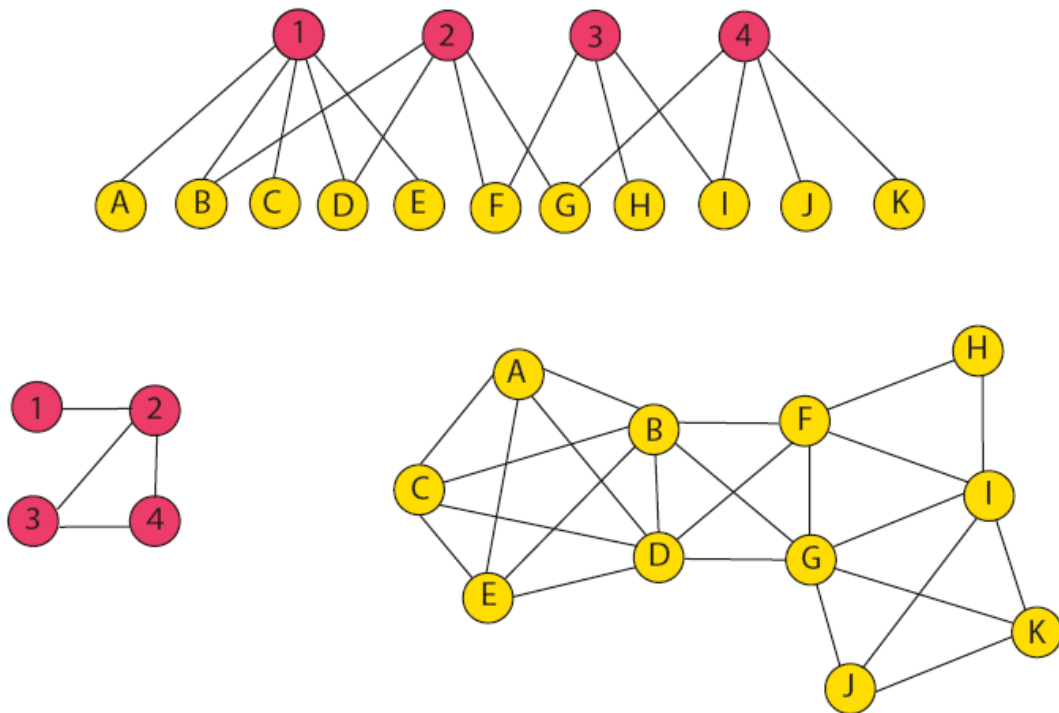
Figure 3.1 The Corporate Board Projections, Conyon & Muldoon (2006, p.3)

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The values for L and C_Δ would be calculated for the JSE Top 40 data. Within a network, $0 \leq C_\Delta \leq 1$. When $C_\Delta = 1$ then everybody would be connected to everybody else and when $C_\Delta = 0$ nobody is connected. This is a measure of how "clubby" the boards of directors are.

The UciNet 6 software package will be used to analyse the data and calculate the average path lengths and clustering co-efficients. Whereas Conyon & Muldoon (2006) made use of the generating functions, this study will primarily compare the properties of the South African network to those calculated by Santella *et al* (2008) for Italy, France, Germany, UK and the US.

3.4 Validity, Reliability and Generalisation

In order to embed and demonstrate validity in the research it is important that the researcher is fully aware of the research subject. Further, the researcher must ensure that the problem statement, research questions and purpose is supported by the outcome of the interpretation and analysis of the data. To embed and show reliability in the research, the author must demonstrate objectivity throughout the whole research without offering any unsupported subjective opinions. The researcher should also show that they have conducted the research and written a thesis within their field of knowledge (Eriksson & Geijer, 2006).

The data extracted for analysis was obtained from multiple sources and validated to ensure reliability. This resulted in a change in approach from reliance on third party databases to extraction of the data directly from many sets of the specific companies' annual reports. The analysis of the data to answer the research questions has been performed according to the author's best knowledge and in an objective manner, however, given the size of the dataset and the large number of attributes present, other researchers may have analysed the data in different ways and reached alternate interpretations.

Generalisation is a special case of validity which shows how research results could be applicable to other groups, conditions or circumstances (Eriksson & Geijer, 2006). This

author believes that the generalisation of this thesis is restricted in a number of ways. The sample taken represents the largest, highest profile companies listed on the JSE main board. These companies are influenced by the social, political and economic forces in South Africa. The research here, should in the opinion of the author, not be applied to other countries and their boards, without collecting and analysing that specific country data to build country specific views. Secondly, the analysis should not be applied to companies outside of the JSE top 40 without careful consideration. While the considerations of the King codes should be applied by all companies listed on the JSE, this research shows that even in the top 40 this is not always the case. The fewer resources an organisation may have and the further it is from the spotlight, the less compliance levels may be. Further, those companies which are not required to comply with these codes are even less likely to do so.

3.5 Research Design and Methods

3.5.1 Data Collection Strategies

The population for this study comprises the companies listed on the Johannesburg Stock Exchange. The McGregors BFA directors' database was downloaded on 8 February 2009 and the directors serving on the boards of the companies present in the download were extracted. The integrity of the information was immediately in doubt as no fields were present to identify the date of appointment and resignation of the directors. An attempt was made to use the CIPRO database to validate the information but this lead to further discrepancies rather than resolution of differences as directors were present with the same surname but differing initials and identity numbers (or had no identity number present).

At this point a decision was taken to restrict the sample for purposes of this study to 40 companies to allow the data to be manually verified and corrected. The sample selected was therefore a purposive sample and random sampling of the entire population was not regarded as appropriate.

To resolve the differences, the latest available annual financial statements (AFS) of the companies included in the sample were downloaded from the McGregors BFA database

(McGregor BFA, 2009) and from the websites of the companies concerned. The latest financials were regularly downloaded until 30 November 2011. No financials released after this date were included in the data.

The details of the company directors were then manually extracted from the annual reports (primarily from the board attendance registers), reconciled with the original sample data and changes and additional fields captured. During this process data with respect to the nature (executive vs non-executive), independence and positions was captured.

The key fields captured, validated and used in the analysis include:
Company

- Company Name;
- JSE Short code;
- Year end;
- Earliest date (representing the 1st day of the financial year of the earliest set of AFS examined); and
- Latest Date (representing the last day of the financial year of the latest set of AFS examined).

Director

- Director Name (Surname and initials);
- Qualifications (not validated or consistently captured);
- Executive (vs non-executive) Director;
- Independent Director;
- Chairman;
- Date appointed; and
- Date resigned (or retired).

3.5.2 Selection of Companies

In South Africa there are 339 companies listed on the main board (Amoils, 2009). The lack of readily accessible, reliable information and the desire to have results comparable to a

wider range of countries led to the decision to restrict the number of companies being examined and a smaller subset of the companies being chosen for the sample population.

In order to make the results of the study comparable with the results of the work performed by Santella *et al* (2008), 40 companies were selected. Previous studies used the primary indexes of the stock exchange to select the sample for study. For example, Santella *et al* (2008) used the S & P – MIB 40 index for Italy, the CAC 40 for France, the first forty companies (by market capitalisation) on the FTSE 100 for the UK, the DAX 40 for Germany and the first forty companies (by market capitalisation) on the NYSE US 100 index for the USA. Selecting the top 40 JSE listed companies (by market capitalisation) was therefore a logical choice.

The most widely known index on the JSE is the All Share Index (Alsi). This includes the largest companies (market leaders) listed on the JSE and includes approximately 160 shares representing around 80% of the market capitalization (First National Bank, 2009). The FTSE/JSE Top 40 Index tracks the share price performance of the 40 largest companies on the JSE by full market value in the FTSE/JSE All-Share Index, irrespective of whether they are resources, industrial or financial companies (First National Bank, 2009; FTSE 2009a, p. 1). It covers 19 different sectors (as at 30 June 2008), with just over 50% of the index weight coming from the Mining sector (FTSE, 2009a).

This index was selected as being most comparable to those used by Santella *et al* (2008) and is therefore used for the purposes of this study.

The FTSE provide details of the current rand value market capitalization for the companies listed on the JSE (FTSE, 2009b). The list obtained for the 04/03/2009 was obtained and sorted to select the top 40, which are used for the purposes of this research. These are listed in Table 3.1 on the following page:

#	Company Name	Market Capitalisation (Net ZARm)	Subsector Code
1	BHP Billiton	368157.310	1775
2	Anglo American	199059.588	1775
3	Sasol	172856.630	537
4	MTN Group	160963.477	6575
5	SABMiller	155210.420	3533
6	Anglogold Ashanti	107636.293	1777
7	Standard Bank Group	91740.499	8355
8	Impala Platinum Hlds	83909.597	1779
9	Compagnie Financiere Richemont AG	69165.000	3763
10	Gold Fields	67375.889	1777
11	Naspers	60093.102	5553
12	Firstrand Limited	48838.033	8355
13	Harmony	47579.573	1777
14	Anglo Platinum	38559.278	1779
15	Sanlam	32238.394	8575
16	Old Mutual	30519.973	8575
17	Remgro	29313.299	2727
18	Absa Group	28516.852	8355
19	Bidvest Group	26379.937	2791
20	Shoprite	25978.318	5337
21	Telkom	25917.392	6535
22	Tiger Brands	22412.818	3577
23	Growthpoint Prop Ltd	18599.048	8733
24	Nedbank Group	16994.221	8355
25	RMB Holdings	16685.738	8355
26	Reinet Investments	16387.026	8985
27	African Bank Invest	16324.757	8773

#	Company Name	Market Capitalisation (Net ZARm)	Subsector Code
28	Liberty International	16270.354	8737
29	Aspen Pharmacare Holdings	16247.372	4577
30	Kumba Iron Ore	16219.844	1775
31	ArcelorMittal South Africa Ltd	16203.090	1757
32	Pretoria Portland Cement	15967.013	2353
33	Truworths International	13626.102	5371
34	Massmart Holdings	13244.237	5373
35	Murray & Roberts	12777.866	2357
36	Steinhoff International Holdings	12606.378	3726
37	Netcare	11948.869	4533
38	Investec PLC	11480.186	8777
39	Aveng	10502.087	2357
40	Woolworths Holdings	10400.483	5373

Table 3.1 FTSE Top 40 by Market Capitalisation (FTSE 2009b).

The 40 companies selected above cover R2,155 billion of the R2,524 billion market capitalisation of the board, giving an 85.39% coverage by value, although covering only 11.7% of the number of securities listed.

Notes:

- Liberty International PLC changed its name on 7 May 2010 to Capital Shopping Centres Group PLC. The last annual report captured was for 31/12/2009.
- Reinet Investments was incorporated on 1/10/2008 so no data was available prior to this.

3.5.3 Selection of Directors

Some countries, including South Africa, Britain, the United States and Singapore have a single board of administration where the board of directors has the legal responsibility for

the company's affairs and is the locus of control within the company. The use of an executive or group management committee is not mandated by law in these countries, although is still used by a number of the organisations. For example, in South Africa companies such as BHP, Compagnie Fin Richemont and MTN make use of this structure.

This is different from countries with a two-board system, for example Austria, Belgium and Germany, where the shareholders appoint a supervisory board, which in turn appoints directors for the executive board (Hong, 2005).

Where the two-board system is legally enforced both sets of board members have been included as directors in the interlocking graphs by Santella *et al* (2008). In the countries with one board only the members of that board have been included even where a voluntary management committee exists. For the comparative position in South Africa, only members of the main board are therefore included as we don't have a legally enforced two-board system.

3.5.4 Selection of the Date

In the data collection process approximately 281 sets of annual financial statements were downloaded and examined. As a result of the combination of sources, and the principal of accounting for every director present on the initial McGregors list, the final list contained the 40 companies and 1061 lines reflecting directors, alternate directors and group management committee members.

The annual reports examined cover the period June 2004 to June 2010 for the entire sample, with annual reports in some cases having been examined from prior to 2000 (Netcare) and as recently as 2011 for Shoprite, SAB Miller, and Investec amongst others. The list of directorships therefore included people who had resigned as early as June 2001 (Stofberg J du T from Naspers Limited as per the March 2002 annual report) as well as those appointed as recently as October 2011 (Nhleko PF of MTN as per the December 2010 annual report).

For the study to be comparable with that performed by Santella *et al* (2008), the date of data extraction for the comparison purposes would need to align with those used in Santella's study. The table below summarises the dates used:

Country / Board	Date of sample
Italy	31 December 2007
France	March 2008
United Kingdom	March 2008
Germany	August 2008
United States	2 September 2008

Table 3.2 Dates of Data Points for Comparative Countries' Networks

Based on the availability of the director information from the financial statements as described above and the dates used in the Santella study as per Table 3.2 Dates of Data Points for Comparative Countries' Networks, the date of 1 October 2008 was selected as the cut-off date.

This date is within the range of dates used and has all the necessary data available at the time of the network analysis being performed, and allows for Reinet Investments Manager S.A. which was only established in October 2008 to be included. Reinet had four directors appointed at this date, with two of them having links to other organisations.

A new column was added to the spread sheet (IncludedInSample) and a formula was coded into the column to provide a "y" or "n" based on specific criteria as below.

The criteria used to extract the sample for further processing were:
- appointed on or before 1 October 2008;
- not resigned before 1 October 2008; and
- not an alternate director or solely a member of the management committee.

526 of the 1061 records matched the criteria and represented directorships in force as at 1 October 2008. These were pasted into a new excel sheet to form the primary sample for the testing.

3.5.5 Pretesting and Validation

The original data collected was captured into an Excel spread sheet and each data entry was validated against an alternate source to confirm completeness and validity. The details of the source were also captured. The source was mainly published annual financial statements.

3.5.6 Data Collection Problems and Challenges

When mapping out the director networks it is critically important to have consistency of the key field otherwise the directorships of that director will not be linked together and the network will be incorrectly mapped. No unique identifiers (such as South African identity numbers or passport numbers) were present in the data source (primarily annual financial statements). The director's name was the only choice available as the key field. As names are ambiguous in nature due care had to be taken with the data capture.

3.5.6.1 Directors Names

There is no standard format for the presentation of director names in annual financial statements. The names can be presented in any one of a number of formats including:
- First name (or nickname) and surname;
- Surname and initial; and
- Surname and multiple initials.

It is critically important to have consistency of names otherwise the directorships will not be linked together and the network will be incorrectly defined, showing too few links. When capturing the data, names were captured as surname and initials, with no punctuation. After the capture of the data, the data was sorted by surname, and a validation check was done on all directors who shared a surname (regardless of initials), or had

similar surnames, to ensure that name had not been incorrectly captured, or been inconsistently presented in the annual financials. The exercise was performed by:

- Scanning the annual financial statements to see if any alternate forms of the name or initials were used;
- Analysing the directors biographies to see whether the director was showing as being a director of other companies in the sample; and
- Looking up the director on the CIPRO (and subsequently CIPC) database to see whether other directorships relating to the sample were listed.

3.5.6.2 Location of Director Information in a set of AFS

Each annual report used as a data source had a listing of directors. These listings (along with the director biographies) tended to show only the directors still serving at the financial year end rather than all directors who served during the period. There were also large differences in the way the companies chose to report their director information. In order to obtain complete information around the directorships it was necessary to review all of the sources present within the annual reports, including:

- Chairman's report;
- Directors listing;
- Directors biographies;
- Board meeting attendance; and
- Director emoluments.

3.6 Analysis of the Data

3.6.1 General Analysis

The general analysis was performed making use of a combination of Microsoft Excel and Microsoft Access.

Information on the graph included:

- Average numbers of directors / company;
- Average number of directorships / director; and

- Average number of interlocks / company.

The data was exported from MS Excel into MS Access to create a table (Sample_080630) that could be interrogated through SQL queries.

Query name	SQL Code
distinct jse code list	SELECT DISTINCT Sample_080630.[JSE Code] FROM Sample_080630;
stats _ executive vs non exec directorships	SELECT Sample_080630.Executive, count(Executive) FROM Sample_080630 GROUP BY executive;
stats _ min _ max _ avg number of companies per director	SELECT Min([Count]) AS [Min], Max([Count]) AS [Max], Avg([Count]) AS [Avg] FROM [stats _ number of companies per director];
stats _ min _ max _ avg number of directors per company	SELECT Min([stats _ number of directors per company].Count) AS [Min], Max([stats _ number of directors per company].Count) AS [Max], Avg([stats _ number of directors per company].Count) AS [Avg] FROM [stats _ number of directors per company];
stats _ min _ max _ avg number of directors per company (exec)	SELECT Min(Count) AS [Min], Max(Count) AS [Max], Avg(Count) AS [Avg] FROM [stats _number of directors per company (e vs ne)]

	WHERE executive="y";
stats _ min _ max _ avg number of directors per company (Non)	SELECT Min(Count) AS [Min], Max(Count) AS [Max], Avg(Count) AS [Avg] FROM [stats _number of directors per company (e vs ne)] WHERE (((([stats _number of directors per company (e vs ne)].Executive)="n"));
stats _ number of companies per director	SELECT Sample_080630.Name, Count(Sample_080630.[JSE Code]) AS [Count] FROM Sample_080630 GROUP BY Sample_080630.Name ORDER BY Count(Sample_080630.[JSE Code]) DESC;
stats _ number of companies per director (e vs ne)	SELECT Sample_080630.Name, Sample_080630.Executive, Count(Sample_080630.[JSE Code]) AS [Count] FROM Sample_080630 GROUP BY Sample_080630.Name, Sample_080630.Executive ORDER BY Count(Sample_080630.[JSE Code]) DESC;
stats _ number of directors per company	SELECT Sample_080630.[JSE Code], Count(Sample_080630.Name) AS [Count] FROM Sample_080630 GROUP BY Sample_080630.[JSE Code] ORDER BY Count(Sample_080630.Name) DESC;
stats _number of directors per company (e	SELECT Sample_080630.[JSE Code],

vs ne)	Sample_080630.Executive, Count(Sample_080630.Name) AS [Count] FROM Sample_080630 GROUP BY Sample_080630.[JSE Code], Sample_080630.Executive ORDER BY Sample_080630.[JSE Code];
Summary of director counts	SELECT [stats _ number of companies per director].Count, Count(*) AS Expr1 FROM [stats _ number of companies per director] GROUP BY [stats _ number of companies per director].Count;

3.6.2 Network Analysis

3.6.2.1 NodeXL

NodeXL is an open-source template for Microsoft Excel that provides easy to use network visualisation (Network Graphs) made available by the Social Media Research Foundation (2009).

