

Corporate Social Capital Links to Firm Performance: An Empirical Study

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Abstract

Traditional corporate social capital formulations have been based on a firm's positioning within its network of market place alliances. This paper extends this model by incorporating firm status attributes of intellectual capital and corporate reputation into an integrated model for corporate social capital. An empirical study of some 155 firms in the global Information Technology sector was conducted, exploring the linkage between elements of corporate social capital and firm performance. The results find that money matters, with financial soundness being the most predictive corporate social capital element for firm performance. Beyond financial soundness, a firm's market network centrality and internal capital were significant predictors. For large or profitable firms, centrality was found to be a liability and internal capital an asset, in terms of firm performance. In contrast, for small or loss making firms the opposite is true, where centrality is an asset and internal capital a liability. Additionally, the direction of influence of centrality could change depending on which performance measure is used.

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1. Introduction

Corporate Social Capital (CSC) has been identified as social capital in the context of organizations. Leenders and Gabbay, (1999) raised the awareness of CSC, focusing on concepts, theories and the application of social capital to business. CSC is often associated with the network of inter-firm alliances or joint ventures. The business press coverage of such activity is escalating exponentially, with more than 70,000 articles reporting on the topic in the past year, a rate of close to 200 per day². Around 20% of this activity is in the information technology sector. With most organizations claiming a multitude of alliances, markets can no longer be characterized by individual buyers and sellers. The macro view of markets now consists of a complex web of inter-organizational activity. A firm's ability to leverage its position or build its social capital within a complex web of market actors, is likely to have a significant influence on its overall performance.

Several researchers have identified linkages between joint venture performance and firm performance (Stuart, 2000; Das, Sen & Sengupt, 1998; Baum & Calabrese, 2000; Tsai, 2001). However, limiting the formulation of CSC to structural alliance network positioning is potentially understating its power. This has been acknowledged by some authors in referring to this type of formulation as “structural aspects of social capital” (Borgatti, Jones and Everett, 1998), leaving room for richer interpretations. This paper develops a concept for CSC which moves beyond the structural aspects. This richer model of CSC adds a “connectionist” view of firm ties (Borgatti and Foster, 2003), whereby ties are seen as more than bridges between firms, but also identify firm attributes that act as attractors for tie formation. Podolny (2001) identifies such ties as pipes and prisms and explores the value of the status of actors in exploiting market place structural holes (Burt, 1992). A firm's status is seen as a potential signal of the underlying quality of a firm's products or services, leading to various economic benefits (Podolny, 1993). Podolny formulates a firm's status in terms of the nature of its network connections only (Bonacich, 1987). But status is likely to be comprised of many more

² Factiva search on “Joint Venture” activity for the year up to 1st August 2006

attributes than the nature of a firm's current alliance ties. For example, Lin's (1982) theory of instrumental action speaks of attributes like wealth, status and power placing actors within a social hierarchy, dictating the level of access to social resources. In this research, a firm's status within the social structure of the market is developed as a firm's absorptive capacity, intellectual capital and its corporate reputation.

The key question this research is addressing is to determine what impact a firm's CSC has on its overall performance. A new integrated model for CSC is developed to help understand what elements of CSC can be exercised in improving firm performance. This research makes use of advanced content analysis techniques, applied across an extensive range of business publications, to enable a richer interpretation of CSC across a sample of some 155 firms in the global IT services sector. The contribution this research aims to make is to firstly add to the much needed pool of empirical research required to substantiate or otherwise the rich suite of theories that have been developed around social capital, in particular, at the organizational level. Secondly, by building a bridge to the intellectual / intangible asset management field, the research aims to contribute an understanding of the role CSC plays in a firm's intangible asset performance.

Firm performance is measured by Return on Investment (ROI), Total Shareholder Return (TSR) and market to book values (measured as Tobins Q). The results show that wealth matters when it comes to good CSC and good performance, with financial soundness being a significant predictor of firm performance for all performance measures. Other CSC elements which influence firm performance include centrality, absorptive capacity and internal capital. The size, profitability and IT industry sub sector is seen as important in determining CSC's influence on performance. However, a management paradox exists for certain elements where the direction of influence changes depending on firm circumstances. Centrality is found to be a liability and internal capital an asset for large or profitable firms, in influencing performance. For small or loss making firms the opposite is found with centrality proving an asset and internal capital a liability in terms of performance. The direction of influence for centrality swings between being a liability when predicting ROI, to an asset when predicting market measures like Tobins Q.

Section 2 provides context from the literature from which the formulation of CSC is derived. Numerous normative studies propose a link between CSC and firm performance, but there is a paucity of empirical work directly linking CSC and specific performance metrics like return on investment, and shareholder return. Section 3 provides the research questions being addressed and subsequent hypotheses formulation. An innovative suite of methods have been assembled along with the development of an integrated model of CSC, to test the research hypotheses, and is described in section 4. The methods are drawn from the fields of social network analysis, content analysis and traditional multivariate statistical analyses. Section 5 provides the results of the analysis which includes confirmatory statistics for the integrated CSC model proposed, and then the specific hypotheses test results. A discussion is provided in section 6 on the relevance of the results obtained in terms of its contribution to the research themes for social capital, intellectual or intangible capital and corporate reputation. The potential impact on management practice in leveraging CSC for firm performance is also discussed. Finally, potential limitations of the research and suggestions for future research are offered.

2. Corporate Social Capital

CSC has been defined as “the set of resources, tangible or virtual, that accrue to a corporate player through the player’s social relationships, facilitating the attainment of goals” (Leenders and Gabbay, 1999, p3). The breadth of current CSC definitions leaves ample room for a variety of conceptual formulations. In this research a wide net has been deliberately cast to incorporate complementary business constructs that arguably provide a more complete construct for CSC, beyond formulations that are limited to network structural positioning. This review initially explores the business concepts that are potential contributors to CSC. This is followed by a review of selected empirical research studies.

The alliance literature mostly focuses on “the single deal”, however the sheer growth in the number of alliances being formed will naturally lead to discussions of “alliance networks”, beyond simple partnerships (Dyer and Nobeoka, 2000; Gulati, Nohria, et al, 2000; Uzzi, 1997). The social capital available to firms within a network will depend on how they identify and execute network connections as well as how attractive they are as potential partners. Social networks become valuable conduits for information and knowledge flows, providing access to new opportunities, but over-embeddedness can also be constraints on independent action (Uzzi, 1997; Portes, 1998). Good social capital becomes even more important in uncertain environments (Gulati and Gargiulo, 1999), when firms fall back to their trusted partners, whom they typically have some history with (Gulati, Nohria, et al, 2000; McCutcheon and Stuart, 2000). The choice of network partners is most influenced by a prior contact or experience (Gulati, 1995).

Intellectual / intangible capital research is still in its infancy, with a concerted focus on the topic beginning in the mid to late 1990s. The topic attracted the interest of the OECD in 1999 (OECD, 1999) through its international symposium for measuring and managing intellectual capital, which provided further impetus to intellectual capital research into the new millennia.

The connection between social capital and intellectual capital has been argued by a number of authors (Nahapiet and Ghoshal, 1998; McElroy, 2002; Pomedá, 2002). Intellectual Capital has commonly been decomposed into the three basic components of external capital, internal capital and human capital (Sveiby, 1997; Stewart, 1997). External capital is defined as the intangible contributions of customers, suppliers and partners to the firm. Internal Capital refers to the internal systems, patents, organizational structures and Human Capital as the skills, competencies and education of the firm's staff.

While social capital proponents are arguing for its inclusion in formulations of intellectual capital (McElroy, 2002; Pomedá, 2002), this research takes a view that intellectual capital can act as a contributor to CSC. Viewing intellectual capital through a social capital lens would see human capital as an actor's human competence attributes that attract the actor into social networks. External capital is seen as the relationships with external stakeholders and internal capital as the network structures that exist inside the organization. In effect, intellectual capital is being positioned as a component of firm "status" as described by Podolny (1993).

Corporate reputation could be defined as the general opinion of the investing public towards a firm in the marketplace. Corporate reputation is introduced here as a firm status attribute, and therefore social capital contributor. While corporate reputation has largely been developed within the marketing literature (Brown and Perry, 1994; Fombrun and Shanley, 1990; Dollinger, Golden et al, 1997), one could argue that reputations, like social capital, are measured or assessed by external actors. As such, reputations are socially constructed and therefore deserve to be considered as a form of social capital, operating in the market place.

2.1. Empirical Studies Linking Social Capital Elements to Firm Performance

This review has purposefully cast a broad net across the literatures of social networks, intangible / intellectual capital and corporate reputation for studying the links between CSC elements and firm performance. Despite the breadth of the literature covered, empirical studies specifically linking CSC to firm performance are scarce.

Table 1 summarises selected articles that report on empirical research that address the topic to some degree.

Table 1 – Selected Empirical Studies linking social capital elements to firm performance

References	Dependent Variables	Independent Variables ³
Das, Sen and Sengupta, 1998	Stock market return	Alliance announcement
Stuart, 2000	Sales growth	Alliances, sales of partners, innovativeness of partners, age of partners
Florin, Lubatkin and Schulze, 2003	Funds raised Sales growth Return on sales	Human resources Social resources Sales at IPO Firm age Industry sector
Podolny, Stuart and Hannan, 1996	Growth	Crowding, status, sales of competitors, patents
Powell, Koput, Smith-Doerr and Owen-Smith, 1999	Sales Non-operating income Internal R&D spending	R&D ties, experience, diversity, centrality
Tsai, 2001	New product rate ROI	Absorptive capacity Centrality

³ In some cases only the major variables identified. Excludes control variables.

