

The Relationship between Intellectual Capital and Firm Performance: An Empirical Study of Thai Firms

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Abstract

The purpose of this study is to empirically investigate the relationship between 3 components of intellectual capital (IC) namely: human capital, structural capital, and relational capital, and firm performance (FP) in Thailand. In addition, this study examined the inter-relationship among main-components of IC and the moderating effect of tangible resources: physical resource and financial resource on the IC-FP relationship. In this respect, the quantitative study was conducted using data collected from 572 firms operating in Thailand across industry setting. Hypotheses were tested through multiple regression analysis. The findings revealed all three main-components of IC: human capital, structural capital, and relational capital, do have positive association with firm performance in Thailand. The result suggested that main components positively associate among each other. The evidence suggested various supports on the moderating effects of tangible resources on the IC-FP relationship. The findings of this study are consistent with previous research done in other international and industry contexts.

Keywords: Intellectual Capital, Human Capital, Tangible Resources

1. Introduction

In today's 'new economy', firms are increasingly knowledge-based, technology-based, and information-based which has changed the way businesses compete (Bontis 1999; Drucker 1993). Not only are service firms making changes, but manufacturing firms are also facing significant changes resulting from mass customization, technological change, and the entry of international competitors into their markets (Eusebio et al., 2007). In the new economy, intellectual capital is recognized as a major corporate asset capable of attaining and sustaining competitive advantage and in turn achieving superior performance (Barney, 1991; Drucker 1993). The intellectual capital as an intangible resource plays an important role in the modern management approach especially for value creation. Several researchers propose that intellectual capital is increasingly important and the main source of sustainable competitive advantage (Edvinsson and Malone, 1997; Newbert, 2007).

In 2009, the Thai government has announced that the “creative economy” will be a new direction for Thailand. The Thai government aims to generate value-added products and services based on the intention to increase Thailand’s competitiveness through its service sectors especially in tourism and cultural heritage. Thus, Thailand’s economy is moving away from being industrial to be more service industries focused. Senge (1990) stated that a shift from manufacturing to service-oriented economy should help firms thrive in the new strategic environment when they see themselves as learning organizations pursuing continuous improvement in their knowledge assets. Apart from the knowledge asset, intellectual capital has been a focal point of interest, not only from academic researchers and CEOs, but also from national policy makers.

There has been extensive research on intellectual capital has been carried out in various international settings including the USA (Stewart, 1997), the UK (Roos et al, 1997), Scandinavia (Edvinsson and Malone, 1997), Australia (Sveiby, 1997), Canada (Bontis, 1996; 1998; 1999), Austria (Bornemann, 1999), Malaysia (Bontis, Keow, and Richardson, 2000), Taiwan (Huang and Hsueh, 2007), and Jordan (Sharabati, Jawad, and Bontis, 2010). However, limited empirical research on the relationship between intellectual capital and firm performance has been conducted in Thailand. Although many empirical studies on the relationship between intangible resource and performance have been carried out, most studies have focused on a limited range of resources, small sample sizes, and single-industry focus (Carmeli and Tishler, 2004; Newbert, 2007).

Thus, this research attempts to fill this gap by generalizing the relationship between intellectual capital and firm performance of firms operating in Thailand. This research extends the components of intellectual capital by using a large sample size across various industry settings. The inter-relationships among the main components of intellectual capital are studied. The moderating effects of tangible resources, physical and financial resources are also examined. Therefore, this study attempts to answer the following research questions:

1. Is there any relationship between the main components of intellectual capital–human capital, structural capital, and relational capital-and firm performance among Thai firms?
2. Are there any inter-relationships among the main components of intellectual capital?
3. Is the relationship between intellectual capital and firm performance affected by tangible resources (physical and financial resources)?

Theoretical Framework and Research Model

The foundations of the theoretical framework of this study rest on three elements: intellectual capital concept, resource-based views of the firm, and firm performance. Drawing upon the intellectual capital concept, this study develops a conceptual model that explores the relationship between sub-components of intellectual capital and firm performance. The intellectual capital reflects strategic management research as intangible resources have been documented as

influencing factors on firm performance across industries in many international settings (Stewart, 1997; Edvinsson and Malone, 1997; Bontis, 1996; 1998; 1999; Bontis, Keow, and Richardson, 2000; Huang and Hsueh, 2007; Sharabati, Jawad, and Bontis, 2010). This study attempts in elevating intellectual capital concept for Thai business context. This study follows the diamond model of intellectual capital of Bontis (2002) as well as the terminology and category of intellectual capital.

The intellectual capital includes three main components: human capital, structural capital, and relational capital. Each component contains subcomponents as human capital encompasses employees' competences, education, attitude, and creativity. Structural capital comprises of organizational culture, structure, system and IT. Relational capital composes of corporate reputation, market orientation, customer loyalty, and partnership. In addition, this study highlights the inter-relationship among the main components of intellectual capital similar to the study done by Bontis 2002; Cabrita and Bontis, 2008). Moreover, this study introduces the moderating impact of the tangible resources on the IC-FP relationship. Thus, the research model of this study is shown in figure 1.