NodeXL 1.0.1.74 (downloaded 16/2/2009) was used for initial exploration and then for the final analysis NodeXL 1.0.1.196 was used (downloaded 5/3/2012).

NodeXL was used to provide the initial visualisation of the Director/Company network showing the sub-graphs and isolates present within the data.

3.6.2.2 Ucinet

Further data analysis was performed using Borgatti's Ucinet for Windows software (Borgatti *et al, 2002).*

Ucinet was used to map out the networks and to calculate the key network statistics, L (average path lengths) and C_Δ (clustering) for each of the sub-graphs within the network, as well as to prepare the data for export to NetDraw for visualisation. Ucinet and NetDraw were used in order to have results comparable with the work done by Santella *et al* (2008).

Further key metrics on the graph were calculated (again for comparative purposes), including:

- Number of sub-graphs (components);
- Number of companies the first component;
- Number of isolates;
- Density of the graph;
- Network density;
- Freeman degree; and
- Normalised betweenness centrality.

Ucinet was also used to perform the matrix mathematics necessary to transform the Director/Company matrix into a Company/Company matrix, and to produce the necessary export files for use with Netdraw.

3.6.2.3 Netdraw

A key component of the Santella research was the weighted network diagrams used to visualise the networks resulting from the analysis. The COMP matrix derived from Ucinet above will be visualised with Netdraw to allow for direct comparisons of the South African network to those analysed by Santella.

To achieve consistency, the network must be drawn with node size (dots representing the companies) determined by normalised betweenness centrality and for the edge thickness to be determined by the strength of the relationship between the two companies (i.e. the number of common directors).

3.7 Summary

The required data for the analysis was captured from and checked to the Annual Reports of the companies in the sample, in excess of 250 sets of annual reports were used. The small world analysis for the top 40 companies of the JSE was successfully performed using NodeXL and Ucinet and the key network metrics calculated for comparison.

The general metrics for the sample of companies were also calculated on the data making use of NodeXL, Ucinet, Microsoft Excel and Microsoft Access. The resulting outputs were made available for analysis in the next chapters.

The graphical representation of the resulting networks were successfully calculated and drawn using NodeXL and NetDraw in formats that were directly comparable with those of the work performed by Santella *et al* (2008).

4 Results

4.1 Introduction

This chapter describes the results from the analysis of the dataset. The results are described in three sections, the general analysis, network analysis (performed using NodeXL, Ucinet and NetDraw) and finally the key metrics related to the boards of the companies under review.

4.2 General Analysis

The final dataset constructed contains 531 rows (directorships), matching the 531 records selected as per the selection of records (3.5.4). When summarising these by company, using Query "distinct jse code list", 40 rows were returned confirming that 40 companies were present.

A listing of all companies and directors, with the executive status of the directorship was extracted from the original sample. This was pasted into Excel and summarised as a cross tabulation, to give the JSE shortcode (company), and the number of executive and non-executive directorships for that company. The cross tab was then copied into a new sheet and the formula's added to calculated the percentages executive and non-executive. These were then sorted, filtered and summarised to give:

- Overall statistics;
- Boards with highest percentage of non-executive representation;
- Boards with highest percentage of executive representation; and
- Frequencies of numbers of executive and non-executive positions.

4.3 Network

4.3.1 NodeXL

The 526 records from the primary sample were copied from the sample tab of the spreadsheet and pasted into the "Edges" tab of the NodeXL template, with the Company Name being in the first column and the Director Name being in the second.

The ENI column which provides the classification between Executive, Non-Executive and Independent was copied into the first optional column (N).

The NodeXL function "Prepare Data / Get Vertices from Edge List" was then used to populate the Vertices sheet of the template. The NodeXL Analysis function was used to calculate the "Graph Metrics" and to populate the Subgraph Images.

The NodeXL overall metrics were calculated automatically and populated into the appropriate tab within the Excel sheet. Key metrics from these are included in the table below.

Metric	Value
Graph Type	Undirected
Unique Edges	526
Vertices	498
Graph Density	0.0042504
Connected Components	7
Single-Vertex Connected Components	0
Maximum Vertices in a Connected Component	396
Maximum Edges in a Connected Component	430
Maximum Geodesic Distance (Diameter)	12
Average Geodesic Distance	6.532589
NodeXL Version	1.0.1.196

Table 4.1 NodeXL Key Graph Metrics

Edges and Vertices

Each edge represents a directorship, so the 526 is consistent with the data as per the sample. The vertices represent both directors and companies. Since we have 40 companies and 458 directors, this matches to the 498 vertices.

Density

The graph density as calculated by NodeXL is 0.00425404. This is not comparable to the densities as calculated by Santella *et al* (2008) as this network is a director/company network rather than the company/company network used in their calculations. In order to have consistent networks the director/company network is transformed to a company/company network and the density calculated for the company network (see Ucinet below).

4.3.1.1 First Layout

The Graph Layout type was set as "Fruchterman-Rheingold", in an undirected graph, with a Repulsion force of 3.0, and 50 iterations. This initial layout did not differentiate between directors and companies and the layout has many overlapping vertices and edges.

Created with NodeXL (http://nodexl.codeplex.com)
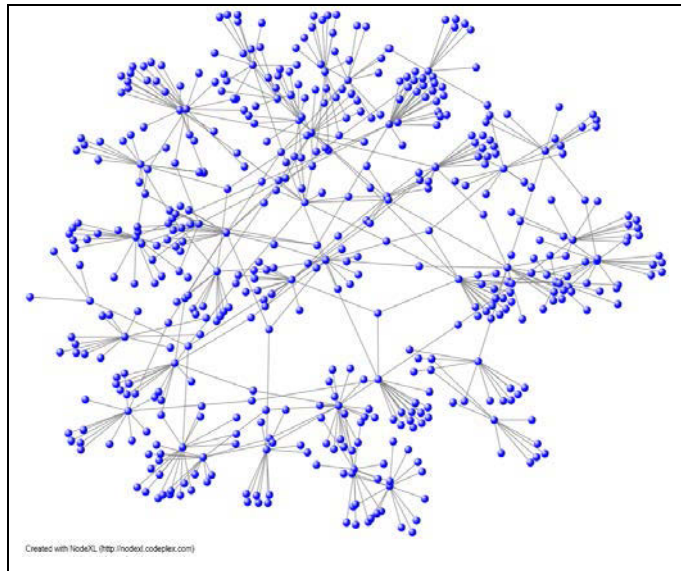
For the first graphic representation the Vertex properties were then populated to differentiate between companies and directors as follows:

- Companies
    - o Shape : sphere (3)
    - o Size : 3
    - o Colour

- Primary Segment = Red
- Secondary Segment = Pink
- Isolates = Orange
- Directors
  - Shape : Solid Diamond (7)
  - Size : Set to 1.2, 1.6, 2.0, 2.4 based on number of directorates
  - Colour
    - Single Directorate = Blue
    - Multiple Directorates = Green
- General
  - Layout property : Locked : Yes (1)

A number of iterations of "Fruchterman-Rheingold" were executed to reduce overlap between the edges. Vertices were manually adjusted to visually separate out the components of the graph. The resulting graph reflects the structure of the JSE Network and is shown to the right.
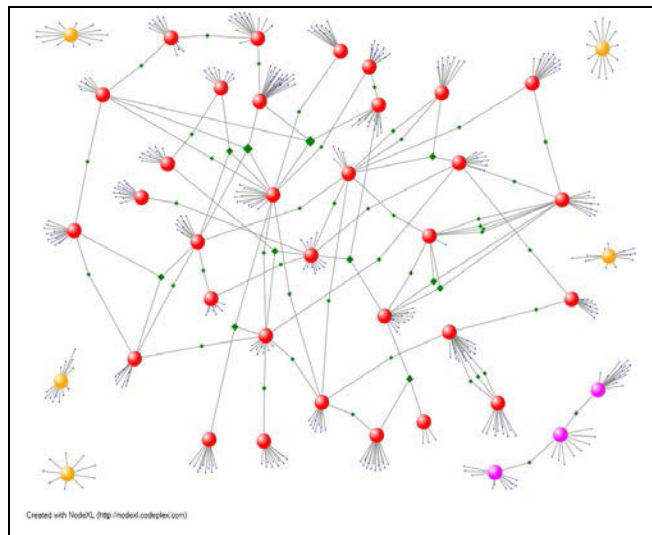
4.3.1.2 Second Layout

For the second graphic representation the Vertex properties were further adjusted to differentiate between companies and directors as follows (only changes are reflected):

- Companies
  - Labels

The spheres previously reflecting the companies have been replaced with the JSE short codes for the companies in the sample. This provides a representation of the network in which the companies are more easily identifiable.

Created with NodeXL (http://nodexl.codeplex.com)
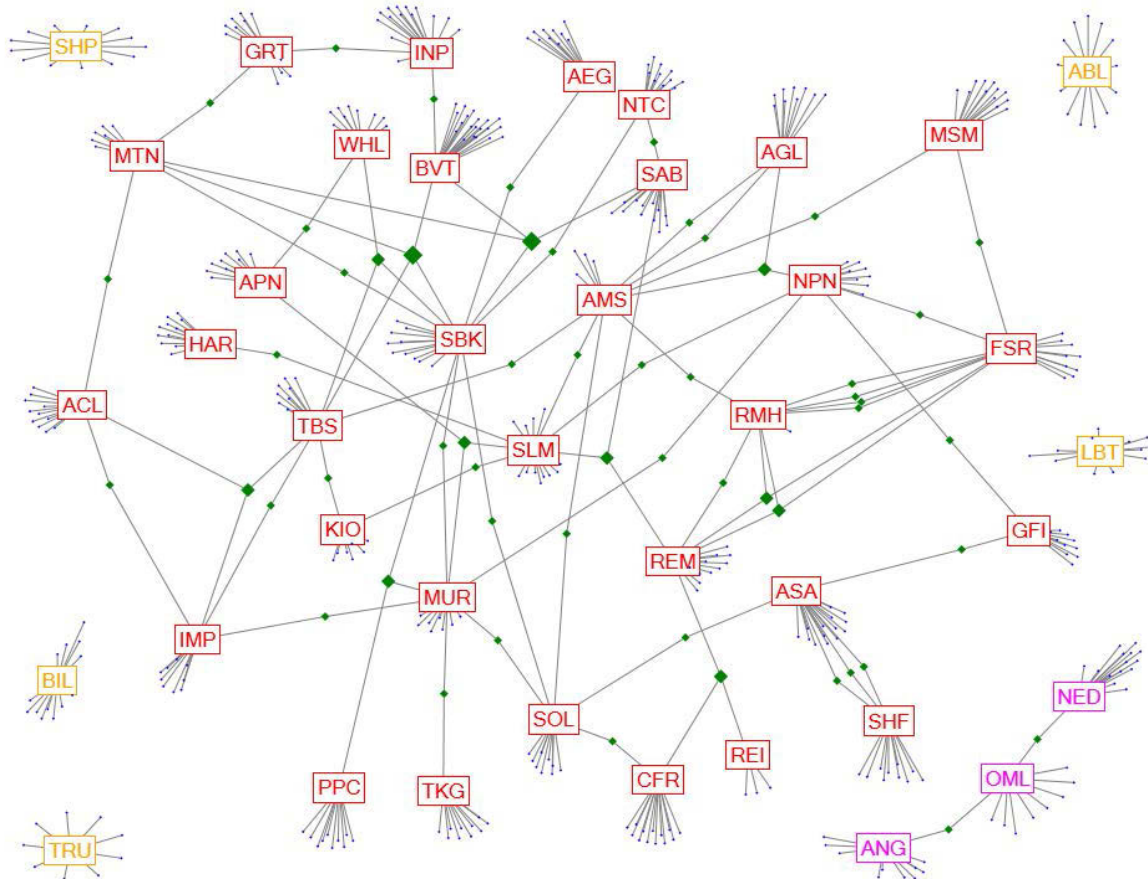
4.3.1.3 Third Layout

For the third graphic representation by NodeXL the edge properties were adjusted to differentiate between executive, non-executive and independent directorships. Only key changes are reflected:

- Edges
  - Colour
    - Non-executive directorships = Blue
    - Independent directorships = Black
    - Executive directorships = Red

o Line Width

- Executive directorships linked to 2nd company = 2

The edges connecting directors and companies have been colour coded to reflect the nature of the relationship. This allows a deeper understanding of the roles of executive, non-executive and independent directors in the network.

Created with NodeXL (http://nodexl.codeplex.com)
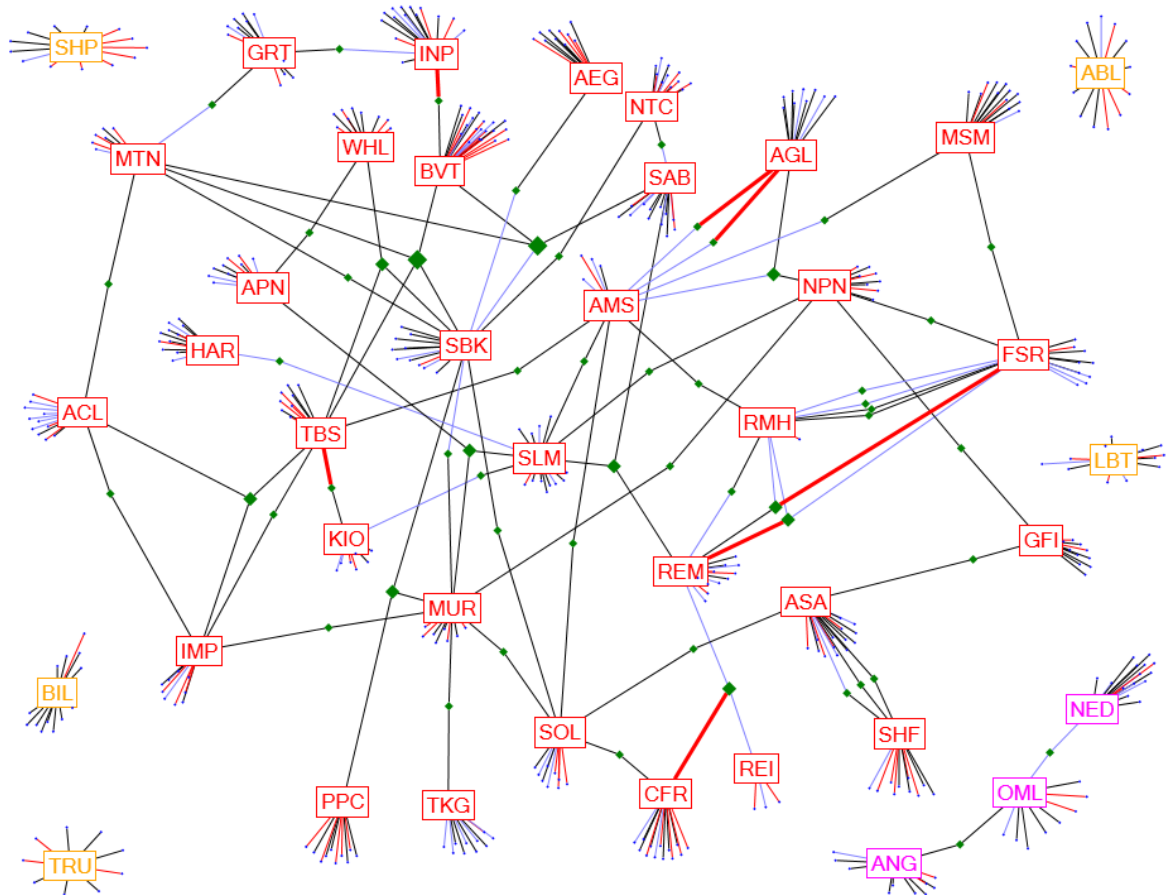
4.3.2 Ucinet

The 531 records from the primary sample were copied from the sample tab of the spreadsheet and transformed using the PivotTable and PivotChart Wizard in Microsoft Excel to create a company-to-director matrix. This matrix has the companies as columns and the directors as rows, with a value of 1 at the intersection if the director is a director of that company, and a value of 0 if not. This matrix was pasted into a UCINET dataset

(080630.##h)with 40 columns (companies) and 464 rows (directors). Given the total of 531 director seats in the top 40 companies, this gives an average of 1.144 (531/464) directorships per director.