References	Dependent Variables	Independent Variables³
Koka and Prescott, 2002	Sales per employee	Information volume, information diversity, information richness.
Fombrun and Shanley, 1990	Corporate reputation	Profitability, risk, advertising, size, ownership, market to book, yield, visibility, Beta, favourability, charity, foundations, diversification.
Chauvin and Hirschey, 1993	Market value	Cash flows, growth, risk, market share, advertising, R&D
Bond and Cummins, 2003	Tobins Q	Advertising, R&D

Table 1 contains a diverse suite of empirical studies. One line of investigation of the benefits of alliances is seen as the actual announcement. It has been found that the announcement itself can provide abnormal positive movements in share price, especially for technology based alliances (Das, Ken and Sengupta, 1998; Chan, Kensinger et al, 1997). Whether this benefit is sustained post announcement or whether the accounting benefits like ROI are also achieved is still a point of contention. Florin, Lubatkin and Schulze (2003) investigate firm performance pre- and post IPO. From a sample of 275 ventures, they find that social capital does leverage other firm resources to achieve a sustainable competitive advantage.

The semiconductor and biotechnology industry sectors have been popular areas for exploring interorganizational alliance effects. These sectors are seen as emerging growth sectors with high levels of alliance activity. For these studies, growth in revenue, staff

members or R&D spending are the firm performance measures of interest. The independent variables tested varied from partner attributes like age, experience, revenue, patents, innovativeness and diversity, to centrality and crowding (Stuart, 2000; Podolny, Stuart and Hannan, 1996; Baum, Calabrese and Silverman, 2000). These studies were largely interested in how start-up firms could enhance their growth prospects by partnering with larger, more experienced firms. The studies focused on the social capital of the potential partners, more so than the firms themselves.

Koka and Prescott (2002) examined the impact of social capital on information dimensions of volume, diversity and richness. Using the Steel industry as an example they were able to show that different dimensions of social capital impacts performance differentially. Like some of the previous studies, firm performance was limited to sales performance.

The corporate reputation literature is built on the premise that corporate reputation is tightly linked to firm performance. The empirical studies however are mostly focused on what attributes of a firm contribute to its reputation. In this case firm performance measures like ROA, earnings, sales, book values, advertising, size are used as predictors of corporate reputation, rather than the reverse (Fombrun and Shanley, 1990; Brown and Perry, 1994).

The most common intangibles included as independent variables are advertising and R&D expenditure, measures that are available for some sectors in the Compustat data base. While the studies find that these intangible factors do have an influence on share values (Chauvin and Hirschey, 1993; Bond and Cummins, 2003), Bond and Cummins find that they fall far short of explaining the growing market to book gap. The accounting research has only been able to include limited constructs for intangible assets, mostly being R&D and advertising (Lev, 2001; Chauvin, K. and M. Hirschey, 1993). No relational or external capital attributes are included and therefore are incomplete for a comprehensive study of intangibles and social capital.

In summary, the empirical research around CSC and firm performance is somewhat limited. Most studies have focused on single firm performance measures which only partially describe a firm's overall performance. The selection of independent variables is varied, but no single study provides a comprehensive treatment of social capital. If it is measured at all it is limited to a structural measure with a small selection of additional attributes like absorptive capacity, experience, age, diversity and trust. No attempts were made to formulate a more comprehensive treatment for social capital incorporating these other variables. The opportunity to develop a more comprehensive or integrated model for social capital and then assessing its impact on a comprehensive suite of firm performance measures is the gap in the literature that this research addresses.

3. Research Questions and Hypotheses Development

The fundamental research questions being addressed here are:

1. What impact does CSC have on overall firm performance?
2. To what extent do the sub-elements of CSC contribute or detract from firm performance?

The empirical research literature has looked at a variety of firm performance measures. In most cases only a single performance measure is used, which does not provide a balanced perspective of a firm's overall performance. For this research three firm performance measures of return on investment, Tobins Q (a market to book value measure) and total shareholder return are used. These measures were selected to provide a balance of accounting performance measures and market based performance measures. Sales performance is used as a control variable for firm size.

The hypotheses addressing these questions are built up through a five layered construct for CSC. An integrated model of CSC can be developed through five "building block" layers as shown in Figure 1 – Integrated model for corporate social capital.

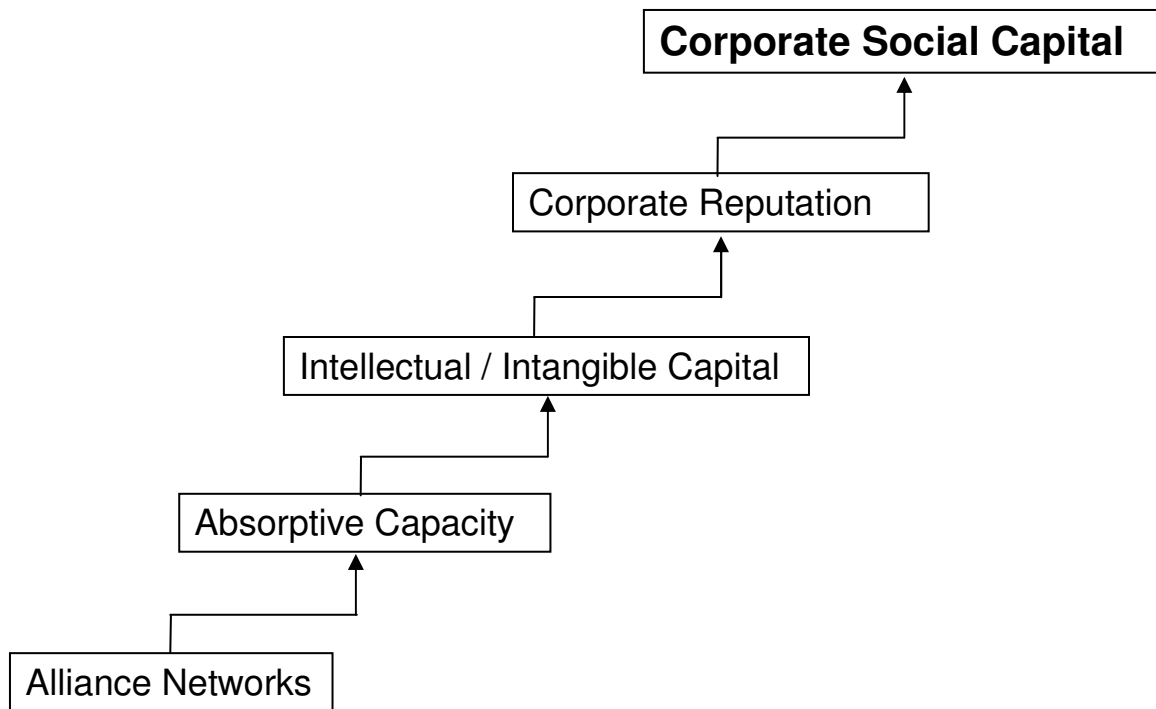


Figure 1 – Integrated model for corporate social capital

From a base formulation of alliance networks, absorptive capacity is added to cater for the ability to absorb new knowledge from alliances. Intellectual / intangible capital is added as a status attribute for the firm. Corporate reputation can be formulated as intellectual capital with the addition of financial soundness. Collectively the concepts of alliance networks, absorptive capacity, intellectual / intangible capital and corporate reputation can be incorporated into an integrated model for CSC.

The first construct is a firm’s centrality, measured by its positioning within the market’s network of alliances, versus firm performance. The hypothesis is that a firm’s centrality can be viewed as a significant intangible asset for the firm. Intellectual capital researchers refer to external capital (Sveiby, 1997) or relationship capital (Marr and Chatzkel, 2004; Roos and Roos, 1997), but not specifically centrality. Additionally, the hypothesis relating firm centrality to performance is inferred by social network researchers (Baker, 1990; Tsai, 2001; Burt, 1992) and will be tested empirically here:

H1: Centrality is positively associated with Firm Performance

The second construct adds absorptive capacity, which is operationalised as R&D intensity (Tsai, 2001; Cohen and Levinthal, 1990), to centrality and provides a richer concept, labeled here as “structural social capital”. Absorptive capacity takes into account a firm’s capacity to absorb knowledge or information from an alliance partner. The hypothesis below suggests absorptive capacity can predict overall firm performance:

H2: Absorptive capacity is positively associated with Firm Performance

The third construct uses elements from the intellectual capital model (Sveiby, 1997) to come up with an enriched version of an intellectual capital construct. The Sveiby model decomposes intellectual capital into components of external capital, internal capital and human capital. For this research, centrality is used in place of the “external capital” element in Sveiby’s intellectual capital model on the basis of conceptual equivalence, in that they both focus on a firm’s external relationships. A number of authors have proposed that a firm’s intellectual capital predicts firm performance (Sveiby, 1997; Stewart, 1997; Lev, 2001). The other elements of intellectual capital are also reported separately in the literature. The relationship between human and social capital is argued by Colman (1988). Pennings (1998) identifies the importance of both social and human capital on firm survival. The following hypothesis proposes the relationship between human capital and firm performance.

H3: Human capital is positively associated with Firm Performance

Internal, or organizational capital has also been related to the competitive advantage of the firm (Martin-de-Castro, Navas-Lopez, et al., 2006). A fourth hypothesis is therefore proposed to test this proposition empirically:

H4: Internal Capital is positively associated with Firm Performance

The fourth construct introduces financial soundness together with intellectual capital to come up with a representation of corporate reputation. Several authors have developed theories linking corporate reputation, to firm performance (Hall, 1992; Fombrun and Shanley, 1990). The elements of centrality, internal and human capital are to be tested in H1, H3 and H4. Therefore the final component of corporate reputation is tested in H5 below:

H5: Financial soundness is positively associated with Firm Performance

Figure 2 summarises the linkage between the research model and the proposed hypotheses:

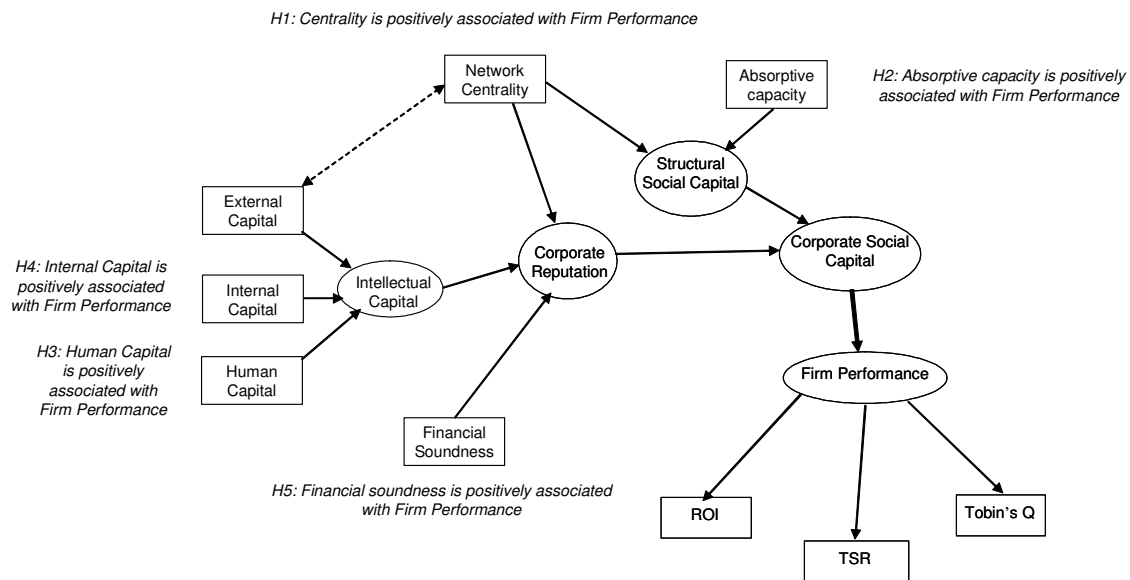


Figure 2 – Path Model and Hypotheses

The ovals represent latent variables which are manifested in the observed or measured variables identified in the rectangles. The dotted connection between centrality and external capital identifies the potential redundancy between these elements from a conceptual perspective. The hypotheses are shown linking the measured variables, being the elements of CSC, with the three firm performance measures of ROI, TSR and Tobin's Q.

4. Research Methods

The empirical research has been focused on a single market sector, the global information technology (IT) sector of firms listed on the US stock exchange (GICS code 45). The rationale for the selection is both for reasons of scope management, but also for the “high intangible” characteristics of this sector. Given that CSC incorporates largely intangible elements, the selection of a sector high in intangibles is more likely to provide a comprehensive source of data from which to conduct the research. It is also an industry rich with alliance activity, providing a good data source for the study of network patterns in the market place (Hagedoorn and Schakenraad,1992; Knoke, Yang and Granados, 2002).

4.1. Data Sources and Sampling

Three key commercial data sources have been used in this research.

1. The Computer Wire contracts data base provides more than 10 years of data on major contracts signed in the IT sector world wide.
2. Factiva is a Dow Jones and Reuters company which provides global news and business information through on-line sources.
3. The Compustat financial data base is considered a primary source of financial data for publicly listed US companies.

The sampling period selected for this research ranges from 1st January 2001 to 31st December 2004. This period was purposely chosen to avoid the extreme market valuation changes of the so called dotcom boom and bust. The Factiva news sources were updated on a daily basis during this period. The Computer Wire transaction data base records the date of the transaction, the size of the contract, the client, the prime supplier and subcontractors. The Compustat financial data base contains data of differing periodicity depending on the factor selected. The financial data drawn to calculate attributes for financial soundness, Tobins Q and total shareholder return are calculated on a calendar year basis.

4.2. Analytical Techniques

This section describes four analytical techniques; social network analysis, content analysis, financial analysis and multivariate statistical analysis, used in this research:

4.2.1. Social Network Analysis Methods

An eigenvector centrality index measure (Bonacich, 1987) was used for representing centrality in the market place. Degree centrality, designed to identify those firms who are most connected in the market place, is another popular centrality measure. The eigenvector measure is a prestige measure identifying those firms connected to the most connected firms. The use of this centrality measure was motivated from pilot studies that indicated that firms connected to multiple and highly connected systems integration firms, having significantly higher market to book valuations i.e. an inferred prestige effect. This measure has been used by Podolny (1993) as a measure of a firm's status in the market place. The pilot studies also indicated a high correlation between degree centrality and eigenvector centrality for the data set used, therefore either centrality measure would have sufficed. The eigenvector centrality measure was calculated using the UCINET software (Borgatti, Everett and Freeman, 2002).

4.2.2. Content Analysis Method

Content analysis (CA) is a popular method for systematically developing quantitative descriptions from textual information (Neuendorf, 2002). Prior uses of CA to assess intellectual capital strengths of firms has been limited to self reported content like annual reports (Guthrie and Petty, 2000) or the limited coverage that market analyst reports can provide (Arvidsson, 2004). Using the Factiva news source and computer assisted content analysis, this research significantly broadens the base data from which intellectual capital elements are identified. The ability to search across a large range of business publications from analyst reports to general news articles provides a larger data source for the content

analysis, representing the views of a much broader range of reporters. It also now makes it feasible to analyse many firms and whole market sectors using CA.

The technique is typically based on identifying and counting concepts that exist within the text, to test hypotheses developed as part of a quantitative research activity. A coding scheme was developed for each variable. Pilot studies were undertaken to develop the coding scheme for each variable. For internal and human capital measures the following mapping is made between the formulations offered by Guthrie and Petty, 2000 and pre-defined Factiva taxonomy terms.

Table 2 – Search term mappings

IC Classification Equivalence (Guthrie and Petty, 2000)	Factiva Intelligent Taxonomy Terms
<p><i>Human capital:</i> Employee, Education, Training, Work-related knowledge, Entrepreneurial spirit</p>	<p>Employee Training/Development Workers Pay Labor Disputes Lay-offs Recruitment Directors Dealings Executive Pay Management Moves</p>
<p><i>Internal Capital:</i> Intellectual property, Management philosophy, corporate culture, management processes, information/networking systems, financial relations</p>	<p>Intellectual Property Best Practice Competitive Intelligence Corporate Governance/Investor Relations Corporate Process Redesign Knowledge Management Supply chain Information Technology Debt/Bond Markets</p>

The centrality of a firm is determined using the network of joint venture relationships identified by the number of unique articles linking firms that are categorized under the “Joint Venture” Factiva taxonomy term. The number of unique joint venture announcements is used as strength of relationship proxy.

The concept of social capital liabilities is introduced through identifying negative stories as well as positive and neutral stories. An index is developed which weights negative stories at twice that of positive or neutral stories. i.e. the index is equal to the number of positive or neutral articles minus the number of negative articles times 2. The indexing scheme is based on the greater perceived impact of negative news as opposed to positive news on stock prices (De Gieij and Marquering, 2004; Dean and Faff, 2004). In identifying negative stories to create the index, the coding scheme has typical themes which would constitute a negative story. For human capital, typical themes would be layoffs or senior management moves.

4.2.3. Financial Analysis Methods

Financial soundness is a measure of a firm’s financial robustness i.e. its ability to sustain an adequate financial performance in the face of potentially unanticipated events like a sudden market downturn or natural disasters. Financial soundness is operationalised through the use of Altman’s Z score (Eidleman, 1995), a proven method for prediction of business failure. Altman’s Z score is calculated as:

$$Z = 1.2 * X1 + 1.4 * X2 + 3.3 * X3 + 0.6 * X4 + 1.0 * X5;$$

Where:

X1 = Working Capital/Total Assets

X2 = Retained Earnings/Total Assets

X3 = EBIT/Total Assets

X4 = Market Value of Equity/Book Value of Debt

X5 = Sales/Total Assets

This measure was initially designed to assess the potential for a firm to become insolvent or bankrupt in the short to medium term. The measure has been chosen for the simplicity of calculation from readily available data, and its popularity as a financial soundness measure.