The research performed by Santella *et al* (2008) was done on a director-director network. The conversion was performed using UCINET's functionality.

In order to get the company-company and director-director matrices in UCINET, some simple matrix algebra was performed, as illustrated by Hong (2005) to create two matrices:
1. COMP = T080630 x 080630 i.e. 40 x 40 companies-by-companies matrix
2. directors = 080630 x T080630 i.e. 464x464 directors-by-directors matrix

This was done as follows:
T081001.##h was created as a transposed matrix (i.e. the rows and columns are interchanged) of dataset 081001.##h using the Data -> Transpose function in the UCINET spreadsheet editor.

The matrix algebra was then performed using the Tools -> Matrix Algebra functions to perform the multiplication of the matrices with the following commands:
1. COMP=Prod (T081001,081001)
2. Directors=Prod(081001,T081001)

This produced the two new matrices COMP and Directors. To produce comparable network statistics to the other 5 countries in the Santella sample the COMP matrix was further analysed using the functions UCINET:
- Network density
- Freeman degree
- Normalised betweenness centrality

Network Density result was calculated using the UCINET Network/Cohesion/Density/Density Overall function. The result of the density calculation

for the COMP matrix was 0.1064 and is included with the comparative statistics in section 5.3.

The Freeman degree was calculated and the top ten are shown in the Table below:

JSE Company Code	Freeman Degree
SBK	15 (10)
RMH	10 (3)
TBS	10 (7)
FSR	10 (4)
MTN	9 (6)
REM	9 (6)
MUR	9 (8)
AMS	9 (7)
SLM	8
BVT	7 (5)

Table 4.2 Freeman Degree (Top 10 SA)

The normalised betweenness was calculated for the companies in the South African network and the top ten are shown in the table below:

JSE Country Code	Normalised Betweenness
SBK	14.383
MUR	11.312
SLM	10.632
SOL	10.623
AMS	9.965
TBS	8.601
SAB	6.929
NPN	6.642
REM	6.631
MTN	5.057

Table 4.3 Normalised Betweenness (Top 10 SA)

4.3.3 NetDraw

The COMP matrix was visualised using NetDraw (Visualise -> NetDraw).

NetDraw was loaded, and the COMP dataset selected. Netdraw was then configured as follows:

- Nodes size determined by normalised betweenness centrality
- Line width was set to be determined by the tie strength of the COMP relation (i.e. the number of directors shared between two companies).
- Analysis-> Node Centrality Measures : Set Node Sizes by Betweenness
- Properties->Lines->Size->Tie Strength
    - Using relation : COMP
    - Minimum line width : 1
    - Maximum line width : 8
- Properties->Lines->Arrow heads->Visible
    - Arrow heads : Off
    - Apply to : All ties
- Properties->Nodes->Symbols->Shape->General – all active nodes
    - Shape of nodes : Circle
- Layout -> Graph-Theoretic Layout -> Spring embedding
    - Layout Criteria : Distances + Node Repulsion
    - Starting : Current positions
    - No. of iterations : 100
    - Distance between components : 2
    - Proximities : geodesic distances
- Properties->Nodes->Symbols->Size->Attribute-based
    - Attribute : Betweenness
    - Minimum node size : 4
    - Maximum node size : 24
- Properties -> Nodes -> Labels -> Placement
    - Relative to lines : Underneath lines
    - When to draw : After node symbols

The initial network was then drawn as presented below:
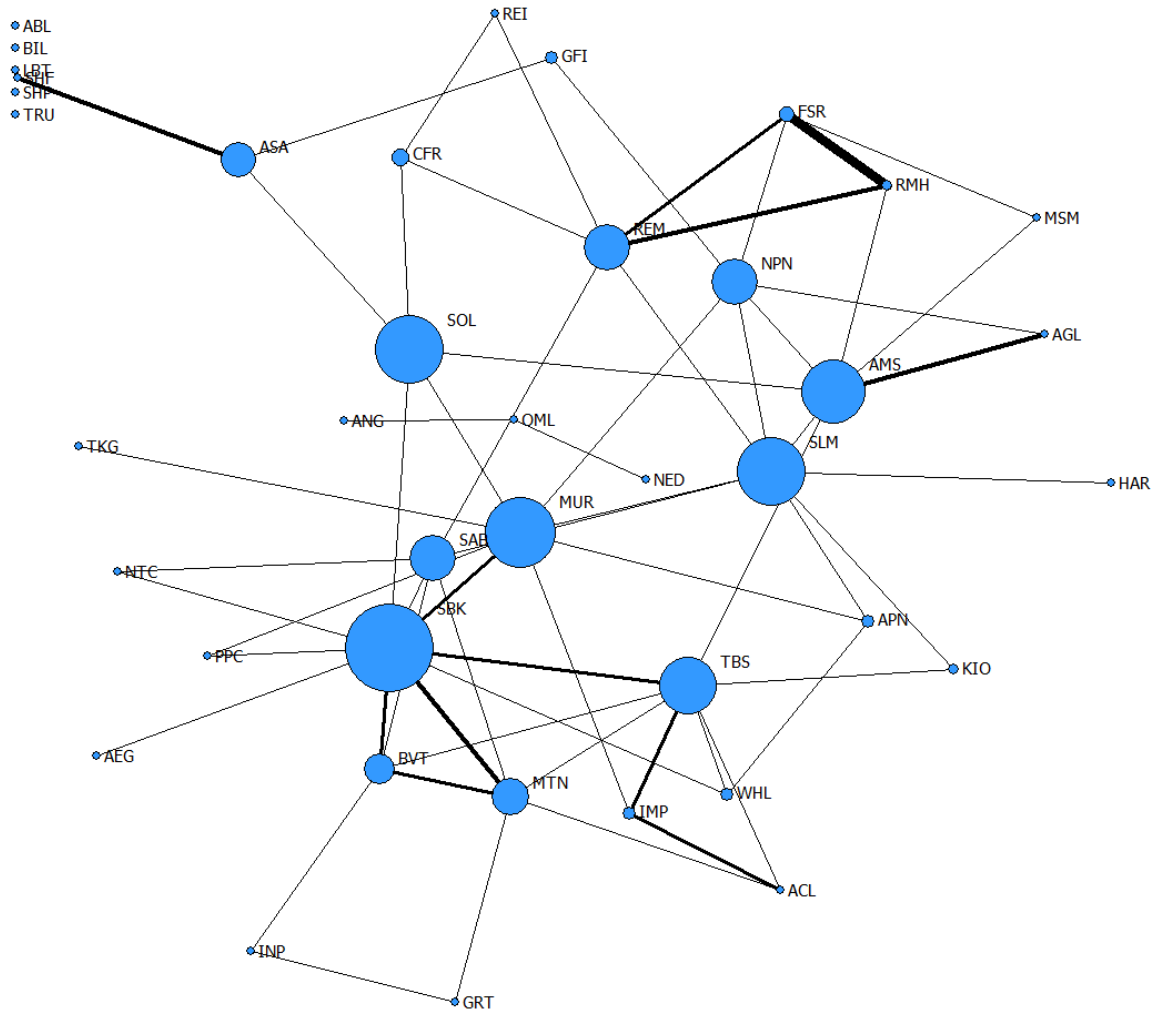
Figure 4.1 Initial South African Network

Once the initial network layout was performed some minor amendments were made to the layout by hand. These included:

- Moving the secondary segment (NED, OML, ANG) to the bottom right of the map so as not to overlap with the primary segment;
- Moving nodes closer to the main segment to fit better onto the page; and
- Moving the isolates so that they were one below the other and the labels were visible.

The final South African network was then available as used in sections 5.2.2, The South African Companies' Network and 5.3, Comparison between the Six countries' Networks.

4.4 Key Board Metrics

The analysis of directors and the company network has been performed. This has been done through detailed analysis of the dataset covering the period June 2004 - June 2010 as necessary, with some information being presented specifically for 1 October 2008, being the point in time selected to provide information comparable to the research performed by Santella *et al* (2008).

Limitations in data

Inherent limitations are present in the design of the data structures used to capture the data collected. The data has been captured into a flat data structure that has not been normalised to separate the period and position of the directorship from the director. Given the long average appointments for directorships and the relatively stable positions held this has a minimal effect on the dataset but certain classes of anomalies have arisen. Some examples clarifying the nature of these are summarised below:

- Directors resign or retire from executive positions and are appointed as NEDs
- Directors who were NEDs are appointed as Executives
- Directors resign as Chairman of the Board and are retained as Independent NEDs
- Directors resign from the board and are reappointed years later with a gap in service

Given the restrictions in the data structure, a judgement call was made in each such case so as to ensure that the most accurate information was presented for the key date of 1 October 2008.

Further limitations are present in the sources of the data and the inability to confirm the data collection with credible third party sources. The information presented by organisations in the Annual Reports was taken as fact and the context of the information

used to most accurately capture the information. Anomalies were found in the annual reports and were dealt with as follows:

- Where the appointment date of a director was not accurately stated, but only the month or year was provided, an attempt was made to scan through earlier annual reports to find the more accurate date. In cases where after such attempts no specific date was found the first date in the period was used, for example 1989 would be captured as 1/1/1989 and March 1989 would be captured as 1/3/1989.

- The classification of directors between independent and non-independent should be clearly identified but in some cases is not made. Reinet in particular was problematic in his area and their four NEDs have not been classified in the Annual Reports.

4.4.1 Total Number of Directors (Board Size)

The information presented below is extracted from the dataset and summarised and collated through MS Access and Excel to be tabulated as required (A to F) and further fields calculated based on these numbers (G to I).

Column G represents the total number of directorships held by the directors, calculated by multiplying the number of directors holding each level of directorship and summing these per year.

Column H represents the average number of directorships held per director, and is calculated by dividing the total number of directorships (Column G) by the total number of directors (Column F).

The % Singles (Column I) represents the percentage of single director directorships, being the number of single directorships (Column C) divided by the total number of directorships (Column G).

A	B	C	D	E	F	G	H	I
	Number of directors per directorship						D'Ships /	
Year	1	2	3	4	Grand Total	D'ships	Director	% Singles
2004/06/30	360	49	16	2	430	517	1.202	70.21%
2005/06/30	387	48	15	3	453	540	1.192	71.67%
2006/06/30	388	51	11	4	454	539	1.187	71.99%
2007/06/30	401	54	10	2	467	547	1.171	73.31%
2008/06/30	399	48	7	2	456	524	1.149	76.15%
2009/06/30	402	46	9	2	459	529	1.153	75.99%
2010/06/30	411	52	7	2	472	544	1.153	75.55%

Table 4.4 Directorships per Director 2004-2010

The table below presents information relating to the appointment of new directors in each year period. The appointments are summarised (in block B on the left) based on the number of existing directorships held by the director. Column C reflects the number of directors appointed, column D the number of directorship positions filled, and column E the percentage of appointments made to directors who do not hold any other directorship positions.

A	B								C	D	E
	Existing directorships : New appointments								New appointments in the year		
Year	0:1	0:2	0:3	1:1	1:2	2:1	2:2	3:1	Directors	Directorships	%Singles
2004/06/30	48	2	0	15	0	3	0	1	69	71	67.61%
2005/06/30	62	2	0	3	0	3	0	1	71	73	84.93%
2006/06/30	55	4	0	5	1	0	2	0	67	74	74.32%
2007/06/30	49	0	1	8	0	2	0	0	60	62	79.03%
2008/06/30	43	1	0	7	0	2	0	0	53	54	79.63%
2009/06/30	48	1	0	8	2	3	0	0	62	65	73.85%

	Existing directorships : New appointments								New appointments in the year		
A	B								C	D	E
2010/06/30	56	2	1	6	0	2	0	0	67	71	78.87%

Table 4.5 New Directors Appointed 2004-2010

4.4.2 Duality

Through examination of the sets of financials in collecting the dataset the designations of directors was recorded. As discussed previously, the data structure was not ideal for recording the changing positions of directors over time. The information presented below was extracted from the dataset as at 30 June 2008 (with the exception of Reinet which was incorporated after this date), and then the extracted data was verified back to the first set of annual reports issued at or after 30 June 2008.

JSE Code	*Chairman of the Board*		*Chief Executive Officer*	
	Designation	*Name*	*Designation*	*Name*
ASA	Indep. Non-Exec Chair	Marcus G	Group CEO	Booysen SF
ABL	Indep. Non-Exec Chair	Mogase MC	CEO	Kirkinis L
AGL	Non-Exec Chair	Moody-Stuart M	CEO	Carrol CB
AMS	Non-Exec Chair	Phaswana TMF	CEO	Nicolau NF
ANG	Indep. Non-Exec Chair	Edey RP	CEO	Cutifani M
ACL	Indep. Non-Exec Chair	Mokhele KDK	CEO	Nyembezi-Heita NMC
APN	Non-Exec Chair	Dlamini NJ	Group CEO	Saad SB
AEG	Indep. Non-Exec Chair	Savage RB	CEO	Jardine WR
BIL	Indep. Non-Exec Chair	Argus DR	CEO	Kloppers MJ
CFR	Executive Chair	Rupert JP	Group CEO	Platt N
FSR	Non-Exec Chair	Ferreira GT	CEO	Harris PK
GFI	Indep. Non-Exec Chair	Wright AJ	CEO	Holland NJ

JSE Code	Chairman of the Board		Chief Executive Officer	
	Designation	Name	Designation	Name
GRT	Non-Exec Chair	Marais JF	CEO	Sasse LN
HAR	Non-Exec Chair	Motsepe PT	CEO	Briggs GP
IMP	Indep. Non-Exec Chair	Mokhele KDK	CEO	Brown DH
INP	Non-Exec Chair	Herman HS	CEO	Koseff S
KIO	Non-Exec Chair	Zim PL	CEO	Myburgh EJ
LBT	Non-Exec Chair	Finch RG	CEO	Fischel DA
MSM	Non-Exec Chair	Lamberti MJ	CEO	Pattison GM
MTN	Indep. Non-Exec Chair	Ramaphosa MC	Group President & CEO	Nhleko PF
MUR	Indep. Non-Exec Chair	Andersen RC	Group CEO	Bruce BC
NPN	Indep. Non-Exec Chair	Vosloo T	CEO	Bekker JP
NED	Non-Exec Chair	Khoza RJ	CEO	Boardman TA
NTC	Indepe. Non-Exec Chair	Vilakazi SJ	CEO	Friedland RH
OML	Non-Exec Chair	Collins CD	CEO	Sutcliffe JH
PPC	Indep. Non-Exec Chair	Shaw MJ	CEO	Gomersall JE
REI	Non-Exec Chair	Rupert JP	CEO	Schwenke J
REM	Non-Exec Chair	Rupert JP	CEO	Visser MH
RMH	Non-Exec Chair	Ferreira GT	CEO	Cooper P
SAB	Non-Exec Chair	Kahn JM	CEO	Mackay EAG
SLM	Indep. Non-Exec Chair	Andersen RC	CEO	Van Zyl J
SOL	Non-Exec Chair	Cox PV	CEO	Davies LPA
SHP	Non-Exec Chair	Wiese CH	CEO	Basson JW
SBK	Indep. Non-Exec Chair	Cooper DE	CEO	Maree JH
SHF	Non-Exec Chair	Steinhoff BE	CEO	Jooste MJ
TKG	Non-Exec Chair	Arnold ST	CEO	September RJ
BVT	Non-Exec Chair	Ramaphosa MC	CEO	Joffe B

JSE	Chairman of the Board		Chief Executive Officer	
Code	Designation	Name	Designation	Name
TBS	Indep. Non-Exec Chair	Van Vught LC	CEO	Matlare PB
TRU	Indep. Non-Exec Chair	Saven H	CEO	Mark MS
WHL	Non-Exec Chair	Hawton DA	CEO	Susman SN

Table 4.6 Chairman of the Board vs Chief Executive Officer at 30 June 2008

4.4.3 Executive and Non-executive Directors

The information presented below in Table 4.7 Boards with Highest % Executive Representation (Top 3 SA 1994-2010) was extracted from the dataset and summarised and collated through MS Access and Excel to be tabulated as required (A to E) and further fields calculated based on these numbers (F to H).

Column A (Period End) indicates the period for which the top companies are listed, column B indicates the ranking (highest to lowest based on percentage executive representation – Column H). Column C provides the company name. Columns D (NonExec) and E (Exec) provide the total number of non-executive and executive directors represented on the board. Column F is the total of D and E. Column G is calculated as the percentage D of F, and H calculated as the percentage E of F.

The rank of the first company in each year to achieve a non-executive representation percentage (column G) of 67% has been shown below the top 3 in italicised text. This provides an alternate measure of the improving position of Non-executive directorship representation on the board.

A	B	C	D	E	F	G	H
PE	#	Company	NonExec	Exec	Total	% Non	% Exec
30-Jun-04	1	NTC	5	9	14	36%	64%
30-Jun-04	2	BVT	14	17	31	45%	55%
30-Jun-04	3	PPC	6	6	12	50%	50%
30-Jun-04	*13*	*AEG*	*10*	*5*	*15*	*67%*	*33%*
30-Jun-06	1	SHP	6	7	13	46%	54%

A	B	C	D	E	F	G	H
PE	#	Company	NonExec	Exec	Total	% Non	% Exec
30-Jun-06	2	NTC	5	5	10	50%	50%
30-Jun-06	3	SHF	6	6	12	50%	50%
30-Jun-06	*13*	*CFR*	*10*	*5*	*15*	*67%*	*33%*
01-Oct-08	1	SHP	6	7	13	46%	54%
01-Oct-08	2	REI	2	2	4	50%	50%
01-Oct-08	3	BVT	12	11	23	52%	48%
01-Oct-08	*12*	*LBT*	*8*	*4*	*12*	*67%*	*33%*
30-Jun-10	1	SHP	5	6	11	45%	55%
30-Jun-10	2	ABL	7	6	13	54%	46%
30-Jun-10	3	BVT	13	11	24	54%	46%
30-Jun-10	*10*	*AEG*	*8*	*4*	*12*	*67%*	*33%*

Table 4.7 Boards with Highest % Executive Representation (Top 3 SA 1994-2010)

The information presented below in Table 4.8 Boards with Highest % Non-executive Representation (Top 3 SA 1994-2010) was extracted from the dataset and summarised and collated through MS Access and Excel to be tabulated as required (A to E) and further fields calculated based on these numbers (F to H).

Column A (Period End) indicates the period for which the top companies are listed, column B indicates the ranking (highest to lowest based on percentage non-executive representation – Column G). Column C provides the company name. Columns D (NonExec) and E (Exec) provide the total number of non-executive and executive directors represented on the board. Column F is the total of D and E. Column G is calculated as the percentage D of F, and H calculated as the percentage E of F.

A	B	C	D	E	F	G	H
PE	#	Company	NonExec	Exec	Total	% Non	% Exec
30-Jun-04	1	SBK	18	1	19	95%	5%
30-Jun-04	2	FSR	13	1	14	93%	7%
30-Jun-04	3	MSM	9	1	10	90%	10%
30-Jun-06	1	SBK	16	1	17	94%	6%
30-Jun-06	2	GRT	13	1	14	93%	7%
30-Jun-06	3	TKG	10	1	11	91%	9%

A	B	C	D	E	F	G	H
PE	#	*Company*	*NonExec*	*Exec*	*Total*	*% Non*	*% Exec*
01-Oct-08	1	SBK	18	1	19	95%	5%
01-Oct-08	2	BIL	12	1	13	92%	8%
01-Oct-08	3	AMS	11	1	12	92%	8%
30-Jun-10	1	GFI	12	1	13	92%	8%
30-Jun-10	2	BIL	10	1	11	91%	9%
30-Jun-10	3	RMH	9	1	10	90%	10%

Table 4.8 Boards with Highest % Non-executive Representation (Top 3 SA 1994-2010)

# Execs	# Co's
1	5
2	13
3	6
4	8
5	3
6	2
7	2
11	1
133	40

# Non Execs	# Co's
2	1
5	1
6	2
7	1
8	9
9	5
10	7
11	4
12	3
13	1
14	2
15	2
16	1
18	1
307	40

Table 4.9 Frequency of Exec vs Non-exec Representation on Boards (SA)

4.4.4 Independent Directors

The dataset was summarised by year and by status of director, extracting the information relating to the executive, non-executive and independent status of each of the directors. The appointment date of each director was then used to calculate the number of days' service, which was compared to the nine year mark (based on 365.25 days per year). The number of independent directors exceeding nine years' service was then totalled.

Date	2010/06	2009/06	2008/06	2007/06	2006/06	2005/06	2004/06
# Directors	543	529	524	547	538	539	517
Exec	141	138	126	141	145	154	146
Non Exec	106	99	103	107	105	108	100
Independent	296	292	295	299	289	278	271
> 9 Years	69	65	69	68	49	45	45
% > 9 Years	23.3%	22.3%	23.4%	22.7%	17.0%	16.2%	16.6%

Table 4.10 Split of Exec vs Non-Exec vs Independent Directors (30 June each year)

King III Practice 2.18.6 (IoDSA, 2009) requires that a minimum of one third of non-executive directors be rotated every year. As an approximate measure of this one can look to see if a third of current NEDs have been appointed in the current year. The dataset has been analysed to extract the numbers of NEDs appointed each year, the total number of NEDs serving each year and then the % of new appointments calculated.

Date	2010/06	2009/06	2008/06	2007/06	2006/06	2005/06	2004/06
Total NEDs	402	391	398	406	394	386	371
NED app's	54	42	42	51	55	47	55
% of total	13.4%	10.7%	10.6%	12.6%	14.0%	12.2%	14.8%

Table 4.11 Percentage New NED Appointments (Director Rotation)

4.4.5 Unaffiliated Directors

The period for the analysis of unaffiliated directors runs from June 2004 to June 2010. The appointment date of each director was used to calculate the number of days' service, which was compared to the three year mark (based on 365.25 days per year). The number of independent directors with less than three years' service was then summed. The % of directors meeting this criterion was then calculated as per Table 4.12 on the following page.

Date	2010/06	2009/06	2008/06	2007/06	2006/06	2005/06	2004/06
Unaffiliated	116	114	108	118	138	138	145
Affiliated	180	178	187	181	150	139	126
% Unaffiliated	39.2%	39.0%	36.6%	39.5%	47.8%	49.6%	53.5%

Table 4.12 Classification of Independent Directors into Affiliated vs Unaffiliated (30 June each year)

Table 4.13 below lists the longest serving independent directors during the period June 2004-June2010, ranked by the period of tenure (in days). 5 of the top 10 are still serving as directors in the companies listed. The shortest serving of these directors, at 8185 days, has been on the board for over 22 years.

Director	Code	Appointed	Resign/Retired	Service (Days)
King MW	AMS	1979/01/01	2004/08/16	9359
Plumbridge R	SBK	1980/01/01	2005/05/25	9276
Frost BJ	WHL	1986/01/01	2010/11/01	9070
Clewlow WAM	PPC	1983/01/01	2007/01/23	8788
Rapp M	LBT	1986/01/01	Current Director	8765
Bradley EL	SBK	1986/01/01	2009/05/28	8548
Dreyer JW	RMH	1987/10/01	Current Director	8308
Goss PM	RMH	1987/11/12	Current Director	8266
Dow RG	TRU	1988/02/01	Current Director	8185
Parfett AE	TRU	1988/02/01	Current Director	8185

Table 4.13 Top 10 Longest Serving "Independent" Directors June 2004-June 2010

4.5 Summary

In this chapter the researcher has presented the tables, graphs and network diagrams reflecting the results of the analysis as suggested in Chapter Three. This has been done through detailed analysis of the dataset covering the period June 2004-June 2010 as necessary, with some information being presented specifically for 1 October 2008, being the point in time selected to provide information comparable to the research performed by Santella *et al* (2008).

The key tools used in calculation and presentation of the results were UciNet, NetDraw, NodeXL, Microsoft Access and Microsoft Excel. Detailed analysis of the results presented, aligned to the research questions, is presented in Chapter Five.

5 Discussion

5.1 Introduction

In this chapter, the significance of the results presented in Chapter Four is discussed. Firstly, the South African network (as at 1 October 2008) is explored, looking at the bipartite director/company network, then at the company projection and at relationships within the network. Thereafter a detailed comparison is undertaken between the South African network and that of the other countries (The UK, US, Germany, Italy and France) as calculated by Santella *et al* (2008). Finally further key metrics within the South African network, covering a broader time frame, are explored.

5.2 The South African Network

5.2.1 Bipartite Network (Directors and Companies)

The network diagram (Figure 5.1) reflects the bipartite relationships between the directors and companies for the top 40 companies selected for the sample and was generated using NodeXL as described in Section 4.3.1. In the diagram the directors are reflected as diamonds, blue diamonds for directors who are members of the board of a single company, and green diamonds for those directors who sit on (and therefore connect to) the boards of multiple companies. The size of the diamond reflects the number of boards the director connects.

The network has 526 unique edges (directorships) between 498 vertices (consisting of 458 directors and 40 companies) as reflected in Table 4.1 NodeXL Key Graph Metrics. The South African network visibly displays the properties of a highly connected network. It can be seen that there are two connected components, one consisting of 32 companies (names indicated in red), and one of 3 companies (pink). The remaining 5 companies (orange) are isolated from the two networks.

Created with NodeXL (http://nodexl.codeplex.com)

Figure 5.1 The Bipartite South African Network (Oct 2008)

The largest component contains 430 of the 536 edges (directorships) comprising 82% and 364 (396-32) of 458 (498-40) director vertices, making up 79% of the directors in the sample. Clearly the majority of directors and directorships constitute the primary component of the network.

While the majority of the directors and directorships are included within the network, it is still one of relative low density (calculated as 0.004). This is immediately apparent as most organisations share just a single director with another although some share as many as 4 (RMH and FSR). As identified in the South African section (bottom right) of Table 5.2 Board Directorships in the Six Countries (Oct 2008 for SA), there are two directors who hold the most directorships in the sample. These two directors are Ramaphosa MC (Cyril) and Band DDB (Doug), both of whom sit on four boards and are clearly visible as the large

diamonds towards the top centre of the network. These two directors jointly sit on the boards of Standard Bank (SBK), MTN Holdings (MTN) and Bidvest (BVT). Mr Band sits on Tiger Brands (TBS) as his fourth directorship while Mr Ramaphosa sits on the board of SAB Miller (SAB).

The primary component of the network has a fairly high number of redundant connections. There are three companies (AEG, HAR, TKG) which could be isolated from the primary component through the termination of a single directorship (either on the part of the affected company or the connected company). A further two companies (PPC, REI) have connections to two other companies, but, both of these connections occur through a single director. Termination of the directorship by the affected company would therefore sever the links to both of those companies and disconnect the company from the network. Termination of a single directorship by one of the other companies to which these are connected would not have the same affect.

There are no directors (even those above) which when removed from the network would cause the network to splinter into multiple components.

The key network statistics (of length and density) for the bipartite network are were calculated and presented in Table 4.1 NodeXL Key Graph Metrics. The maximum Geodesic Distance (Diameter) of the network is 12. At its widest point, it therefore takes 12 directorships to traverse from the outermost company across the network to the company furthest away. The average Geodesic Distance is reflected as 6.533, just over half of the maximum, aligning to the visible representation of a clustered rather than elongated network. As noted earlier, the network density is 0.004. Without comparative metrics this in itself is not a hugely useful metric.

5.2.2 Unipartite Company Network Projection
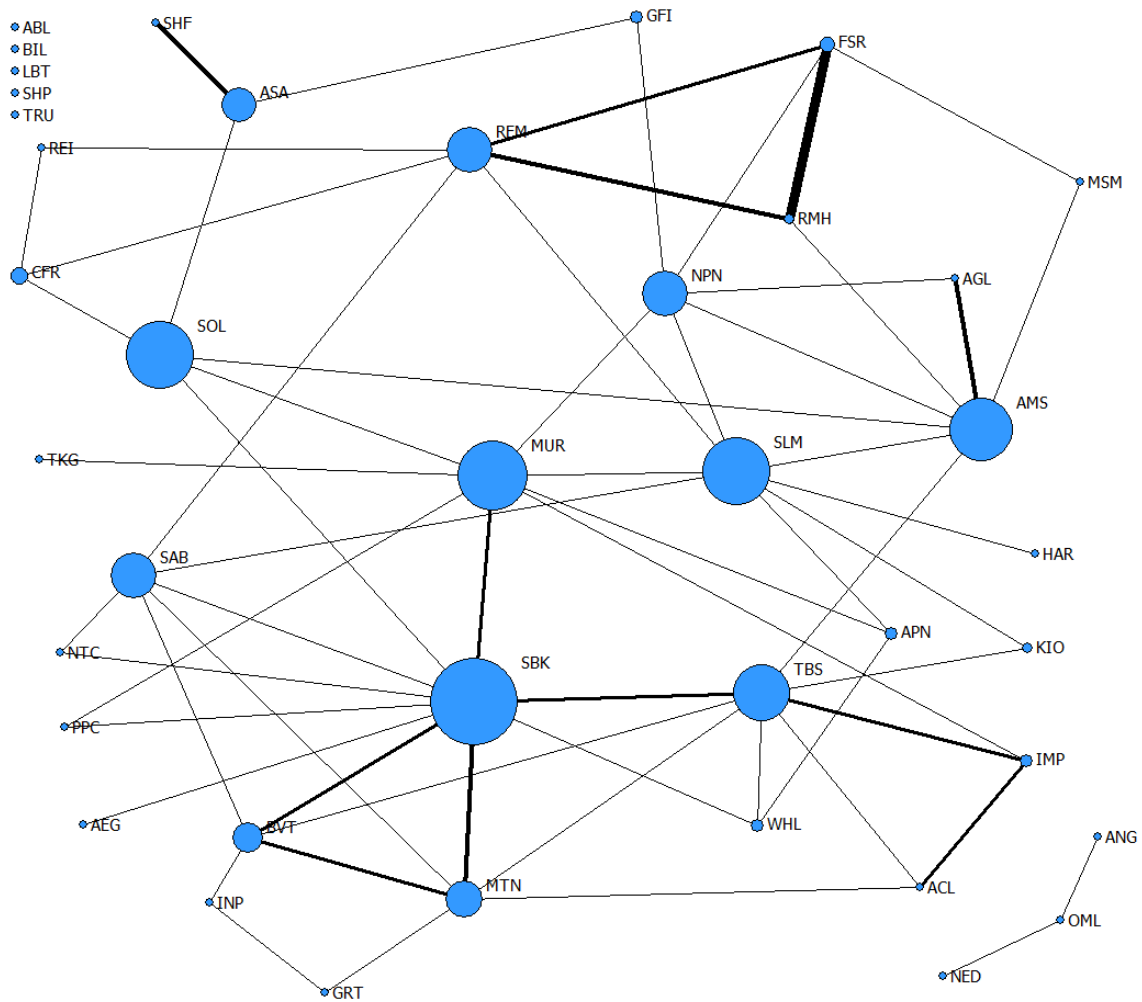
Figure 5.2 South African Companies' Network Unipartite Projection (Oct 2008)

The company network now shown in Figure 5.2 is a unipartite projection after the matrix transformation, as described in section 3.6.2.2, has removed the directors and replaced them with direct connections between the company vertices. The thickness of the edges connecting the companies represents the number of directors in common. For example, in the previous graph (Figure 5.1) it can be see that there are three directors in common between Steinhoff International Holdings (SHF) and Absa Group Limited (ASA) and the edge between these two is clearly thicker than that of Anglo American (ANG) and Old Mutual (OML) which share only a single director. The RMB Holdings (RMH) to

FirstRand Limited (FSR) connection (with 4 directors) clearly shows up as being the strongest connection.

The clustered nature of the South African network is even more clearly visible in this representation. The three companies (TKG, HAR, AEG) connected through a single directorship (as discussed in section 5.2.1) are clearly visible. What is much less clear from this representation is the tenuous nature of the connections of PPC and REI. In this representation they appear no different to the connections of GFI, KIO, NTC amongst others.

The sizes of the company vertices in the graphic are scaled relative to their normalised betweenness, calculated using Ucinet as described in Section 4.3.2 and presented in Table 4.3 Normalised Betweenness (Top 10 SA). The dominant role played by Standard Bank (SBK) in the network is clear, with supporting positions of Murray and Roberts (MUR), Sanlam (SLM) and Sasol (SOL). This handful of companies form the core of the South African JSE network and bind the network together.

The number of directorships linking the companies is calculated in the Freeman degree and is shown in Table 4.2 Freeman Degree (Top 10 SA). Looking at the top list immediately highlights some anomalies. Standard Bank being at the top of the list is not unexpected with links to ten other companies through fifteen directorships. The positions of RMB Holdings (RMH), Firstrand (FSR) and Murray and Roberts deserve special mention. RMH appears second on the top ten list with FSR appearing fourth and MUR appearing seventh. Of these, RMH and FSR are not amongst the most central in the network. These two companies both have ten directorships linking them to other companies, however, RMH is linked to just three companies and FSR to four. Both therefore have multiple directorships to the same companies. This is visible through the strong edge connecting them to each other, and to Remgro Limited (REM). Therefore despite these companies having large numbers of directorships, their importance in the network is somewhat diminished and they form their own clique within the broader network. The contrast between the roles of Standard Bank and FirstRand is marked.

Murray and Roberts on the other hand has nine directorships in common with other companies, connecting it to eight other companies. This moves it to second spot in the normalised betweenness ranking despite the relatively low number of directorships, and it plays a far more important role in the network then others with more directors.

As discussed in section 5.2.1, the Geodesic distances are key measures of the graph and the maximum and average distances were presented for the bipartite graph. For the unipartite projection (companies) the interconnecting vertices (directors) have been removed and replaced with direct links. This therefore halves the distances between any two vertices in the projection. The maximum geodesic distance (diameter) of the company network is therefore 6 and the average geodesic distance is 3.226.