Financial metrics are used to identify firm performance measures and intangible asset performance. Firm performance is operationalised through a selection of several measures:

- a) Return on Investment (%)
- b) Total Shareholder Return (%)
- c) Tobins Q (ratio)

Bivariate correlation results indicate that the above measures are sufficiently independent of each other (see Table 15). Intangible asset performance is operationalised as a market to book value estimate known as Tobins Q. Tobins Q uses replacement values of assets to represent book values in place of the traditional historic book values. As replacement values are not commonly assessed, an approximation for Tobins Q is used (Chung and Pruitt, 1994) and is calculated as:

Tobins Q = (Market Value + Preferred Stock Liquidation Value + Total Debt) / Total Assets.

4.2.4. Statistical Analysis Methods

Factor analysis is used to assess the validity of the path model presented in Figure 2. Do the observed variables cluster as predicted by the latent variables that they represent? How discriminating are the CSC elements?

Multiple regression analysis is used to identify the explanatory power of CSC for the selected firm performance measures, at each level of the CSC formulation. This stepwise

analysis is aimed at identifying the expected improvement in explanatory power with each additional CSC layer.

The general models are:

Centrality level:

$$\text{Model 1: Firm Performance} = b_0 + b_1\text{CENT} + e$$

Structural Social Capital Level:

$$\text{Model 2: Firm Performance} = b_0 + b_1\text{CENT} + b_2\text{RES} + e$$

Intellectual Capital Level:

$$\text{Model 3: Firm Performance} = b_0 + b_1\text{CENT} + b_2\text{HC} + b_3\text{IC} + e$$

Corporate Reputation Level:

$$\text{Model 5: Firm Performance} = b_0 + b_1\text{CENT} + b_2\text{HC} + b_3\text{IC} + b_4\text{ZSCORE} + e$$

Corporate Social Capital level:

$$\text{Model 5: Firm Performance} = b_0 + b_1\text{CENT} + b_2\text{RES} + b_3\text{HC} + b_4\text{IC} + b_5\text{ZSCORE} + e$$

Model 5 is used to test the five hypotheses relating the individual elements of corporate social capital with firm performance.

Based on prior research studies in related fields (Lev and Sougiannis, 1999; Hand and Lev, 2003, Toby, 2000), firm size and industry sub sector are used as control variables. The additional control variable of profitability is introduced due to the relatively large proportion of loss making firms in the sample. The proposition that the role of book values on share values differs for firms in loss making, rather than profit making situations (Collins, Pincus et al., 1999), further supports its selection as a control variable.

A snowball sampling procedure for network data is used for this research. For large networks, where the identification of all network actors is impractical, a sampling method is required. For large networks there exists no systematic theory of network sampling (Granovetter, 1976; Rothenberg, 1995). Snowball sampling enlarges an initial node selection by adding adjacent nodes through a number of stages (Frank, 1979). Frank builds a mathematical theory to demonstrate a connection to probability theory. Theory aside, snowball sampling has proved the most pragmatic method for sampling large networks. Rothenberg (1995) argues that empirically driven sampling, as identified

above, provides a more representative sample for network data, than methods that try to satisfy probabilistic criteria.

Figure 3 provides an overview of the research methods employed:

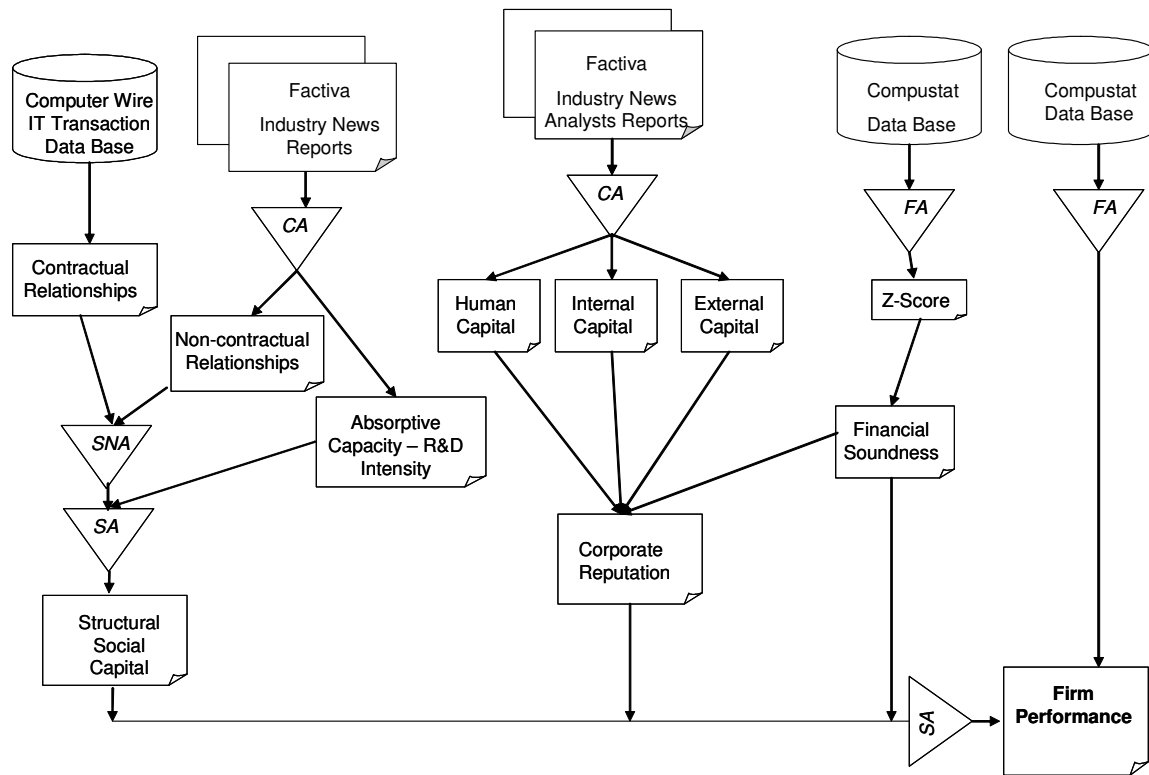


Figure 3 – Overview of Research Methods

The data sources are shown at the top of the figure. The CSC constructs are shown below. The triangles show the analytical technique that is used to quantify or operationalise the core concepts. The analytical codes stand for:

CA = Content Analysis; SNA = Social Network Analysis; FA = Financial Analysis and SA = Statistical analysis.

In summary, the above range of research methods has been assembled to enable the core proposition of linking CSC to firm performance to be tested empirically.

4.3. Variables

Table 3 identifies the labels for each variable used in the analyses, with a short description:

Table 3 – Variable labels and descriptors

Variable Labels	Description
<i>Independent Variables</i>	
CENT	Market centrality measured as Eigenvector centrality
RES	R&D Intensity = R&D/Net Sales. A proxy for absorptive capacity
HC	Human Capital Index
IC	Internal Capital Index
<i>Dependent Variables</i>	
ROI	Return on Investment (%)
TobinsQ	Tobins Q (ratio). Proxy for market to book ratio
TSR	Total shareholder return (%). Share price appreciation plus dividends
<i>Control Variables</i>	
NetSales	Sales net of credits. Proxy for firm size.
ZSCORE	Altman's Z-Score. Proxy for financial soundness
IND	Industry Sector Dummy: 1 = Software and Services, 0 = other IT sectors
P_L	Profitability Dummy: 1 = mean earnings per share \geq 0, 0 = mean earnings per share $<$ 0

5. Results

To establish a measure of centrality for a firm, a network representation of the market was developed using alliance data mined from commercially available data sources. Content analysis of the Factiva and Computer Wire data bases is used to develop a networked representation of the IT Services market place.

5.1. Descriptive Data and Data Transformations

The following table provides descriptive statistics for the key variables from the research model.

Table 4 – Descriptive Statistics

	N	Minimum	Maximum	Mean	Std	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
CENT	156	0.1	42.82	7.5276	8.37831	1.747	0.194	3.011	0.386
RES	150	0	1320	96.04	220.826	3.579	0.198	14.507	0.394
HC	150	-623	2241	151.9333	319.7139	3.152	0.198	14.02	0.394
IC	156	0	3048	218.2821	416.1196	4.291	0.194	23.55	0.386
EC	156	-463	2674	185.7628	489.2104	3.375	0.194	12.638	0.386
ZSCORE	152	-278.22	36.09	-1.1769	27.14962	-7.535	0.197	72.903	0.391
NetSales	155	0.36	135312	8836.885	19476.87	3.461	0.195	14.726	0.387
TobinsQ	149	0.19	35.88	2.9056	4.88572	5.372	0.199	31.2	0.395
TSR	145	-72.76	3076.62	33.8559	260.8578	11.199	0.201	130.999	0.4
ROI	154	-7471.28	118.69	-114.8323	628.6739	-10.735	0.195	124.63	0.389
EBIT Margin	155	-6022.2	41.55	-96.9533	536.019	-9.408	0.195	99.458	0.387
Valid N	130								

Some points to note are that the data is not normally distributed. Using the assumption that the ratio of kurtosis and skewness to its standard error can be used as a test of normality (that is, you can reject normality if the ratio is less than -2 or greater than +2), none of the variables meet this test of normality.