5.2.3 Director Relationships Within the Network

In this final graphical representation of the bipartite network (Figure 5.3 Relationships between Companies through Key Directors (Oct 2008)) we revert back to the network as generated by NodeXL with some changes in the representation to highlight some key directorship information. The network as generated in section 4.3.1.3 is used as a base. This network differs from that discussed in 5.2.1 above in that the edges (directorships) have been colour coded to represent the nature of the directorship. Executive directorships are highlighted in red, with further emphasis placed on those where a director hold both executive and non-executive directorships. The non-executive directorships are presented in blue, with independent non-executive directorships presented in black. In addition, a number of director clusters are highlighted for further discussion.
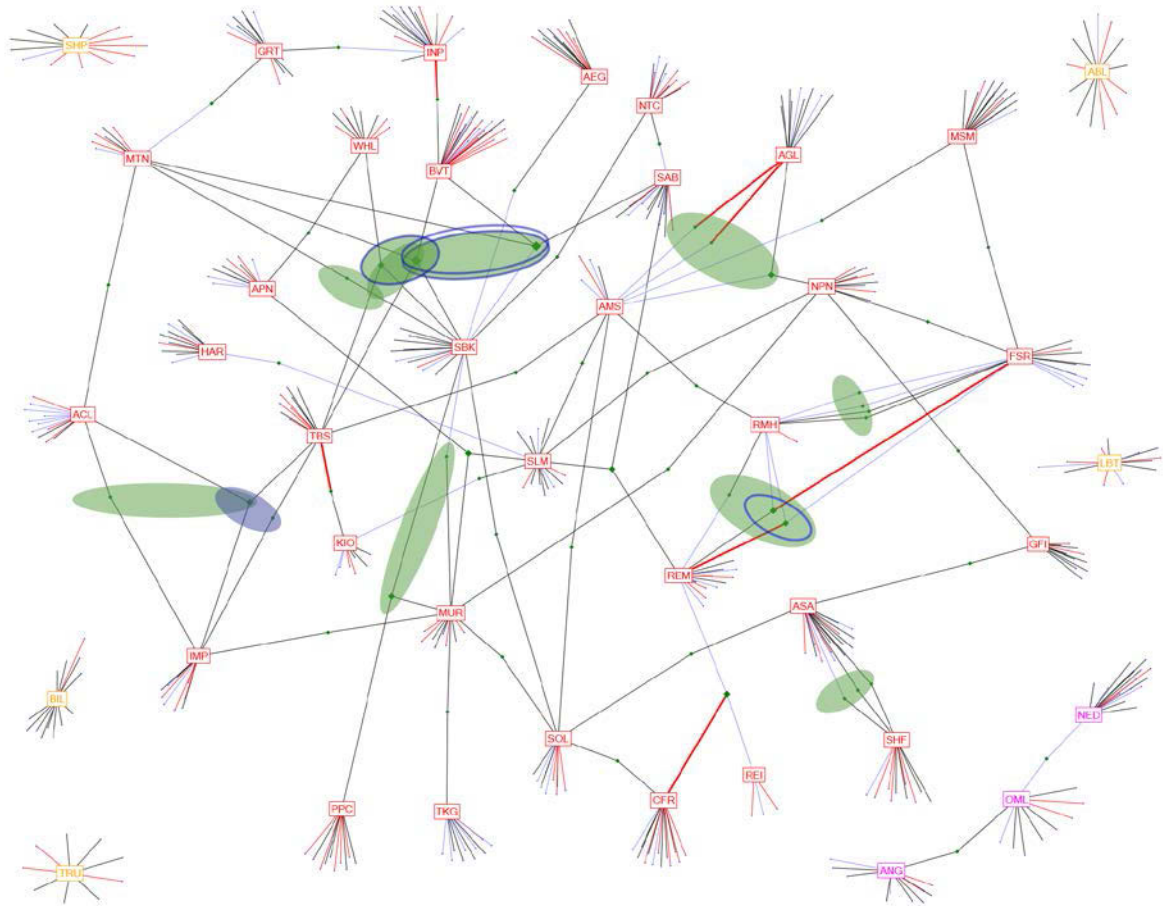
Figure 5.3 Relationships between Companies through Key Directors (Oct 2008)

The majority of executive directors are solely directors of a single organisation. There are a limited number of executive directors who also hold positions on the boards of other companies, these seven directors are executives of six companies (TBS, CFR, REM, FSR, AGL, INP) out of the forty covered in the sample. For further detail see Table 5.6 Executive vs Non-executive Posts of Directors which is discussed in more detail in Section 5.6.

Anglo American PLC (AGL) is the only company to have two executives sit on the board of another company, with Cynthia Carrol and Rene Medori sitting on the board of Anglo Platinum (AMS) as non-executive directors (not independent).

First Rand Limited and Remgro Limited are the only companies to have an executive from each sitting on the board of the other, with PK Harris (CEO of FirstRand) sitting as an independent non-executive on the board of Remgro, and L Crouse, the Financial Director of Remgro sitting as an non-executive (not independent) on the FirstRand Board. The cross over nature of such a relationship does beg questions around the true independence of the directors concerned and how it is that one is considered independent while the other is not.

Looking at the highlighted clusters of directors, each green shaded ellipse marks a cluster of directors who are in common between two companies. The blue shaded ellipse marks another cluster which shares a director with a previous cluster. The four directors in common between MTN and Standard Bank are highlighted using three green ellipses due to their positioning amongst a number of other relationships. In this area there are also three blue shaded ellipses identifying further relationships.

The number of clusters around Standard Bank serves to reinforce just how important the handful of directors is within the network. Just four directors form key multiple director bonds with four companies, one third of the number of such bonds in the entire network. Standard Bank is involved in five of the twelve multiple director relationships in the network. It is also worth nothing once again the difference in the multi-directorship intercompany relationships between Standard Bank and Firstrand directors. Six FSR directors are involved in multi-director relationships, with all six sitting on the board of RMH. Only two of the six sit on a second board (REM). Contrast this to SBK where, as discussed earlier, four directors form more bonds.

It is clear that the appointment of just a few well connected directors has a significant impact on the centrality of the company within the company network.

5.3 Comparison of South Africa to the Other 5 Countries

The discussion up to now has centred on the various projections of the South African network, looking at various attributes of the network and relationships within the network.

Looking at this in isolation does not however give us any real indication as to the nature and importance of the structure of the network. The focus now moves onto the work done by Santella, Drago and Pollo in 2008. In their study they compared the company networks of the main listed companies of five key stock exchanges around the world in the United Kingdom, the United States of America, Italy, Germany and France. Their comparison looks at the top forty companies in each of the countries (with the exception of Germany where only 39 are included). By comparing the South African network from a similar time period and with a similar cross section of companies, it is possible to position South Africa relative to these others and through the relative position better understand the significance of the network attributes. It is unfortunate that in the work performed by the researchers they presented only this single unipartite projection.

Having spent some time in Section 5.2.2 discussing the unipartite projection of the South African network, the projections from the comparative countries are now presented in Figure 5.4 Graphical Comparison of the Six Countries' Networks below.

The United Kingdom (UK) network (middle left) is the most unusual of the six with its elongated shape consisting of three clear spokes emanating from a central cluster. The density of this network is visibly the lowest of the six and there are two weak points where removal of a single directorship would split the primary component producing a secondary component of either three (Rio-Tinto to Cadbury Schweppes) or six companies (Vodafone to Shell). The top right spoke is slightly more robust in requiring at least two directorships to be removed before it would splinter away from the primary component. Whether this could happen through the removal of a single director (holding multiple directorships) is unclear from the data provided, although is unlikely as only two directors hold three directorships as per Table 5.2 Board Directorships in the Six Countries (Oct 2008 for SA). The UK network is also the only other network (than SA) to have a secondary component, made up of two companies, BG and Carnival, while also having the highest number (12) of isolated companies. There are no multi-director links between companies in the network.

The United States (US) network (bottom left) is a low density network more conventional in shape and not having the elongated spokes of the UK network. There are number of

directorships which if removed would remove a single company from the network, but only one which when removed would create a secondary segment. The removal of the directorship between Walt Disney and Bank of America would leave Bank of America and CVS in a two company segment. The US network has five isolates and no secondary segment. There are two multi-director company links reflected by the thicker edges connecting Medtronic and Bancorp as well as between AT&T and Anheuser-Busch. Unlike the UK network which has a (relatively) dense core, the US network has a more distributed core with a dominant General-Electric to the bottom right and a few, namely, AIG, UTC and Wells Fargo forming clusters above and left.

At first glance the French (top right) and Italian (top left) networks look fairly similar in that they have a highly connected inner core with numerous (fifteen plus) multi-director connections each (the heavy edges zig zagging through the core of the networks) and some companies hanging off this core, with both also having a tail which could be disconnected to produce a two company isolate by severing a single directorship (present on the top left of each of the network graphs). These are Unipol Gruppo Finanziaro Spa and Banca Monte Dei Paschi Di Siena Spa for the Italian network and Vallourec and Peugot for the French.

A clear distinction between the two is present in the number of isolates, with France having only one compared to the eight of Italy. This would have a significant impact on the density calculation of the two networks, with Italy showing a 0.1039 vs that of 0.1551 for France (Table 5.1 Country Networks: Descriptive Statistics).

The German network is visibly the most connected highest density network of those presented here. This is supported through the count of the number of intercompany directorship connections as reflected in Table 5.3 Total Intercompany Links for each Country Network. Germany has 112 links vs 108 for France and 84 for Italy. The convention of showing multi-director links by virtue of thicker connecting edges is not followed for this country network as presented by Santella *et al* (2008) so no immediate comparison is available on that front. The core of the German network is formed by Allianz and BASF, with Lufthansa, Linde and Bayer connecting into a very strong five way centre. While a number of the companies in the network are connected through a

single directorship, there are no weak links which if removed would create a secondary segment.
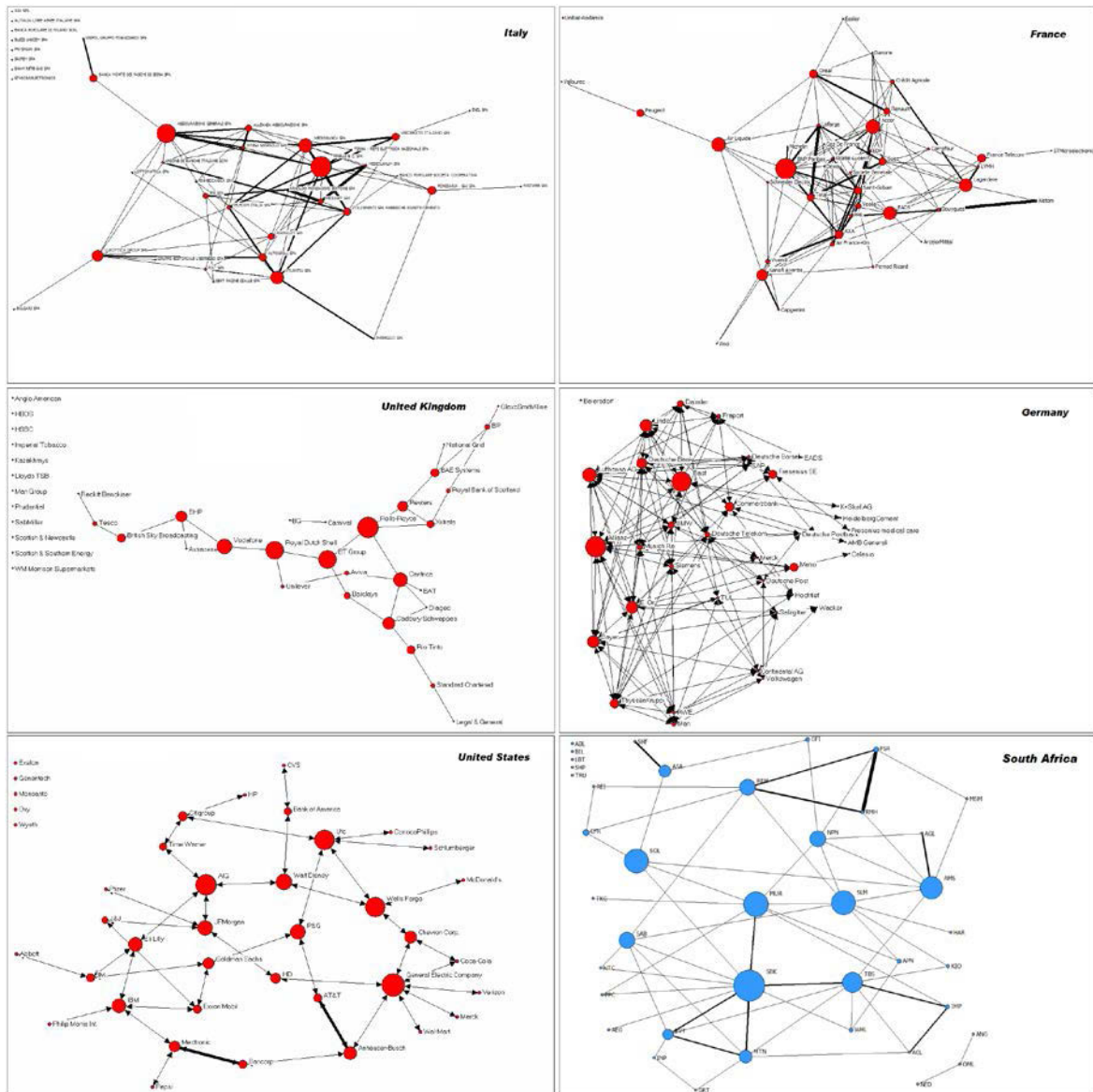
Figure 5.4 Graphical Comparison of the Six Countries' Networks

Having explored the five comparative networks and reflecting back on the earlier discussion around the South African network, it can be concluded that the South African network (bottom right) is clearly denser than those of the UK and USA, while not being as strongly connected as those of France and Germany. In the measure of isolates, South Africa is similar to the USA with five, far fewer than Italy and the UK. The South African network is the only other than the UK to have a secondary segment. This comprises three

companies, Nedbank, Old Mutual and Anglogold Ashanti. The network clearly has fewer multi-directorship connections than Italy and France.

By virtue of comparisons, the South African network falls in the middle, not in the same camp as the sparsely connected UK and USA networks, while not being nearly as densely connected as France or Germany. It is closer to the UK in some measures than Italy, while being farther away in others.

The quantitative metrics of the six networks are presented in Table 5.1 Country Networks: Descriptive Statistics below. The statistics for all countries (except South Africa) were extracted or calculated from Table 1 and Table 2 of Santella's paper (2008, p.10). Columns C to F come directly from Table 1. Columns G & H were calculated from data presented in Table 2, with Columns I & J being calculated from columns B,G and H.

A	B	C	D	E	F	G	H	I	J
Country	*Compa nies*	*Network Componen ts*	*Companies in 1st component*	*Isolat es*	*Network density*	*Dir's*	*D'ships*	*D'ships / Company*	*D'ships / Dir*
Italy	40	9	31	8	0.1039	491	575	14.375	1.171
France	40	2	39	1	0.1551	487	595	14.875	1.222
UK	40	14	26	12	0.0410	485	515	12.875	1.062
Germany	39	2	38	1	0.1984	795	908	23.282	1.142
United States	40	6	35	6	0.0564	489	532	13.300	1.088
South Africa	40	7	32	5	0.1064	458	526	13.150	1.148

Table 5.1 Country Networks: Descriptive Statistics

Columns C, D and E provide details around the number of network components in the network (C), the size of the first (largest) component in the graph (D) and the number of companies which are isolated from any of the connected components (E). These numbers are inter-related in that the smaller than size of the 1st component, the higher number of isolated components and the more overall network components will be presented. We see

this clearly with the UK having only 26 companies connected in the first component (the smallest of the sample), 12 isolated companies (the most) and the largest number of network components, 14.

Germany on the other extreme has just two network components, one made up of 38 companies (the largest component in all of the networks) and just one isolated company. Italy has the second smallest 1st component, and correspondingly the 2nd largest number of isolates. The earlier discussion showed that Italy (with South Africa) fell in the middle two of the six networks, so there is therefore not a direct relationship that can be inferred between the size of the 1st component and the connected nature or density of the network.

Column F, the network density, again has the companies in order with the UK, US, Italy, South Africa, France and Germany. It is noticeable that the UK and US are fairly similar in network densities with values of 0.041 and 0.056 respectively. Italy and South Africa are even closer together with values of 0.104 and 0.106 respectively. France comes in 50% higher at 0.155 and Germany trails with 0.198. These values cover a wide range and clearly show the extremes in connectedness of company networks.

The number of directors (G) and directorships (H) in the network are compared, along with the average number of directors per company (I), and directorships per director (J). Germany has the highest number of directors, 795, holding 908 directorships (1.14 each), and correspondingly, the highest number of directors per company, 23.28. France's directors hold the highest number of directorships per director with an average of 1.22.

South Africa has the lowest number of directors, 458, holding 526 directorships (1.14 each) at an average of 13.15 directors per company (second only to the UK). The UK has 27 more directors than South Africa in 485, but they hold only 515 directorships (the lowest) at the lowest average of 1.06. The USA is the second lowest number of directorships per director at 1.088. The UK also has the lowest number of directorships per company at 12.875.

The count of directorships held by directors is explored in Table 5.2 Board Directorships in the Six Countries (Oct 2008 for SA) below. The low number of directorships per director is clearly visible for the UK and the US, with neither having any directors holding more than three positions, and both only having two directors holding three. France has one director holding six positions, and another five holding four. Italy has one with five and four with four. Germany is better than both of these, with none over four and six holding four positions.

South Africa while not having as few multi directorships directors as the UK and US is better than France, Germany and Italy. South Africa has only two directors with four positions.

US #	Dir.	Freq.	Cum.
1	448	0.916	0.916
2	39	0.080	0.996
3	2	0.004	1.000
Total	489	1.000	

France #	Dir.	Freq.	Cum.
1	413	0.848	0.848
2	48	0.099	0.947
3	20	0.041	0.988
4	5	0.010	0.998
5	0	0.000	0.998
6	1	0.002	1.000
Total	487	1.000	

Italy #	Dir.	Freq.	Cum.
1	428	0.872	0.872
2	48	0.098	0.969
3	10	0.020	0.990
4	4	0.008	0.998
5	1	0.002	1.000
Total	491	1.000	

UK #	Dir.	Freq.	Cum.
1	457	0.942	0.942
2	26	0.054	0.996
3	2	0.004	1.000
Total	485	1.000	

Germany #	Dir.	Freq.	Cum.
1	713	0.896	0.896
2	60	0.075	0.971
3	17	0.021	0.992
4	6	0.008	1.000
Total	796	1.000	

South Africa #	Dir.	Freq.	Cum.
1	403	0.880	0.880
2	44	0.096	0.976
3	9	0.020	0.996
4	2	0.004	1.000
Total	458	1.000	

Table 5.2 Board Directorships in the Six Countries (Oct 2008 for SA)

The cumulative frequencies calculated in the table above are presented graphically in Figure 5.5 Number of Directorships per Director by Country below. It is important to note that the graph Y axis has the range 80% to 100% in order to allow the reader to more easily see the difference between the countries. It must be noted that even the country with the lowest number of single company directors (France) has 84.8% of directors holding only a single directorship. The UK with the highest has 94.2%. The similarity in patterns between the UK and US are clearly visible, with South Africa and Germany also looking similar. The similarity in patterns between the latter two is significantly influenced by the choice to present the Y axis as percentages rather than the raw numbers, which provides the cumulative relative frequencies. When looking at the absolute numbers, as shown in Table 5.3 Total Intercompany Links for each Country Network the pattern changes once again.
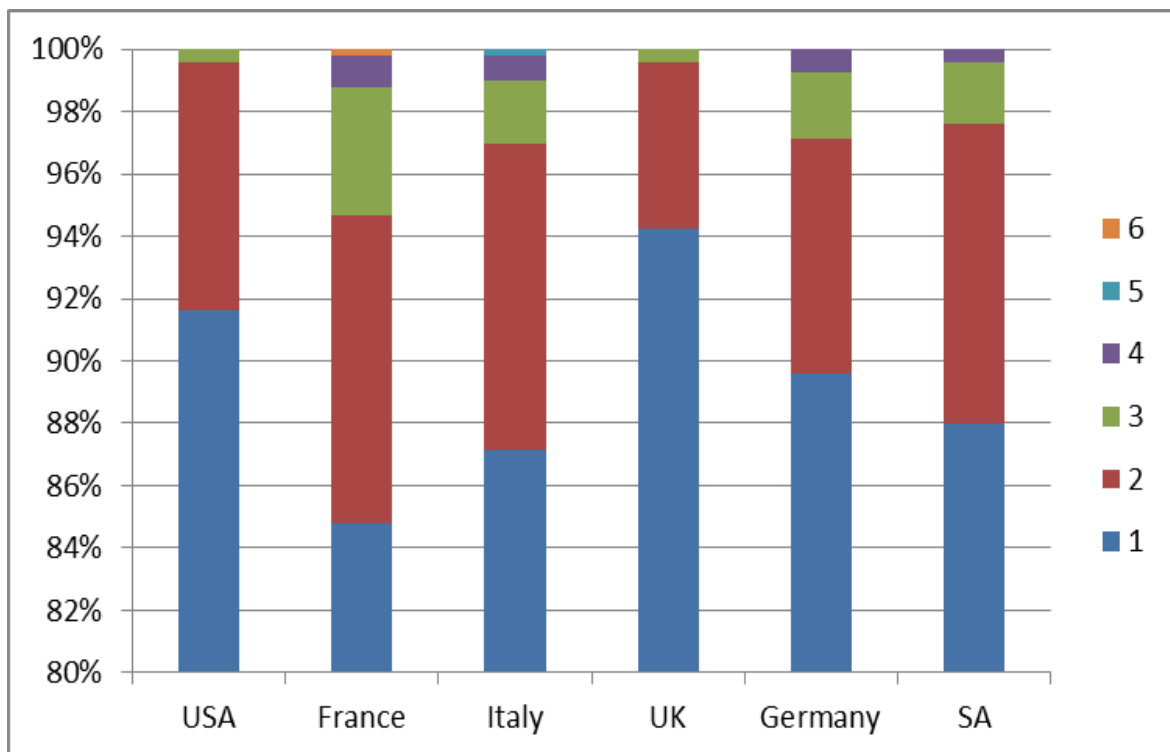
Figure 5.5 Number of Directorships per Director by Country

An alternate way to view the multi directorship directors (and hence the links between companies), providing focus on the totals rather than relative positions, is to calculate the total number of links between companies based on the data provided in Table 5.2 Board

Directorships in the Six Countries (Oct 2008 for SA). This has been done by using Directorships (#) subtract one multiplied by the frequency of directors (Dir.) for each level within a country and adding up the results. The results per country are presented in the table below:

#	Country	Intercompany Links	#	Country	Intercompany Links
1	UK	30	4	Italy	84
2	USA	43	5	France	108
3	SA	68	6	Germany	112

Table 5.3 Total Intercompany Links for each Country Network

The countries are ranked in the table from the lowest number of intercompany links (UK) to the highest (Germany). The two items to highlight in the table are the proximity of France to Germany, which re-iterates how although Germany has the much higher number of directors, France with the highest number of directorships per director closes that gap. South Africa has a significantly fewer number of links (sixteen) then Italy.

We conclude the discussion around the comparison between the countries (including South Africa) by looking at two measures of interconnection, the Freeman Degree and the betweenness.

The Freeman Degree is a measure of local centrality or the potential of a company to interact with a specific number of directors. The Freeman degree within the context of the networks being examined also identified the extent of connections a company has with directors who also interact with other companies within the sample of top companies being examined on that country's stock exchange. A high Freeman degree does not necessarily correspond with a high centrality in the network (Santella *et al,* 2008). Betweenness is a measure of centrality of a node (a company) within the entire network. The betweenness indicates the number of paths passing through a node, with paths being the shortest route that connects two nodes. Betweenness is a complementary measure in relation to the Freeman Degree as it determines whether a node holds a central or periphery location within the network (Freeman, 1979; Borgatti, 2005; as cited in Santella *et al*, 2009).

A summary of the analysis of the Italian, French and German companies as performed by Santella *et al* (2008) is provided below:

- Italian Blue Chips with the higher number of connections tend to be located at the centre of the network;

- The French companies with a higher Freeman Degree have a similar high number of connections to those of the main Italian Blue Chips, but a higher number of average links per director. As with Italy, the companies with the higher Freeman Degree also tend to be at the centre of the network, which is also a centralised form; and

- Germany is similar in nature, with companies that have a high number of links being at the centre of a centralised network.

South Africa is not fundamentally different with respect to the Freeman Degree (Table 5.4). Standard Bank has 15 connections to ten companies, and RMB, Tiger and FirstRand each have ten connections to between three and seven other companies. The betweenness of these top four companies (Table 5.5 Country Networks' Normalised Betweenness) shows Standard Bank as being most central the network followed by Murray & Roberts, Sanlam and Sasol. The anomaly is two companies with high numbers of connections (RMB and FirstRand) not being central to the network. As discussed earlier in the analysis of the South Africa network (Section 5.2) this is caused by the high number of cross holding directorships between those two companies. The network as a whole is however still a mostly centralised network with a dense core as was visible in Figure 5.4 Graphical Comparison of the Six Countries' Networks.

The UK blue chips have lower values of the Freeman Degree than Italy, Germany, France and South Africa as reflected in Table 5.4 Country Networks' Freeman Degree . Centric has the highest value in the UK network, having just five connections to five other companies, compared with the likes of BNP Paribas of France having 21 connections to 16 companies, Pirelli & C. Spa of Italy having 22 connections to 14 companies, and Standard Bank of South Africa having 15 connections to 10 companies.

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As discussed earlier, the UK network takes a fundamentally different shape, being longer and elongated, with a star layout compared to the centralised forms of France, Germany, South Africa and Italy. The shape of the network reflects the much greater distance between the peripheral and central companies. The betweenness of the companies in the central portion of the star is therefore much higher as without those redundant (alternate) links more of the shortest paths travel through the centre of the network.

This is clearly shown in Table 5.5 Country Networks' Normalised Betweenness. Rolls-Royce (UK) has a betweenness of 18.668 against Paribas (France) 16.470, Allianz (Germany) 15.635, Standard Bank (South Africa) 14.383 and Pirelli (Italy) 13.893.

The US falls between the two camps. As identified by Santella *et al* (2008) the US companies with a higher Freeman Degree have a low number of links to other directors (General Electric seven links to seven companies, UTC five to five) which is similar to the UK. However, the United States network also takes a centralised form more similar to France, Germany, South Africa and Italy. The US companies with a higher Freeman Degree have also tended to be at the centre of the network.

US		*France*	
General Electric	7 (7)	BNP Paribas	21 (16)
UTC	5 (5)	Accor	17 (15)
IBM	4 (4)	Total	16 (11)
Anheuser-Busch	4 (3)	Saint-Gobain	15
AIG	4 (4)	Axa	14
JP Morgan	4 (4)	Lafarge	14
Wells Fargo	4 (4)	Suez	13
Medtronic	4 (3)	Lagardere	13
		Veolia	12
		Sanofi Aventis	11
		Oreal	11

Italy		UK	
Pirelli & C. Spa	22 (14)	Centrica	5 (5)
Mediobanca Spa	17 (12)	Rolls-Royce	4 (4)
Atlantia Spa	16 (10)	Cadbury Schweppes	4 (4)
Assicurazioni Generali Spa	14	BT Group	3
Italcementi Spa Fabbriche	14	BHP	3
Telecom Italia Spa	12	Royal Dutch Shell	3
Mediaset Spa	12	Xstrata	3
Alleanza Assicurazioni Spa	11	Vodafone	3
Autogrill Spa	11	Reuters	3
Intesa Sanpaolo Spa	9	BAE Systems	3
Luxottica Group Spa	9	BP	3
Arnoldo Mondatori Spa	9		

Germany		South Africa	
E. On	19	Standard Bank Group	15 (10)
Bayer	18	RMB Holdings	10 (3)
Allianz	17	Tiger Brands	10 (7)
Deutsche Bank	15	Firstrand	10 (4)
Lufthansa	15	MTN Group	9 (6)
ThyssenKrupp	14	Remgro	9 (6)
Linde	13	Murray and Roberts	9 (8)
Daimler	13	Anglo Platinum	9 (7)
Munich RE	12	Sanlam	8
BMW	10	The Bidvest Group	7 (5)
Deutsche Telekom	10		

Table 5.4 Country Networks' Freeman Degree

US		France	
General Electric	20.524	BNP Paribas	16.470
AIG	18.444	Accor	10.990
UTC	17.072	Air Liquide	10.970
Wells Fargo	17.038	Lagardere	10.184
Walt Disney	12.877	Eads	10.048
JP Morgan	12.427	Sanofi Aventis	8.405
P & G	11.842	Oreal	5.915
Eli Lilly	11.550	Axa	5.501
IBM	11.269	France Telecom	5.369
Anheuser-Busch	10.493	Total	5.337

Italy		UK	
Pirelli & C. Spa	13.893	Rolls-Royce	18.668
Assicurazioni Generali Spa	12.296	Royal Dutch Shell	16.262
Mediobanca Spa	8.846	BT Group	15.610
Atlantia Spa	8.090	Vodafone	13.495
Luxottica Group Spa	7.002	Centrica	12.506
Fondiaria - Sai Spa	5.084	Cadbury Schweppes	9.829
Italcementi Spa Fabbriche Cemento Banca Monte Dei Paschi Di Seina Sp	4.388	BHP	8.907
	4.125	Reuters	7.962
Unicredito Italiano Spa	4.125	British Sky Broadcasting	6.208
Autogrill Spa	4.072	Rio Tinto	6.208

Germany		South Africa	
Allianz	15.635	Standard Bank Group	14.383
BASF	15.074	Murray and Roberts	11.312
Lufthansa	10.222	Sanlam	10.632
Bayer	8.867	SASOL Limited	10.623
E. On	8.647	Anglo Platinum	9.965
Linde	8.219	Tiger Brands	8.601
Deutsche Bank	7.132	SAB Miller	6.929
Commerzbank	6.523	Naspers	6.642
ThyssenKrupp	6.090	Remgro	6.631
Fresenius	5.360	MTN Group	5.057

Table 5.5 Country Networks' Normalised Betweenness

5.4 Board Size

Mizruchi (1996) suggests that US boards have steadily grown in size since the 1950's however no indication is given as to whether this pattern of growth has continued through into the 2000's, stabilised, or even declined.

The reworked Santella data, supplemented by the South African position, is presented in Column I of Table 5.1 Country Networks: Descriptive Statistics (Santella *et al*, 2008, p.10). This shows that the average South African board (in the top 40) has 13.15 directors. This number is the second lowest of the countries presented, with only the UK coming in lower with 12.875. The US is marginally higher with 13.3, followed by Italy (14.375) and France (14.875). Germany is significantly higher at 23.282. South Africa is not out of norm for the companies sampled.

The year on year movement in the numbers of directorships is presented in Table 4.4 Directorships per Director 2004-2010 Column G. The table shows that the lowest number is 517 in 2004, with the highest being 547 in 2007. The range of 30 over the lowest provides a movement of 5%. The numbers vary both upwards and downwards between the years, with the second lowest being present in 2008 and the second highest in 2010.

Corresponding to these movements, the average number of directors per board has varied from 12.9 in 2004 to the maximum of 13.68 in 2007 and the 2010 average of 13.6. By way of comparison to those presented above, this keeps South Africa below those presented for Italy, with the fluctuations moving it above and below the US.

Of more significance is the downwards trend of the number of directorships per director (Column H). This has decreased each year from 1.2 in 2004 to a low of 1.149 in 2008, increasing marginally again to 1.153 in 2009 and 2010. This same trend is also visible in the percentage of directorships which are single directorships (Column I).

Table 4.5 New Directors Appointed 2004-2010 summarises all of the new director appointments from 2004 to 2010. The percentage of directorships being granted to directors not holding a position in the top 40 companies in the sample varies between 67.6% in 2004 up to 84.9% in 2005 and then varying between 73%-79% from 2006 to 2010. In each of the 2004 to 2006 years appointments were made to existing directors to bring their total number of directorships up to four. Since July 2006 no further directorships have been granted to create four directorship directors. The sequence of three directorship directors created since 2004 is 3, 3, 1, 3, 2, 5, and 3. Looking at the total numbers of such directors present in the network as reflected in Column C of Table 4.4 Directorships per Director 2004-2010 shows that the appointments above are replacing retired directors. The net number declined from 16 in 2004 to 7 in 2010. Unlike the 4 directorship directors, this band is experiencing a high churn, and if the appointments over 2009 and 2010 had been made to directors with lower directorships the interconnectedness of the network could have been reduced down to the levels being experienced in the UK and US network as discussed in section 5.3 above.

5.5 Duality on the Board

The literature review performed in Chapter Two provided differing views on whether duality is a positive or negative trait of boards. Both Daily & Dalton (1993) and Weir & Laing (2001) put forward arguments of more effective decision (and board) monitoring and promotion of shareholder interests in support of splitting the positions. This has been

adopted into corporate governance codes such as Cadbury and King despite later research offering contradictory views. Dahya *et al* (2009) found little evidence to support the benefits of splitting the role, despite looking at operating results (performance) and share prices (shareholder sentiment).

The need to comply clearly outweighs any contrary arguments and the results presented in Table 4.6 Chairman of the Board vs Chief Executive Officer at 30 June 2008 show that King III Principle 2.16, that the CEO of the company should not also fulfil the role of COB, has been met for all of the Top 40 companies as at 30 June 2008.

The preference of the chair being non-executive is met for all companies with the exception of Compagnie Fin Richemont (CFR) where JP Rupert holds the position of Executive Chairman. Furthermore, 17 of the 40 chairs were also considered independent of the organisation.