Both log and/or inverse transformations were trialed for each of the variables (Tabachnick and Fidell, 2001). Largely these traditional transformations did not achieve the desired results. Given the nature of the distributions and the presence of several extreme outliers with many of the variables, rank transformations were used for all variables (Iman and Conover, 1979). The transformation to ranks avoids the need to exclude extreme outliers from the above distributions. All variables participating in the hypotheses tests were transformed to ranked variables.

5.2. Latent Variables

The path model shown in Figure 2 identifies a number of latent variables; Structural Social Capital, Intellectual Capital, Corporate Reputation and Corporate Social Capital that are manifested in the identified measured variables. The path model is a theoretical model derived from the literature. This section reports on how well the data aligns with the theory when statistical classification methods are used to determine discriminating “clusters”. Factor analysis is used to determine how well each of the measured variables cluster.

Factor analysis was conducted on the independent variables. Principal factors extraction with varimax rotation was set for the six independent variables. Using the default eigenvalue > 1 as the threshold, all variables were clustered into two factors. This supports the view of corporate social capital being a cohesive concept as represented by all of the clustered independent variables.

Table 5 – Factor analysis with default threshold

Component Matrix^a

	Component	
	1	2
CENT	.883	.023
HC	.786	-.150
IC	.875	-.143
EC	.803	.159
ZSCORE	.449	.098
RES	.051	.977

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

The interpretation from the above result would suggest that the intellectual capital (HC, IC and EC) and eigenvector centrality cannot be discriminated. The theoretical model suggests redundancy between centrality (eigenvector) and external capital (EC). The result demonstrates that external capital could be substituted for by eigenvector centrality. A new intellectual capital formulation could therefore be constructed from centrality, human and internal capital. Research intensity however, would not be a sub-component

of the new intellectual capital construct. The corporate reputation concept is formulated as a composite of two different factors i.e. intellectual capital and financial soundness (Z-score). An integrated CSC construct is then made up of centrality, absorptive capacity (R&D intensity), human capital, internal capital and financial soundness.

5.3. Regression Analysis Results

Regressions for corporate social capital components against the selected firm performance measures are shown in Table 8 in the appendix. Three control variables for firm size, profitability and industry sub sector are included. The results indicate that the selected control variables are significant predictors for firm performance. Each control variable was therefore investigated for all models. The regression results are shown in Table 9 to Table 14 found in the appendix. A stepwise regression approach was used to introduce each of the models from model 1 to 5 one step at a time. The control variables were entered as the first step, followed by centrality, R&D intensity, human and internal capital and then finally financial soundness.

For simplicity, the results are summarized in Table 6, showing only the most significant factors and the direction of influence using the corporate social capital regression model, model 5:

Table 6 – Summary table of results

	ZSCORE	CENT	RES	IC	HC	IND	P_L	NetSales
Full Sample								
ROI	+	-				+	+	+
Tobins Q	+	+	+					-
TSR	+							
Large Firm								
ROI	+			+			+	
Tobins Q	+					+	-	
TSR		-						
Small Firm								
ROI	+						+	
Tobins Q				-				
TSR	+							
Profitable								
ROI	+	-		+		+		+
Tobins Q	+		+					
TSR				+		-		-
Loss Making								
ROI	+							
Tobins Q		+		-				
TSR	+							
Software Industry								
ROI	+						+	+
Tobins Q	+							
TSR								
Non-Software Industry								
ROI	+	-					+	+
Tobins Q	+							
TSR								

The above results indicate that financial soundness matters the most, being a significant predictor of all performance measures for the majority of scenarios. The results for the full sample indicate firm size, profitability and whether the firm provides software and services as against more hardware related products does have an impact on ROI. TSR is predicted by financial soundness only. The direction of influence for centrality depends on the performance measure of interest. It is asset for Tobins Q performance but a liability for ROI. Human capital was found to have no significant impact on firm performance.

When controlling for firm size and profitability a pattern of performance appears that discriminates large or profitable firms from small or loss making firms. Figure 4 shows the most significant predictors of firm performance and the direction of influence for firm

size and profitability sub samples using the Corporate Reputation and Corporate Social Capital models, models 4 and 5 respectively. Beyond financial soundness, which is significant for all scenarios, for large or profitable firms, centrality is a liability, while internal capital is a positive contributor to firm performance. For small or loss making firms, centrality is an asset and internal capital is a liability in terms of firm performance.

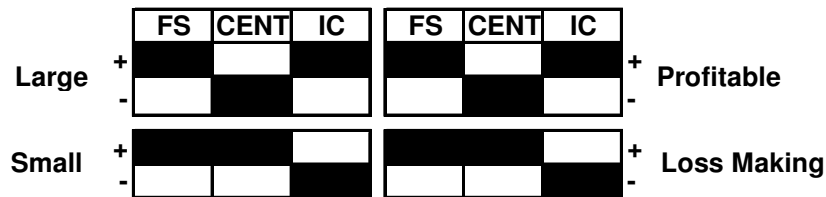


Figure 4 – Patterns of influence of CSC elements on firm performance

The results when controlling for industry sub sector show financial soundness, profitability and firm size impacting on ROI. For the non-software sector high centrality was found to have negative relationship with ROI performance.

In terms of explanatory power of CSC for the three performance measures, the best performance achieved was for ROI, where over 75% of the variation can be explained by CSC. For Tobins Q the explanatory power drops to 36% across the full sample. It is worth noting that for large or profitable firms the explanatory power is 70% and 73% respectively for TobinsQ, once financial soundness is introduced in models 4 and 5. TSR is a barely significant 4%. Looking at the expected increased explanatory power when moving from model 1 (centrality only) to model 5 (full CSC model), financial soundness provides the biggest increase between models 3 and 4 or 5, for all performance measures. Centrality and absorptive capacity provided significant increases in explanatory power for only Tobins Q performance. The addition of the internal and human capital elements only significantly improved explanatory power for Tobins Q for small or loss making firms.

5.4. Hypotheses Test Results

A hypothesis is supported if a significant predictor is found for any of the three performance measure of ROI, Tobins Q or TSR. Given the significance of the control

variables of firm size, profitability and industry sub sector, the CSC model 5 results, when controlling for each of these variables, is used for the hypotheses tests (see Table 9 to Table 14). The results are summarized below:

Table 7 – Hypotheses Test Results

Hypothesis	Performance Indicator Predicted	Result
<i>H1: Centrality is positively associated with Firm Performance</i>	Tobins Q	Supported
<i>H2: Absorptive capacity is positively associated with Firm Performance</i>	Tobins Q	Supported
<i>H3: Human capital is positively associated with Firm Performance</i>		Not Supported
<i>H4: Internal capital is positively associated with Firm Performance</i>	ROI	Supported
<i>H5: Financial soundness is positively associated with Firm Performance</i>	ROI Tobins Q TSR	Supported

Centrality is found to be positively associated with firm performance when predicting Tobins Q. However, the direction of influence changes when predicting ROI. The hypothesis relating absorptive capacity to firm performance is supported for Tobins Q. Human capital was not found to be a significant predictor of firm performance, therefore H3 is not supported. Internal capital is positively associated with ROI for large or profitable firms and therefore the hypothesis H4 is supported. However, the direction of influence changes when predicting Tobins Q for small or loss making firms. Financial soundness predicts all three performance measures of ROI, Tobins Q and TSR and therefore H5 is supported.

While support is found for four of the five hypotheses, it should be noted that for both centrality and internal capital, significant negative relationships to firm performance were

also found for particular scenarios. A discussion of this result is included in the next section.

6. Discussion and Conclusions

This research set out to find empirical evidence for a linkage between CSC and firm performance. The comprehensive analysis conducted explored formulations of CSC at five levels of granularity and tested these against a suite of firm performance measures that were both accounting and market based. The results of the regression tests were conclusive in supporting the view that CSC is strongly linked to firm performance.

While the overall proposition is supported, the value from this research in terms of the underlying theories it supports or otherwise, can be found at the more granular levels of analyses. The relationship between some of the components of CSC and how they impact on different firm performance measures, provide more granular explanations as to what particular management levers can have the most effect. The specific hypotheses tested indicated that human capital was not positively associated with firm performance. While centrality, absorptive capacity, internal capital and financial soundness were positively associated with at least one firm performance measure. For the IT sector, whether a firm is small or large, profitable or loss making, developing software and services or hardware, does make a difference. Depending on what situation a firm is in, will dictate which CSC lever to use to enhance firm performance.

6.1. Social Capital Research

The social capital research has focused on the structural aspects of social capital. In particular, a focus on alliance activity and the network ties they create, is a typical investigative route for organizational level studies. The well documented dichotomy in arguments for social capital between the proposition that dense ego-networks enable better co-ordination and co-operation (Coleman, 1990, Putman, 2000) in contrast to the benefits from bridging weak ties (Ganovetter, 1973) or non-existent ties (Burt, 1992), plays out within the results achieved. The variance in results between the essentially software and hardware sub-sectors, large and small firms, profitable and not profitable

firms of the IT industry reinforces the importance of understanding the competitive intensity of market sectors and controlling for them (Burt, Guilarte et al, 2002).