5.6 Executive vs Non-executive Directors

The appointment of directors to manage a company on behalf of the shareholders creates an agency problem. A generally used solution to this problem is to give management an ownership stake in the business to help align their interests to those of the shareholders. The appointment of additional NED's may help reduce the need for ED's holding an equity stake of the business (Young 2000, p.1320). Furthermore, the King III Code Practice 2.18.1 (IoDSA, 2009) requires that the majority of board members be NEDs and Practice 2.18.5 (IoDSA, 2009) requires that a minimum of two executive directors are represented on the board, specifically, the CEO and the director responsible for finance.

Table 4.7 Boards with Highest % Executive Representation (Top 3 SA 1994-2010) shows the three companies with the highest percentage executive representation on the board for each of the years 2004, 2006, 2008 and 2010.

In 2004, NTC, the company with the highest percentage executive representation had nine executive directors and five non-executive directors, a representation percentage of 64%.

By 2006 the position had changed, with the highest % dropping to 54% (SHP – seven of thirteen directors executive), which remained the same in 2008, and increased marginally to 55% in 2010 (SHP with six of eleven executive).

Evaluating this against the King II requirement for a majority of non-executive directors, we see that in 2004 two companies were non-compliant with this requirement, and from 2006 onwards SHP was the only company of the Top 40 sample which was non-compliant.

Using a stricter cut-off of a two thirds majority, we see that in 2004 twelve companies had more than 33% executive representation, this was the same in 2006, but this had reduced to eleven by 2008, and was at nine in 2010. This shows a clear progressive improvement over the period.

Looking at the companies with the highest non-executive representation over the same period shows a different picture. SBK holds the top position in 2004, 2006 and 2008, having just one executive director through that period and the non-executives varying from 18 to 16 and then back to 18. The top three for each of the years is always 90% or higher representation.

These high levels of non-executive representation are however non-compliant with King III Practice 2.18.5 which requires that the CEO and a director responsible for finance be represented. In 2004 there were five companies with a single executive director, this reduced to four by 2006, increased again to five in 2008, and was down to three for 2009 and 2010. The three companies which were non-compliant in 2009 and 2010 were RMH, BIL and GFI.

Figure 5.6 Network Graph : Executive vs Non-executive vs Independent Directorships (Oct 2008)

In the graph above the directors are again represented as dots and the companies as the small rectangles containing their JSE code. The executive directorships are shown as red lines, independent directorships as black lines and non-executive directorships as blue lines. Seven red lines are present in connections between companies (but only for half of the connection). No director holds more than one executive directorship. The full detail of the split between the directorships is shown in Table 5.6 below.

Posts	*Non only*	*Exec only*	*Both*	**Total**
4	2	0	0	**2**
3	6	0	3	**9**
2	40	0	4	**44**
1	278	125	0	**403**
Total	**326**	**125**	**7**	**458**

Table 5.6 Executive vs Non-executive Posts of Directors

Of the 458 directors present in the sample (125 executive and 278 non-executive), 88 % hold just one position (403).

In a paper discussed earlier (Section 2.3.2.2) it was lamented that 75% of black directors hold just one directorship position (Wu *et al*, 2009). While this study did not capture the racial status of the directors into the dataset (such information was not available in the annual financial statements of the sample companies and to guess the status based on a name was deemed too inaccurate to pass the test of academic rigour) it does provide an indication of the rate of single directorship within the sample. As calculated above, 88% of directors in this sample held only one directorship position. This is significantly higher than the rate of 75% (estimated to be quoted for mid-year 2003) quoted by Wu *et al* (2009) as being the position for black directors in South Africa. Furthermore, 125 of 132 executive directors in the sample (1 October 2008) hold only a single directorship (95%). Wu does not distinguish between those directors holding executive and non-executive positions.

The work carried out by Bridge (2007) found that by June 2006 there were 403 black individuals holding 556 board positions. This amounts to an average of 1.38 directorships per director. This compares favourably with the average of 1.15 for the South African network (1 October 2008) quoted in Table 5.1 Country Networks: Descriptive Statistics.

Only seven directors hold an executive position in addition to a non-executive position. Four of these hold just a single non-executive position, with three holding two non-executive positions each. The majority of directors, 326, hold non-executive posts only.

King III has the requirement that one third (33%) of NEDs be rotated every year. An approximate measure of this was made by measuring the number of NEDs appointed in the year as a percentage of the NEDs serving at the end of the year. These results were presented in Table 4.11 Percentage New NED Appointments (Director Rotation). These results immediately make it clear that the rotation of NEDs has not been happening in accordance with King III. Compared to the target of 33.3% the best 3 years have been 14.8% (2004), 14% (2006) and 13.4% (2010). A significant change in the way in which the

NEDs are elected and rotated is going to need to be undertaken to get close to the King III target.

5.7 Independent vs Unaffiliated Directors

While King II required a majority of non-executive directors, King III Practice 2.18.2 extended this further to require a majority of independent non-executive directors. Table 4.10 Split of Exec vs Non-Exec vs Independent Directors (30 June each year) provides details on the split of the directors. Extracting just the independent directors and comparing them to the total directors in the sample, as presented below in Table 5.7 Percentage of Independent Directors, shows that the King III requirement has in fact been met since the beginning of the period (2004) for the Top 40 companies on the JSE.

Date	2010/06	2009/06	2008/06	2007/06	2006/06	2005/06	2004/06
Directors in sample	543	529	524	547	538	539	517
Independent	296	292	295	299	289	278	271
Percentage Independent	54.5%	55.2%	56.3%	54.7%	53.7%	51.6%	52.4%

Table 5.7 Percentage of Independent Directors

The King III Report does not provide a definition of "Independent director" and the term is a broad one which has various manifestations (Clarke, 2007, p.77). Annex 1.3 of the King III Report does however provide some criteria for consideration when evaluating the independence of a director. These relate to the materiality of shareholding (to both the company and the individual) as well as the absence of contingent remuneration (including share options). These criteria are reasonably straight forward and the companies included in the sample have all of the information required at hand to make the assessment. The challenge for researchers wanting to assess the application of these criteria is that it would require assessment of information which is not readily available to researchers through the annual reports of the companies in question.

The broader unanswered question relates to how the independence of directors may be impaired through a long term relationship with the company concerned. King III addresses this through Practice 2.18.1 (IoDSA, 2009) which suggests that independent NEDs must be subject to rigorous review of both performance and independence after more than 9 years' service, however, no further guidance is however provided on what this may entail.

The question of the independence of directors is one that has arisen recently in the popular press. "There's nothing quite as sad as listening to a board explain just why it is that a director who has been on the board for well over nine years and has all manner of ties with the company is nevertheless independent." (Crotty, 2012, p.18). Crotty goes on to describe how at an AGM, it is strange that none of the shareholders will challenge a claim that a director who has been on the board for 17 years is independent.

Table 4.10 Split of Exec vs Non-Exec vs Independent Directors (30 June each year) provides details of the numbers of executive, non-executive and independent directors for each of the years under review. The number of independent directors in the sample increased from 271 in June 2004 to 299 in June 2007, then declined slightly and increased again to end at 296 in June 2010.

The bottom two rows of the table show the independent directors with greater than nine years' service. This shows a much more dramatic change over the period. In June 2004 there were 45 directors with this length of service, this number increases to 68 by June 2007, with the biggest increase occurring between 2006 and 2007. This translates to 16.6% of directors in 2004 increasing to 23.3% by 2010.

It is something of concern that King III lays out nine years as being the cut-off beyond which "rigorous review of independence and performance needs to occur, and in excess of 20% of independent directors fall into this category. Crotty (2012) describes the experience of shareholder and corporate governance activist Theo Botha who has raised question at an AGM around the independence of directors. "A bizarre thing tends to happen … the director in question gets a bit flustered and then becomes indignant. It is as though Botha

has not merely raised a straightforward question about whether or not the director can be deemed independent … but whether in fact he has any integrity at all". Crotty (2012,p. 18) concludes on the problem succinctly: "the coup de grace is the news that said director's independence is regularly subjected to the most rigorous review by his mates on the board".

Table 5.8 Time Based Analysis of Tenure of Independent Directors (30 June each year) below provides further analysis on the tenure of the independent directors. This shows the average tenure of independent directors having grown from 1858 days (5 years) in 2004 to 2347 days (6.4 years) by 2010, with every year in-between having shown growth. The growth in the median shows that it is not the position that a few ageing stalwarts are holding onto their long term positions while a process of rotation is being undertaken for the independents with shorter periods of tenure. The median has grown from 1276 days (3.5 years) to 2078 days (5.7 years) in 2010.

The longest serving (active) director in each year shows that there are retirements happening for the longest serving directors, but, the tenures are high, ranging from 21.5 years to 25.5 years. One has to question independence when the length of the relationship is so long, almost three times the King III measure of nine years.

Date	*2010/06*	*2009/06*	*2008/06*	*2007/06*	*2006/06*	*2005/06*	*2004/06*
Average	6.4	6.3	6.1	5.8	5.6	5.5	5.1
Median	5.7	5.5	5.3	4.7	4.1	4.1	3.5
Maximum	24.5	23.5	22.5	21.5	23.5	22.5	25.5

Table 5.8 Time Based Analysis of Tenure of Independent Directors (30 June each year)

Table 5.9 Top 3 Longest Serving "Independent" Directors (30 June each year) provides further details on the directors and the companies for which these independent directors serve. The pattern of retirements can be seen as directors move up through the top three until retirement.

2010/06/30	2009/06/30	2008/06/30	2007/06/30	2006/06/30	2005/06/30	2004/06/30
Frost BJ (WHL) 24.5 yrs	Frost BJ (WHL) 23.5 yrs	Frost BJ (WHL) 22.5 yrs	Frost BJ (WHL) 21.5 yrs	Clewlow WAM (PPC) 23.5 yrs	Clewlow WAM (PPC) 22.5 yrs	King MW (AMS) 25.5 yrs
Rapp M (LBT) 24.5 yrs	Rapp M (LBT) 23.5 yrs	Rapp M (LBT) 22.5 yrs	Rapp M (LBT) 21.5 yrs	Frost BJ (WHL) 20.5 yrs	Strauss CB (SBK) 21.5 yrs	Plumbridge R (SBK) 24.5 yrs
Dreyer JW (RMH) 22.7 yrs	Dreyer JW (RMH) 21.7 yrs	Bradley EL (SBK) 22.5 yrs	Bradley EL (SBK) 21.5 yrs	Rapp M (LBT) 20.5 yrs	Williams RA (TBS) 21.5 yrs	Clewlow WAM (PPC) 21.5 yrs

Table 5.9 Top 3 Longest Serving "Independent" Directors (30 June each year)

For comparison purposes the overall top 10 longest serving directors are presented in Table 4.13. From this table it is clear that the top 4 longest serving directors have all retired. The longest serving independent director is Mr King himself, though he retired from his position on the Anglo Platinum board in August 2004.

Those in position 5, 7 and downwards are all still active and their length of tenure will continue to grow. It would appear that the King III code has had little impact on the average lengths of tenure which continue to grow, and the active directors in the top 10 continue to climb the table.

Weir & Lang (2001, p. 90) suggest an alternate term to independence, that of "unaffiliated", which has a more objective criteria in length of service / association with the organisation. This criterion has been applied to calculate the number of directors which can be considered as unaffiliated for each of the years under consideration. This information is presented for the companies in the sample for the period June 2004 to June 2010 in Table 4.12.

The percentage of independent directors which meet the criteria for unaffiliated starts at 45% in 2004 and declines to 29.4% by 2007 then hovers around the 30% mark thereafter.

Combining the results relating to those directors with greater than nine years' service with those indicating affiliation and presenting them graphically give us the view presented in Figure 5.7 Status of Independent Directors 2004-2010.

The initial decline in the affiliated directors (<four years, reflected as green bars in the graph) is absorbed by the growth in the number of directors between four and nine years, and those with more than nine years' service. In the later years (2007-2010) the percentage affiliated directors is reasonably stable as is the percentage of directors with more than nine years' service.
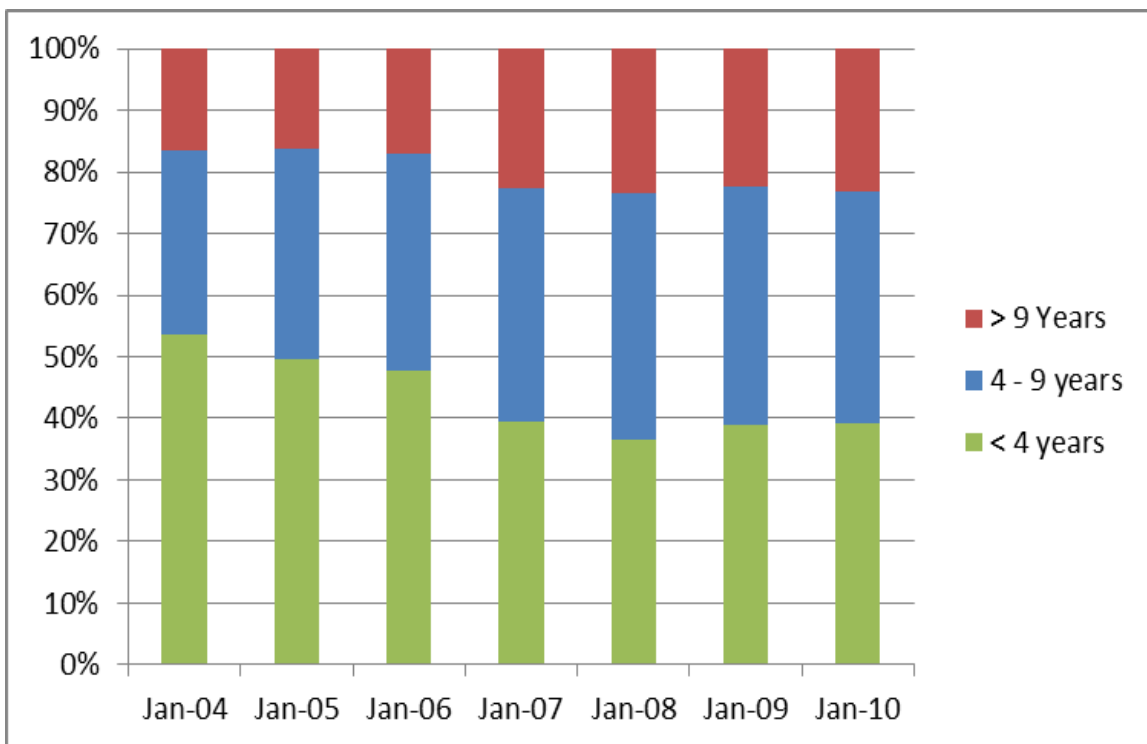
Figure 5.7 Status of Independent Directors 2004-2010

5.8 Summary

One of the primary purposes of this dissertation was to contribute to the research on director interlocks on the South African director network and provide comparable data to the work performed by Santella *et al* (2008).

The author first calculated the comparable South African metrics, then considered the country network before proceeding to integrate the South African information into the

country networks comparison performed by Santella *et al* (2008). This comparison was performed according to Freeman Degree (local centrality), and Betweenness (measure of whether a company has a central or peripheral position).

In Santella's conclusion the authors suggest that there are two models:

- Firstly that made up of France, Italy and Germany with their high number of companies linked to each other through a small number of well-connected directors serving on multiple boards; and

- Secondly, the UK, with a smaller number of companies connected in a far less redundant manner by directors tending to have no more than two board positions.

Santella *et al* (2008) goes on to suggest that the US provides a third model, having a high number of connected companies (as do Germany, France, and Italy) but having connections through directors with just two board positions (as with the UK). Santella *et al* (*2008*) further suggests that the low average number of board positions may be a sign that, unlike the networks of Italy, Germany, and France, the networks from the UK and US might not be prone to systemic collusion.

The South Africa network was shown to be similar to the Italian one in some respects (network density, layout, number of strong links between companies) however it was also shown to be closer to the UK and US networks in other respects (number of links between network nodes). The introduction of South Africa into the comparative group suggest that rather than just the two extremes of the UK vs Germany, that there is a continuum currently reflected as the UK, US, South Africa, Italy, France and Germany.

In considering the matter of whether there are signals of whether the South African network is susceptible to systemic collusion, the patterns are certainly closer to those of Germany, France and Italy, and although the density is far lower than that of Germany and France, it still falls within the region of Italy and is far higher than the UK and US. While the number of links is far lower than Italy it is still higher than the US and UK. While on the continuum South Africa is inbetween the camps, the presence of a handful of directors with more than two directorships suggests systemic collusion is possible.

Key metrics have been calculated across a number of other areas for the South African network, covering the period June 2004 to June 2010. The key areas examined through these included the board size and composition, duality of roles between CEO and Chairman as well as the matter of executive, non-executive, independent and unaffiliated directors.

The average size of South African boards for the sample varies over the time period ranging between 12.9 and 13.68 with the last measured size being 13.6 in 2010. This range of averages is higher than the UK (12.875) and varies around the size for the US (13.3).

All of the companies in the sample have split the role of CEO and Chairman in accordance with the King requirement. The requirement of an independent non-executive chairman is not met by Compagnie Fin Richemont (CFR) where JP Rupert holds the position of executive chairman.

In exploring the ratios of executive to non-executive directors we see that the basic requirement of having a majority of NEDs is met for all of the companies in the sample except for SHP, and that going back to 2004 only two companies did not meet the requirement at that point. King presents a minimum requirement for two executive directors to be represented on the board and although the level of noncompliance has been reduced from five in 2004, it has remained at three for 2009 and 2010.

The King III requirement for a majority of directors to be independent NEDs has been met since the beginning of the sample period under review (2004). While this is very positive, the other requirement of rotation of a third of the NEDs has not been met and the current practices are reaching levels at best just below 15% compared with a target of 33%.

In looking at the level of compliance with the requirement that directors' independence be rigorously assessed once they have reached nine years' service, we see that in excess of 20% of independent directors fall into this category, with some directors still being

classified independent after 20 years' service. Both the mean and median length of service for independent directors has been growing since 2004.

The alternate measure of classifying independent directors as unaffiliated up until four years' service showed an initial 45% meeting the criteria and dropping off to around 30% by 2007 where it has stabilised. The area of independence would certainly seem to be one where further work can be done to assure shareholders and other stakeholders that the agency problem is being adequately addressed.

6 Recommendations and Conclusions

6.1 Introduction

This research set out to answer key questions regarding the board representation patterns of the South African company and director network structure for the JSE Top Forty companies, enhancing both the body of knowledge with respect to the representation patterns in their own right as well as by providing comparative information. The comparative information allowed the South African company network to be compared to those of the UK, US, Italy, France and Germany. In so doing this author sought to provide a deeper understanding of the nature of patterns of the South African network by allowing it to be benchmarked and not simply providing the South African network in isolation.

6.2 Implications of this Research

The research provides a clear view on the networked structure connecting companies within the JSE. While there has long been anecdotal talk of clubs, "old boys" networks and cross director relationships within the boards, there has been little to substantively support this position. The bipartite company/director network projections as well as the unipartite company network projections clearly show the network that connects 32 of the top 40 companies, and while one can debate the cause of network, one can no longer argue about its existence.

The low density of the UK and US networks suggests the connections in these networks are more likely to be beneficial through provision of information rather than providing control, while the high density networks present in France and Germany suggest they provide influence and control. The South African network falls in-between and has a handful of powerful companies and directors, as well as sections of the network in which high levels of control are present.

Taking this into account, it is possible to evaluate the resignation / retirement of directors and the appointment of their replacements to see the impact on the overall network and infer the underlying reasons for the appointment. It would certainly be worthwhile for an independent entity to perform such an activity to monitor the levels of interconnectedness within the network on an on-going basis.

The key statistics examined for the South African network for the period 2004-2010 give insight into the shifting patterns of directorships and connections within the network and the effectiveness of King II and King III in adjusting the patterns. Through this it is plain to see success in some areas of compliance where specific requirements have been provided, such as King II requiring a majority of the board to be made up of NED's. In other areas, such as discouraging NED's with lengthy association with an organisation from being considered independent there has been far less success.

6.3 Recommendations for Future Studies

The study could be enhanced by extending the dataset to look back at the position in the early 2000's and comparing that to the early 1990's (before the dissolution of Apartheid). Examining the key statistics relating to the directorship patterns as well as the network structure would give a clearer picture of the change in patterns and the disintegration and reformation of structures as companies adjusted to the changing local economic and political pressures.

While this study looked at the Top 40 companies, due to data constraints and to allow for the international comparisons to the work performed by Santella *et al* (2008), there is scope to extend the analysis to the balance of the JSE main board.

There is also scope to consider international links formed by directors sitting on the boards of companies across the globe. The directors of many of the top companies, particularly the multinationals, are foreign nationals. For example, on the main board of directors of Compagnie Financière Richemont SA, a diverse range of nationalities are represented. The details of the directors are shown in the following table.

Name	Position	Nationality	Age
Johann Rupert	Executive Chairman	South African	59
Jean-Paul Aeschimann	Deputy Chairman	Swiss	75
Norbert Platt	Group Chief Executive Officer	German	62
Richard Lepeu	Group Finance Director	French	57
Franco Cologni		Italian	74
Lord Douro		British	63
Yves-André Istel		American	73
Ruggero Magnoni		Italian	58
Simon Murray		British	69
Alain Dominique Perrin		French	66
Alan Quasha		American	59
Lord Renwick of Clifton		British	71
Jan Rupert	Manufacturing Director	South African	53
Jürgen Schrempp		German	64
Martha Wikstrom		American	52

Table 6.1 Nationalities and Ages of Directors of Compagnie Financière Richemont SA

Summarised by nationality breakdown:

Nationality	Total
American	3
British	3
French	2
German	2
Italian	2
South African	2
Swiss	1
Total	**15**

Table 6.2 Nationality Summary of Directors of Compagnie Financière Richemont SA

Across the 15 directors, only 2 are South African and 7 different countries are represented. In limiting the research to the interlocks of the largest 40 South African companies the complete picture of global interlocks is not uncovered. Comparisons of the situations

across the largest stock exchanges still will not produce the complete picture as links between the country exchanges will not be visible. Such a complete global analysis can only be done through integrating the datasets of all of these stock exchanges and running the model again. This would be a mammoth task given the numbers of companies and directors spread across the stock exchanges of the world; however, it could reveal networks, connections and patterns of control not previously considered. It would not be unexpected to find that the largest networks of each of the exchanges are linked, creating one large mega-network of influence and control across the globe.

This may seem a little far-fetched and bordering on a grand conspiracy theory, however, taking a look at the Compagnie Financière Richemont SA annual report for 2008 and examining the director profiles for details of other boards on which the directors sit reveals some clues as to what may exist. Simon Murray for example is a non-executive director and is also a director of Vodafone Group (UK). Vodafone is one of the top 40 UK companies and is part of the large network existing within that top 40, therefore we immediately have the SA large component linked to the UK one. Further more systematic analysis will most certainly provide for many more links.

6.4 Summary

The research set out to answer five key questions, as expressed in the hypotheses. The data collected was initially focussed on providing coverage of a single point in time, 1 October 2008, but, in collecting that data and confirming the quality of data it was necessary to examine a significantly broader range of Annual Reports than was initially anticipated. In doing so a much larger data set was created. Through detailed mining of this dataset all of the questions implied in the hypotheses have been answered. However, due to limitations in the data structures of the data collected and the manner in which it was collected not all of the hypotheses could be explored to the same level of detail, covering the same periods. The hypotheses with summarised conclusions are presented on the following page.

Hypothesis 1: The interlocking director network of the JSE top 40 companies compares more closely to that of the UK than that of Germany in terms of network density and average path lengths.

This could not be conclusively stated. The South African network (as at 1 October 2008) is not as dense as the German network, although it is denser than UK network and reflects a different pattern.

Hypothesis 2: There is majority of NEDs on boards in the Top 40 listed companies on the JSE.

This was confirmed to be true for almost all of the boards in the sample for the period under review. Viewed holisitically, 412 of 543 directors (76%) were NEDs in June 2010.

Hypothesis 3: There is majority of independent directors amongst the NEDs on boards in the Top 40 listed companies on the JSE.

This was confirmed to be true with 296 of 412 NEDs (72%) and 296 of 543 directors (55%) being classed independent in June 2010.

Hypothesis 4: There is a majority of unaffiliated non-executives amongst the independent directors on boards in the Top 40 listed companies on the JSE.

This was found to be false with 39.2% of directors being classed as unaffiliated as at June 2010. Only one year in the sample, June 2004, with 53.5% was a majority present.

Hypothesis 5: The majority of Top 40 listed companies on the JSE have independent non-executive directors as Chairman of the board

This was found to be true, with only JP Rupert holding an executive chairmanship position on the board of Compagnie Fin Richemont (CFR).

7 Appendices

7.1 Appendix 1: References

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NodeXL 1.0.1.196

http://nodexl.codeplex.com/releases/78196/download/310292

Ucinet 6.235

http://www.analytictech.com/ucinet/download.htm

7.2 Appendix 2 : JSE Short Codes

JSE Code	Company Name	Year End	Registration Number
ASA	ABSA Group Limited	December	1986/003934/06
ABL	African Bank Investments Ltd	September	1946/021193/06
AGL	Anglo American Plc	December	GB00B1XZS820
AMS	Anglo Platinum Ltd	December	1946/022452/06
ANG	Anglogold Ashanti Limited	December	1944/017354/06
ACL	Arcelormittal Sa Ltd	December	1989/002164/06
APN	Aspen Pharmacare Holdings Limited	June	1985/002935/06
AEG	Aveng Ltd	June	1944/018119/06
BIL	Bhp Billiton Plc	June	GB0000566504
CFR	Compagnie Fin Richemont	March	CH0045159024
FSR	Firstrand Limited	June	1966/010753/06
GFI	Gold Fields Limited	June	1968/004880/06
GRT	Growthpoint Properties Limited	June	1987/004988/06
HAR	Harmony Gold Mining Company Limited	June	1950/038232/06
IMP	Impala Platinum Holdings Limited	June	1957/001979/06
INP	Investec Plc	March	2001/001426/10
KIO	Kumba Iron Ore Limited	December	2005/015852/06
LBT	Liberty International Plc	December	1999/012910/10
MSM	Massmart Holdings Limited	June	1940/014066/06
MTN	Mtn Group Limited	December	1994/009584/06
MUR	Murray And Roberts Holdings Limited	June	1948/029826/06
NPN	Naspers Limited	March	1925/001431/06
NED	Nedbank Group Limited	December	1966/010630/06
NTC	Netcare Limited	September	1996/008242/06
OML	Old Mutual Plc	December	GB0007389926
PPC	Pretoria Portland Cement Company Ltd	September	1892/000667/06
REI	Reinet Investments Manager S.A.	March	CH0045793657
REM	Remgro Limited	March	1968/006415/06
RMH	Rmb Holdings Limited	June	1987/005115/06
SAB	Sabmiller Plc	March	GB0004835483
SLM	Sanlam Limited	December	1959/001562/06
SOL	Sasol Limited	June	1979/003231/06
SHP	Shoprite Holdings Limited	June	1936/007721/06
SBK	Standard Bank Group Ltd	December	1969/017128/06
SHF	Steinhoff International Holdings Ltd	June	1998/003951/06
TKG	Telkom Sa Limited	March	1991/005476/06
BVT	The Bidvest Group Limited	June	1946/021180/06

JSE Code	Company Name	Year End	Registration Number
TBS	Tiger Brands Limited	September	1944/017881/06
TRU	Truworths International Limited	June	1944/017491/06
WHL	Woolworths Holdings Limited	June	1929/001986/06

7.3 Appendix 3a : Network Density

```
DENSITY / AVERAGE MATRIX VALUE
--------------------------------------------------------------------------------

Input dataset:                                    COMP (C:\Program Files (x86)\Analytic
Technologies\COMP)
Output dataset:                                   COMP-density (C:\Program Files (x86)\Analytic
Technologies\COMP-density)



            Avg Value       Std Dev Avg Wtd Degree
         -------------- -------------- --------------

   COMP         0.1064         0.4269         4.1500



---------------------------------------
Running time:  00:00:01
Output generated:  07 Jan 12 18:18:09
UCINET 6.365 Copyright (c) 1992-2011 Analytic Technologies
```

123

7.4 Appendix 3b : Freeman Degree

```
FREEMAN'S DEGREE CENTRALITY MEASURES:
--------------------------------------------------------------------------------


Diagonal valid?                        NO
Model:                                 SYMMETRIC
Input  dataset:                                   COMP  (C:\Program  Files  (x86)\Analytic
Technologies\COMP)


                          1            2            3
                      Degree    NrmDegree        Share
                  ------------ ------------ ------------
    32  SBK         15.000        6.410        0.090
    30  RMH         10.000        4.274        0.060
    37  TBS         10.000        4.274        0.060
    12  FSR         10.000        4.274        0.060
    21  MTN          9.000        3.846        0.054
    29  REM          9.000        3.846        0.054
    22  MUR          9.000        3.846        0.054
     5  AMS          9.000        3.846        0.054
    35  SLM          8.000        3.419        0.048
    10  BVT          7.000        2.991        0.042
    24  NPN          6.000        2.564        0.036
    31  SAB          6.000        2.564        0.036
     8  ASA          5.000        2.137        0.030
    36  SOL          5.000        2.137        0.030
    16  IMP          5.000        2.137        0.030
     4  AGL          4.000        1.709        0.024
     2  ACL          4.000        1.709        0.024
    11  CFR          3.000        1.282        0.018
    40  WHL          3.000        1.282        0.018
    33  SHF          3.000        1.282        0.018
     7  APN          3.000        1.282        0.018
    18  KIO          2.000        0.855        0.012
    13  GFI          2.000        0.855        0.012
    26  OML          2.000        0.855        0.012
    14  GRT          2.000        0.855        0.012
    25  NTC          2.000        0.855        0.012
    28  REI          2.000        0.855        0.012
    27  PPC          2.000        0.855        0.012
    20  MSM          2.000        0.855        0.012
    17  INP          2.000        0.855        0.012
     3  AEG          1.000        0.427        0.006
    38  TKG          1.000        0.427        0.006
     6  ANG          1.000        0.427        0.006
```

```
15   HAR        1.000        0.427        0.006
23   NED        1.000        0.427        0.006
19   LBT        0.000        0.000        0.000
 9   BIL        0.000        0.000        0.000
34   SHP        0.000        0.000        0.000
39   TRU        0.000        0.000        0.000
 1   ABL        0.000        0.000        0.000
```

DESCRIPTIVE STATISTICS

```
                         1            2            3
                    Degree    NrmDegree        Share
                ------------ ------------ ------------
  1     Mean         4.150        1.774        0.025
  2  Std Dev         3.637        1.554        0.022
  3      Sum       166.000       70.940        1.000
  4 Variance        13.227        2.416        0.000
  5      SSQ      1218.000      222.441        0.044
  6    MCSSQ       529.100       96.629        0.019
  7 Euc Norm        34.900       14.914        0.210
  8  Minimum         0.000        0.000        0.000
  9  Maximum        15.000        6.410        0.090
 10 N of Obs        40.000       40.000       40.000
```

Network Centralization = 4.88%

Blau Heterogeneity = 4.42%. Normalized (IQV) = 1.97%

Note: For valued data, the normalized centrality may be larger than 100.

     Also, the centralization statistic is divided by the maximum value in the input dataset.

Actor-by-centrality matrix saved as dataset FreemanDegree

Running time: 00:00:01
Output generated: 07 Jan 12 18:25:24
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7.5 Appendix 3c : Freeman Betweenness

```
FREEMAN BETWEENNESS CENTRALITY
--------------------------------------------------------------------------------


Input dataset:                                    COMP (C:\Program Files (x86)\Analytic
Technologies\COMP)




Important note: this routine binarizes but does NOT symmetrize.



Un-normalized centralization: 3474.000


                        1            2
                Betweenness  nBetweenness
                ------------ ------------
     32  SBK      106.575        14.383
     22  MUR       83.825        11.312
     35  SLM       78.783        10.632
     36  SOL       78.717        10.623
      5  AMS       73.842         9.965
     37  TBS       63.733         8.601
     31  SAB       51.342         6.929
     24  NPN       49.217         6.642
     29  REM       49.133         6.631
     21  MTN       37.475         5.057
      8  ASA       34.867         4.705
     10  BVT       28.958         3.908
     11  CFR       10.650         1.437
     12  FSR        9.475         1.279
     13  GFI        6.733         0.909
     16  IMP        6.483         0.875
      7  APN        5.108         0.689
     40  WHL        4.833         0.652
     30  RMH        2.767         0.373
     18  KIO        1.792         0.242
     20  MSM        1.192         0.161
      2  ACL        1.167         0.157
     26  OML        1.000         0.135
     14  GRT        0.833         0.112
     17  INP        0.500         0.067
     19  LBT        0.000         0.000
     23  NED        0.000         0.000
      3  AEG        0.000         0.000
      9  BIL        0.000         0.000
```

```
    4   AGL            0.000          0.000
    1   ABL            0.000          0.000
   28   REI            0.000          0.000
   33   SHF            0.000          0.000
   34   SHP            0.000          0.000
   25   NTC            0.000          0.000
    6   ANG            0.000          0.000
   27   PPC            0.000          0.000
   38   TKG            0.000          0.000
   39   TRU            0.000          0.000
   15   HAR            0.000          0.000
```

DESCRIPTIVE STATISTICS FOR EACH MEASURE

```
                            1            2

                     Betweenness nBetweenness
                     ------------ ------------
     1       Mean        19.725        2.662
     2    Std Dev        30.011        4.050
     3        Sum       789.000      106.478
     4   Variance       900.652       16.403
     5        SSQ     51589.109      939.554
     6      MCSSQ     36026.086      656.116
     7   Euc Norm       227.132       30.652
     8    Minimum         0.000        0.000
     9    Maximum       106.575       14.383
    10   N of Obs        40.000       40.000
```

Network Centralization Index = 12.02%

Output actor-by-centrality measure matrix saved as dataset FreemanBetweenness

----
Running time: 00:00:01
Output generated: 07 Jan 12 18:19:59
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Refs to check don't gets lost:

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