For larger or profitable firms high centrality becomes a burden for both ROI and TSR performance. This finding supports the arguments for the negative effects of over-embeddedness (Uzzi, 1997; Podolny, Stuart and Hannan, 1996). By postulating that the large and profitable firms are the more established firms, one can build a link to the so called “dark side” of social capital (Portes, 1998; Cohen and Prusak, 2001). The argument made is that actors too embedded in a closed network of alters are susceptible to “group think”, shielded from innovative ideas (Florida, Cushing, et al., 2002; Cohen and Prusak, 2001, Uzzi, 1997), expend too much energy on sustaining unprofitable relationships and therefore social capital becomes a liability, rather than an asset (Portes, 1998). The empirical support for the social capital liability argument at the organizational level is significant as there has to date been limited empirical support for the argument. The significance of high centrality for small or loss making firms suggest a dichotomy in the IT industry between small start up firms, who benefit from building alliances and increasing centrality, and the larger or more established firms, where increased centrality can become a liability. As a maturing industry, the IT industry is presenting the extremes of both explorative and exploitive networks in a single industry (Rowley, Behrens, et al. 2000).

Moving beyond the structuralists’ concept of social capital to the connectionist arguments that incorporate other organizational attributes within the social capital formulation, new findings are available from this research. The results indicate that financial soundness is a foundation requirement for explaining firm performance. Its inclusion in formulations of CSC is largely responsible for the increase in explanatory power when moving from model 3 to models 4 and 5 (see Table 8). This result reinforces a view that wealth is a predominant social capital element for firms as well as individuals. Beyond financial soundness, other attributes that contribute most to a firm’s CSC is its centrality and internal capital. Internal capital refers to results of internal activities like new practices, patents, products, technology use and knowledge management. However, like centrality,

the direction of influence is not always positive. This phenomenon is explored in more detail in the next section on intellectual / intangible capital.

6.2. Intellectual / Intangible Capital Research

This research makes a claim that a firm's intellectual / intangible capital is a firm "status" attribute that contributes strongly to a firm's CSC. Intellectual capital has been traditionally described as a firm's internal, human and external capital (Sveiby, 1997). The factor analyses results support the proposition that the external capital formulation can be substituted for by centrality, but not absorptive capacity. It also identifies that the intellectual capital elements and centrality together form a cohesive single concept, providing support for an enriched formulation of CSC.

A basic premise for intellectual / intangible capital researchers is that increased disclosure of intellectual capital attributes of a firm will lead to better informed markets and therefore more predictable and fairer market returns (Lev, 2001; Mouritson and Larsen, et al. ,2005; Wallman, 1995; Holland, 1999). Much of the research has been driven by the increased disparity between firm market and book values over the past 30 years. This disparity has regularly been attributed to the increased impact of intangible assets (Stewart, 1997; Sveiby, 1997; Lev, 2001) and the "new" services based economy. Accountants have been concerned with the "loss of value relevance" found in traditional accounting reports. That is, traditional measures of earnings and book values are explaining less and less of the variations in stock prices than they did 30 years ago. Accounting researchers place current predictive performance below 50% (Lev and Zarowin, 1999; Ohlsen, 1995; Collins, Maydew, et al. ,1997). The question raised from this research is whether CSC can help explain the gap?

Model 3 specifically addressed the impact of intellectual / intangible capital on firm performance. The proposition for intellectual / intangible capital explaining the growing gap between market and book values is an active area of debate (Hand and Lev, 2003;

Garcia-Ayuso, 2003). While intellectually compelling, the argument has yet to gain significant empirical support. On the contrary, empirical research exists that claims the market to book gap is not explainable by intangibles like R&D and advertising (Bond and Cummings, 2003) and that the gap at this time can only be attributed to “noisy” share prices, that is, random effects. The results of this research (Model 3) would generally support these findings, with intellectual capital elements only predicting less than 20% of the variation in Tobins Q performance (see Table 8). One somewhat surprising result is that internal capital can be both an asset and a liability. For small or loss making firms internal capital was seen as a liability in terms of Tobins Q performance. This is a surprising result as Tobins Q has been promoted as a measure of a firm’s intangible performance, with internal capital assumed to be always positively correlated. These results suggest this is not always the case and internal capital may need to be managed to an appropriate level, depending on the firm’s circumstances.

On the question of whether CSC can explain the intangible gap between market and book performance, model 5 explains only about 36% of the variation in Tobins Q performance for the full sample. However, the performance increases to over around 70% for large or profitable firms. This increased performance is due to the introduction of financial soundness, implying that this factor is more important in predicting Tobins Q for larger and profitable firms than for small or loss making firms. The CSC elements like internal capital and centrality, but excluding financial soundness, performed best at predicting Tobins Q performance. This is consistent with the call by Brown and Perry (1994) to remove the “financial halo”, if one is interested in studying the qualitative aspects of firm performance, and in particular corporate reputation.

Human capital did not feature as a significant predictor of firm performance, which is somewhat surprising. The explanation could be related to the limitations with the research method. Business reports on human capital are somewhat limited and tend to be polarized around fairly narrow topics like executive movements or lay-offs.

6.3. Corporate Reputation and Integrated Corporate Social Capital

Corporate reputation is often linked to a firm's "brand" and is actively investigated in the marketing research literature (Brown and Perry, 1994; Fombrun and Shanley, 1990; Dollinger, Golden et al, 1997). The positive relationship found between corporate reputation and market to book values found by Fombrun and Shanley, (1990) is also demonstrated in this research (see model 4 results, Table 8).

The factor analysis largely confirms the path from the literature (Figure 2), which indicates that the elements contributing to the concepts of corporate reputation and CSC are cohesive, occupying a single factor. The exception is absorptive capacity, operationalised as research intensity, which was identified as a separate factor. Looking at the large, profitable and potentially more established firms, the twin elements of financial soundness and internal capital consistently explain the accounting performance ROI. This result is not unexpected. For loss making firms, financial soundness becomes the only significant predictor of ROI and TSR. This is understandable as loss making firms are seen to be in a transient state (Shamy, and Kayed, 2005), and therefore their survival could be singularly reliant on financial performances.

When one considers the market based firm performance metrics of TobinsQ and TSR the situation changes. While financial soundness is still significantly and positively related to Tobins Q and some TSR scenarios, the sign for internal capital changes to negative when predicting Tobins Q, as discussed earlier. This finding would suggest that even in high intangible industries like the IT industry, market perceptions related to financial soundness are the most powerful predictors. Despite the loss of value relevance trend, financial issues still dominate market perceptions. The only exception appears to be when predicting TobinsQ performance for small or loss making firms, where financial soundness was not found to be a significant predictor. The significant predictors for such firms are internal capital, which has a negative relationship with TobinsQ and centrality, which has a positive relationship with Tobins Q performance. This result is difficult to interpret, as one would expect market analysts to be looking for financial turnarounds or

positive internal capital stories to boost market values for firms in this situation. The other possible interpretation is that firms in this situation may have a narrow range of book values, which may have impacted TobinsQ results, causing the anomalous result achieved.

In general, the explanatory power for TSR is much weaker than for accounting based performance metrics like ROI. The strongest performance is for profitable firms, where all models predict around 20% of the variation in TSR performance. The inference is that CSC is not the “silver bullet” for predicting share market performance.

6.4. *Limitations and Suggestions for Future Research*

The use of advanced content analysis techniques and technologies has been instrumental in enabling the study of CSC and firm performance across a relatively large sample of firms. This facility has led to substantially new findings of interest to both the social sciences and intellectual capital research communities. New techniques come with limitations along with the benefits they provide.

One clear limitation with content analysis techniques is the validity and authenticity of the content being analysed. Business reporters are used for reporting on CSC attributes of the firms. The quality and accuracy of the reporting of individual articles could be questionable. Firms with a strong media following are less likely to be impacted by a wayward reporter, as the weight of accurate reports will mask inaccurate reports. However, firms with a low level of media coverage could be susceptible to a single inaccurate report.

When addressing the intellectual capital attributes of a firm, in particular, the internal and human capital elements, the content analysis can only provide what has been made visible by business reporters. This may be impacted by a firm’s public affairs policies and therefore not accurately represent a true picture of the firm’s internal and human capital. Additionally, the reported aspects of human and internal capital are limited to the “newsworthy” elements like senior executive movements or competitive intelligence

stories and not addressing less newsworthy elements like staff qualifications or a successful new internal business process. Again, these limitations are likely to be greater for firms with modest or non-existent media following.

In terms of future research directions many opportunities exist. The results of this research could be reinforced or otherwise by increasing the sampling period over a longer period, while controlling for the increase in media intensity over time. Individual case studies could also be used, where firms could be individually surveyed for CSC elements to complement the media derived information.

The negative relationship between internal capital and market to book ratios for small or loss making firms is somewhat surprising and is worth further investigation. The management paradox around centrality, when managing for accounting (ROI) versus market based (Tobins Q) performance also provides an opportunity for further investigation.

For the IT sector the results have shown that firm size, whether they are profit making or loss making and whether they mainly develop software or services versus equipment or hardware has an impact on how CSC influences firm performance. Research on the life cycle of firms, from start up to establishment and decline could significantly contribute to an understanding of how CSC evolves with the life cycle of a firm and its interdependency with firm performance measures. The IT industry in particular, is characterized by fast start-ups, establishment and often decline of firms. Some high profile examples include Digital Equipment, Data General and Compaq. Other established firms like IBM, Microsoft and even Yahoo have had to re-invent themselves a number of times to continue to thrive. Has CSC played a role in this reinvention?

In summary, this research has been an ambitious attempt to link a new integrated model of CSC to tangible firm performance measures. It has drawn from the disparate research fields of social science, intellectual / intangible capital and marketing. The results both reinforce social capital theories, not previously tested at the organizational level, and

provides new results prompting further investigation. As the viability of advanced content analysis technologies continues to mature, the world of research into CSC at the organizational level will open up, providing new insights into management practice in an increasingly connected market place.

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Appendix

Full Sample

Regressions for corporate social capital components against selected firm performance measures:

Table 8 – Full sample – Unstandardized Coefficients

	Model 1	Model 2	Model 3	Model 4	Model 5
Perf_{ROI}					
CENT	-0.048	-0.087	-0.056	-0.176*	-0.184*
RES		0.063			0.000
HC			0.069	0.032	0.033
IC			-0.023	0.092	0.090
Z-Score				0.400**	0.410**
IND	20.009**	21.022**	19.738**	-7.562**	14.609**
SIZE	0.342**	0.396**	0.330**	0.386**	0.402**
P_L	59.070**	58.801**	58.143**	33.260**	32.343**
F	75.176**	60.448**	52.272**	70.440**	58.679**
Adj R ²	0.676	0.677	0.678	0.769 ^a	0.765
Δ Adj R ²				0.091	
# Firms	143	143	143	143	143
Perf_{TobinsO}					
CENT	0.405**	0.286*	0.467**	0.288*	0.212 ⁺
RES		0.190*			0.157 ⁺
HC			0.121	0.120	0.109
IC			-0.294*	-0.130	-0.203
Z-Score				0.509**	0.497**
IND	9.562	13.044	8.695	3.922	8.594
SIZE	-0.719**	-0.556**	-0.599**	-0.560**	-0.360 ⁺
P_L	37.170**	36.521**	36.315**	4.177	2.490
F	8.194**	7.664**	6.536**	11.674**	10.736**
Adj R ²	0.199	0.226 ^a	0.192	0.348 ^a	0.364
Δ Adj R ²		0.027		0.156	
# Firms	137	137	137	137	137
Perf_{TSR}					
CENT	0.041	0.016	0.056	0.005	-0.014
RES		0.039			0.022
HC			0.011	-0.005	-0.002
IC			-0.034	0.009	-0.042
Z-Score				0.157	0.203 ⁺
IND	-4.059	-3.323	-5.123	-6.549	-5.116
SIZE	-0.313 ⁺	-0.279	-0.325	-0.294	-0.198
P_L	32.099**	31.999**	33.458**	23.463*	18.245
F	2.508*	2.206 ⁺	1.852 ⁺	1.914 ⁺	1.736 ⁺
Adj R ²	0.043	0.037	0.035	0.044 ^b	0.042
Δ Adj R ²				0.009	
# Firms	136	136	136	136	136

** p<0.01 level, * p<0.05 level, + p<0.10

^a R-squared change is significant at < 0.05

^b R-squared change is significant at < 0.10

Firm Size

Regressions for corporate social capital components; Controlling for Firm Size (50% split of Net Sales used for large firm/small firm) are shown in the table below.

Table 9 – Large Firms – Unstandardized Coefficients

	Model 1	Model 2	Model 3	Model 4	Model 5
Perf_{ROI}					
CENT	0.029	0.010	-0.155	-0.206*	-0.167
RES		0.062			-0.120
HC			0.039	0.007	0.009
IC			0.296*	0.417**	0.415**
Z-Score				0.420**	0.475**
IND	16.366*	15.831*	17.422**	8.665	8.367
P_L	66.520**	67.883**	65.459**	45.202**	39.762**
F	18.420**	13.800**	12.854**	18.815**	16.287**
Adj R ²	0.417	0.412	0.445 ^b	0.591 ^a	0.594
Δ Adj R ²			0.033	0.146	
# Firms	74	74	74	74	74
Perf_{RobinsQ}					
CENT	0.091	-0.108	0.306	0.010	-0.045
RES		0.562**			0.162
HC			-0.039	0.033	0.026
IC			-0.350	0.066	0.072
Z-Score				1.114**	1.030**
IND	31.547**	28.695**	27.322*	10.083	11.330 ⁺
P_L	26.307*	38.478**	29.645*	-33.687**	-25.745*
F	4.049*	7.564**	2.673*	27.071**	22.940**
Adj R ²	0.120	0.282 ^a	0.110	0.697 ^a	0.696
Δ Adj R ²				0.587	
# Firms	68	68	68	68	68
Perf_{TSR}					
CENT	-0.269*	-0.327**	-0.381*	-0.390*	-0.468**
RES		0.167			0.182
HC			0.079	0.072	0.063
IC			0.133	0.154	0.182
Z-Score				0.070	-0.011
IND	-7.959	-8.712	-8.140	-9.339	-7.961
P_L	6.655	10.332	4.408	1.041	9.251
F	2.714 ⁺	2.545*	1.957 ⁺	1.668	1.691
Adj R ²	0.069 ^a	0.082	0.064	0.054	0.066
Δ Adj R ²					
# Firms	70	70	70	70	70

** p< 0.01 level, * p< 0.05 level, + p<0.10

^a R-squared change is significant at < 0.05

^b R-squared change is significant at < 0.10

Table 10 – Small Firms – Unstandardized Coefficients

	Model 1	Model 2	Model 3	Model 4	Model 5
Perf_{ROI}					
CENT	0.204**	0.235**	0.177	0.043	0.064
RES		-0.077			-0.090
HC			0.102	0.079	0.094
IC			-0.015	0.101	0.117
Z-Score				0.331**	0.339**
IND	-2.702	-5.732	-1.769	-2.009	-5.653
P_L	70.606**	69.954**	70.747**	51.119**	49.926**
F	30.968**	23.613**	19.103**	22.896**	19.193**
Adj R ²	0.569	0.571	0.560	0.649 ^a	0.652
Δ Adj R ²				0.089	
# Firms	69	69	69	69	69
Perf_{TobinsQ}					
CENT	0.271 ⁺	0.213	0.356*	0.312*	0.272
RES		0.145			0.167
HC			0.211	0.204	0.192
IC			-0.510**	-0.472**	-0.528**
Z-Score				0.110	0.134
IND	-4.343	1.323	2.761	2.682	10.708
P_L	12.113	13.332	17.883	11.376	10.818
F	1.494	1.588	2.868*	2.500*	2.665*
Adj R ²	0.021	0.033	0.116 ^a	0.113	0.146 ^a
Δ Adj R ²			0.083		0.033
# Firms	69	69	69	69	69
Perf_{TSR}					
CENT	0.177	0.159	0.222	0.134	0.133
RES		0.045			0.042
HC			0.022	0.001	0.032
IC			-0.241	-0.170	-0.231
Z-Score				0.214	0.309 ⁺
IND	5.220	6.914	8.003	8.264	11.595
P_L	36.551*	36.968*	39.821*	26.854	21.124
F	2.746 ⁺	2.057 ⁺	1.859	1.829	1.959 ⁺
Adj R ²	0.075	0.061	0.059	0.068	0.094 ^b
Δ Adj R ²					0.026
# Firms	66	66	66	66	66

** p< 0.01 level, * p< 0.05 level, + p<0.10

^aR-squared change is significant at < 0.05

^bR-squared change is significant at < 0.10

Profit and Loss making firms

Regressions for corporate social capital components; Controlling for firm profit or loss position.

Table 11 – Profitable Firms – Unstandardized Coefficients

	Model 1	Model 2	Model 3	Model 4	Model 5
Perf_{ROI}					
CENT	-0.121	-0.208**	-0.200*	-0.284**	-0.292**
RES		0.150			0.019
HC			0.029	-0.055	-0.057
IC			0.225	0.257 ⁺	0.255 ⁺
Z-Score				0.419**	0.410**
IND	30.815**	31.493**	27.136**	22.750**	23.204**
SIZE	0.517**	0.640**	0.328*	0.547**	0.563**
F	6.180**	5.431**	4.245**	8.570**	7.163**
Adj R ²	0.164	0.183	0.169	0.362 ^a	0.353
Δ Adj R ²				0.193	
# Firms	80	80	80	80	80
Perf_{TobinsQ}					
CENT	0.393**	0.151	0.360*	0.068	0.009
RES		0.410**			0.160 ⁺
HC			0.190	0.009	-0.001
IC			-0.091	0.100	0.039
Z-Score				1.173**	1.124**
IND	12.262	15.117	8.361	-0.910	1.583
SIZE	-0.680**	-0.343	-0.760**	-0.256	-0.092
F	6.389**	7.197**	3.897**	34.554**	29.501**
Adj R ²	0.181	0.253 ^a	0.164	0.731 ^a	0.732
Δ Adj R ²		0.072		0.567	
# Firms	80	80	80	80	80
Perf_{TSR}					
CENT	-0.069	-0.124	-0.187	-0.179	-0.204
RES		0.086			0.047
HC			0.015	-0.007	-0.013
IC			0.359 ⁺	0.355	0.356 ⁺
Z-Score				-0.038 ⁺	-0.059
IND	-16.889 ⁺	-16.078 ⁺	-20.765*	-20.511*	-19.106 ⁺
SIZE	-0.586**	-0.509**	-0.833**	-0.854**	-0.811**
F	7.231**	5.507**	5.323**	4.394**	3.725**
Adj R ²	0.200	0.194	0.221	0.211	0.203
Δ Adj R ²					
# Firms	76	76	76	76	76

** p< 0.01 level, * p< 0.05 level, ⁺ p<0.10

^a R-squared change is significant at < 0.05

^b R-squared change is significant at < 0.10

Table 12 – Loss Making Firms – Unstandardized Coefficients

	Model 1	Model 2	Model 3	Model 4	Model 5
Perf_{ROI}					
CENT	0.114	0.136	0.146	-0.009	0.001
RES		-0.031			-0.031
HC			0.091	0.132	0.141
IC			-0.167	-0.019	-0.024
Z-Score				0.400**	0.418**
IND	4.138	2.885	4.498	5.229	4.510
SIZE	0.144	0.116	0.212	0.172	0.164
F	2.139	1.621	1.925	7.946**	6.470**
Adj R ²	0.052	0.039	0.066	0.391 ^a	0.382
Δ Adj R ²				0.325	
# Firms	63	63	63	63	63
Perf_{TobinsQ}					
CENT	0.434*	0.391 ⁺	0.539**	0.508*	0.455**
RES		0.060			0.099
HC			0.039	0.047	0.046
IC			-0.381*	-0.351*	-0.412**
Z-Score				0.079	0.089
IND	5.874	8.277	5.366	5.511	10.659
SIZE	-0.757**	-0.704*	-0.564*	-0.572*	-0.448
F	4.056**	3.073**	4.036**	3.399**	2.921**
Adj R ²	0.129	0.118	0.189 ^a	0.181	0.178
Δ Adj R ²			0.071		
# Firms	63	63	63	63	63
Perf_{TSR}					
CENT	0.296	0.306	0.333	0.247	0.223
RES		-0.014			-0.011
HC			0.105	0.121	0.155
IC			-0.190	-0.123	-0.208
Z-Score				0.201	0.301 ⁺
IND	-4.906	-5.471	-6.352	-5.507	-2.867
SIZE	-0.274	-0.286	-0.236	-0.238	-0.124
F	0.450	0.301	0.441	0.590	0.805
Adj R ²	-0.031	-0.050	-0.047	-0.041	-0.024 ^b
Δ Adj R ²					0.017
# Firms	63	63	63	63	63

** p< 0.01 level, * p< 0.05 level, + p<0.10

^a R-squared change is significant at < 0.05

^b R-squared change is significant at < 0.10

Software and Non-software firms

Regressions for corporate social capital components; Controlling for industry subsector;

Table 13 – Software Firms – Unstandardized Coefficients

	Model 1	Model 2	Model 3	Model 4	Model 5
Perf_{ROI}					
CENT	0.011	-0.014	0.011	-0.087	-0.094
RES		0.035			-0.005
HC			0.112	0.043	0.041
IC			-0.089	0.053	0.054
Z-Score				0.369**	0.381**
SIZE	0.338**	0.372**	0.325*	0.318*	0.334**
P_L	62.782**	62.205**	62.141**	39.049**	37.830**
F	76.815**	57.211**	47.951**	56.483**	45.992**
Adj R ²	0.712	0.710	0.712	0.778 ^a	0.774
Δ Adj R ²				0.066	
# Firms	93	93	93	93	93
Perf_{TobinsO}					
CENT	0.379**	0.260 ⁺	0.387**	0.295*	0.216
RES		0.169 ⁺			0.152
HC			0.295 ⁺	0.229	0.190
IC			-0.303*	-0.171	-0.247
Z-Score				0.351**	0.359**
SIZE	-0.551**	-0.388 ⁺	-0.538*	-0.543*	-0.314
P_L	31.199**	28.662*	30.694**	8.891	4.554
F	4.117**	3.889**	3.902**	5.283**	5.013**
Adj R ²	0.093	0.113 ^b	0.134 ^b	0.215 ^a	0.236
Δ Adj R ²		0.020	0.021	0.081	
# Firms	92	92	92	92	92
Perf_{TSR}					
CENT	0.121	0.061	0.169	0.187	0.053
RES		0.080			0.081
HC			-0.009	0.205	-0.065
IC			-0.120	0.197	-0.129
Z-Score				0.145	0.244
SIZE	-0.482 ⁺	-0.401	-0.448	-0.433	-0.233
P_L	39.583**	38.366**	41.580**	29.938*	21.150
F	3.012*	2.353 ⁺	2.098 ⁺	2.009 ⁺	1.919 ⁺
Adj R ²	0.065	0.059	0.058	0.145	0.069
Δ Adj R ²					
# Firms	88	88	88	88	88

** p< 0.01 level, * p< 0.05 level, + p<0.10

^aR-squared change is significant at < 0.05

^bR-squared change is significant at < 0.10

Table 14 – Non-Software Firms – Unstandardized Coefficients

	Model 1	Model 2	Model 3	Model 4	Model 5
Perf_{ROI}					
CENT	-0.154	-0.183	-0.213	-0.352	-0.331*
RES		0.059			-0.052
HC			0.014	0.028	0.027
IC			0.171	0.176	0.185
Z-Score				0.444**	0.453**
SIZE	0.402*	0.440*	0.277	0.501**	0.465*
P_L	46.654**	48.441**	49.304**	23.633*	21.762+
F	21.227**	15.696**	12.964**	20.487**	16.662**
Adj R ²	0.553	0.545	0.545	0.700 ^a	0.691
Δ Adj R ²				0.155	
# Firms	50	50	50	50	50
Perf_{TobinsQ}					
CENT	0.426*	0.263	0.592*	0.186	0.092
RES		0.327			0.224
HC			-0.087	0.085	0.093
IC			-0.293	-0.126	-0.160
Z-Score				0.839**	0.793**
SIZE	-0.957**	-0.750*	-0.805*	-0.513*	-0.361
P_L	47.686*	57.258**	51.098*	-2.028	5.840
F	3.959*	3.661*	2.803*	8.818**	6.833**
Adj R ²	0.168	0.195	0.167	0.504 ^a	0.481
Δ Adj R ²				0.337	
# Firms	45	45	45	45	45
Perf_{TSR}					
CENT	-0.083	0.015	-0.158	-0.192	-0.099
RES		-0.205			-0.262
HC			0.049	0.049	0.038
IC			0.168	0.166	0.246
Z-Score				0.126	0.140
SIZE	-0.060	-0.184	-0.174	-0.114	-0.310
P_L	17.440	11.350	18.838	11.541	3.650
F	0.486	0.656	0.466	0.486	0.645
Adj R ²	-0.034	-0.030	-0.059	-0.069	-0.056
Δ Adj R ²					
# Firms	48	48	48	48	48

** p < 0.01 level, * p < 0.05 level, + p < 0.10

^a R-squared change is significant at < 0.05

^b R-squared change is significant at < 0.1

Table 15 – Bivariate Correlations

Correlations

		ROI	TobinsQ	TSR	CENT	RES	HC	IC	EC	ZSCORE
ROI	Pearson Correlation	1	.204*	.258**	.392**	.423**	.477**	.459**	.407**	.707**
	Sig. (2-tailed)		.013	.002	.000	.000	.000	.000	.000	.000
	N	154	148	143	154	148	149	154	154	151
TobinsQ	Pearson Correlation	.204*	1	.226**	.013	-.075	.021	-.174*	.071	.424**
	Sig. (2-tailed)	.013		.008	.871	.374	.806	.034	.392	.000
	N	148	149	138	149	143	143	149	149	146
TSR	Pearson Correlation	.258**	.226**	1	-.031	-.013	.006	-.031	.012	.238**
	Sig. (2-tailed)	.002	.008		.707	.883	.941	.712	.884	.004
	N	143	138	145	145	141	143	145	145	141
CENT	Pearson Correlation	.392**	.013	-.031	1	.759**	.583**	.758**	.670**	.274**
	Sig. (2-tailed)	.000	.871	.707		.000	.000	.000	.000	.001
	N	154	149	145	156	150	150	156	156	152
RES	Pearson Correlation	.423**	-.075	-.013	.759**	1	.548**	.701**	.568**	.260**
	Sig. (2-tailed)	.000	.374	.883	.000		.000	.000	.000	.002
	N	148	143	141	150	150	146	150	150	146
HC	Pearson Correlation	.477**	.021	.006	.583**	.548**	1	.638**	.440**	.295**
	Sig. (2-tailed)	.000	.806	.941	.000	.000		.000	.000	.000
	N	149	143	143	150	146	150	150	150	147
IC	Pearson Correlation	.459**	-.174*	-.031	.758**	.701**	.638**	1	.657**	.187*
	Sig. (2-tailed)	.000	.034	.712	.000	.000	.000		.000	.021
	N	154	149	145	156	150	150	156	156	152
EC	Pearson Correlation	.407**	.071	.012	.670**	.568**	.440**	.657**	1	.316**
	Sig. (2-tailed)	.000	.392	.884	.000	.000	.000	.000		.000
	N	154	149	145	156	150	150	156	156	152
ZSCORE	Pearson Correlation	.707**	.424**	.238**	.274**	.260**	.295**	.187*	.316**	1
	Sig. (2-tailed)	.000	.000	.004	.001	.002	.000	.021	.000	
	N	151	146	141	152	146	147	152	152	152

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

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