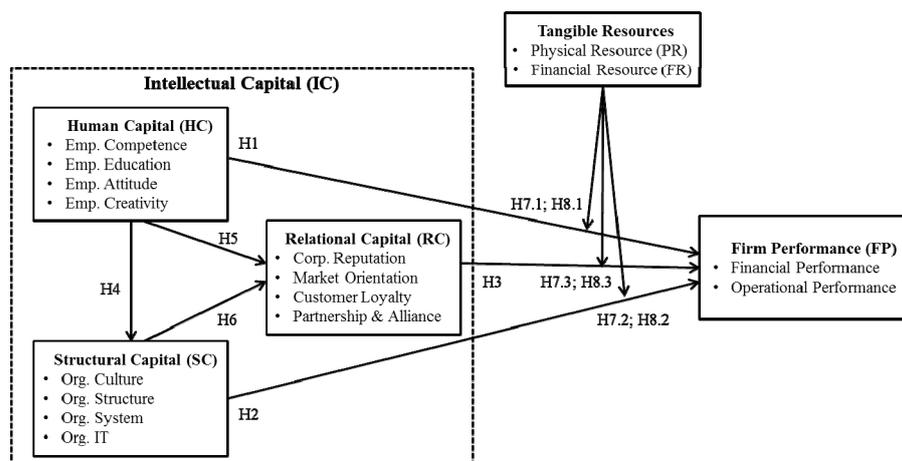


Figure 1: Research Model of this study

2. Literature Review and Hypotheses

The importance of intellectual capital has been extensively recognized. Intellectual capital has been gaining attention not only by academics and practitioners (Petty and Guthrie, 2000) but also government entities (MERITUM, 2002). Intellectual capital helps organizations to make better use of firms' resources that have become an increasingly important source of future earnings and company value. Intellectual capital is a strategic intangible asset that can be a firms' source of competitive advantage to engender economic wealth (Stewart, 1997). The notion of intellectual capital is linked to the ability to create and apply the organization's knowledge (Cabrita and Bontis, 2008). Intellectual capital creates and supports connectivity between resources inside and

outside the organization and also interacts and complements among them in order to generate value.

In this study, intellectual capital is defined as “non-financial assets without physical substance that are held for use in production of goods or services which are owned and controlled by the firm as a result of past event, and from which future economic benefits are expected to flow”. This study follows terminology and category of intellectual capital introduced used by Bontis (2002). Thus, the intellectual capital of this study is comprised of three components namely human capital, structural capital, and relational capital (Figure 2).

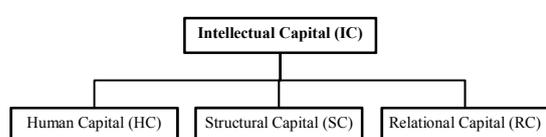


Figure 2: Bontis (2002) Components of IC

Human Capital (HC)

Human capital is a fundamental element of intellectual capital and considerably important to success in the knowledge economy (Bontis and Fitz-enz, 2002). Human capital has been accepted in the RBV literature as a critical resource of the firm and considered to be the most important source of sustainable competitive advantage (Barney, 1991; Grant, 1991; Edvinsson and Malone, 1997; Sveiby, 1997; Bontis, 1999; Seleim, Ashour, and Bontis, 2004). Human capital is the core resource and competence for obtaining competitive advantage in organizations as they are difficult to imitate due to (1) firm-specific or idiosyncratic knowledge and skills, (2) causal ambiguity, and (3) high levels of stock of resources (Barney, 1991; Dierickx and Cool, 1989). In this study, human capital is defined as “the individual knowledge stock of an organization” (Roos et al., 1997) comprising of 4 sub-components: (1) employees’ competence, (2) employees’ education, (3) employees’ attitude, and (4) employees’ creativity.

The impact of human capital on firm performance has been widely analyzed under the assumption that human capital allows the firm to have better capacity to organize and make efficient decision. Kaplan and Norton (1996) asserted that talented employees may facilitate the organization in improving their business processes for better strategic and operational effectiveness. Human capital has been found to be a positive impact on firm performance. Competitive advantage is based on people not on its products (Rudolf, 2004, p. 49). The employees’ competence generates value through knowledge, skills, abilities, talent, and know-how. An organization that invests in its employees’ skills will outperform competitors that do not invest sufficiently (Baird, 2004). The level of education of the firm’s employees is potentially a better

proxy of human resources. Firms should attract qualified employees and manage professional intellect (Quinn, Anderson and Finkelstein, 1996).

Employees' attitude represents viewpoints and perceptions of employees toward their jobs, careers and organization generated by the behavior of the employees in the workplace. Employee attitude can be satisfaction, commitment, ownership, motivation and engagement. Creativity has been defined as "the production of novel, useful ideas or problem solutions" (Amabile et al., 2005, p.368). Creativity encourages innovation as an organization focuses on generating creative ideas. Such organization then will produce innovation, which enhances sustainability in competition and also help create wealth. Innovative and creative ideas of individuals can create value to the firm. Therefore, individuals' characteristics as collective entity provide organization the ability to adapt, create or improve services and products, make better decisions, and so on.

Hence, human capital has been identified as the most important intangible resource for explaining firm performance variance. It is important to analyze how the causal relationship between human capital and firm performance in Thailand. Thus, the first hypothesis of this study is:

H1: A positive association exists between human capital and firm performance.

Structural Capital (SC)

Structural capital is central to the firm's resources because it enables employees to work together for the benefit of the firm. Structural capital is the supportive infrastructure that enables employees (human resources) to function. The RBV literature asserts that structural resources of a firm enable it to assemble, integrate, combine and deploy resources to fulfill its objectives (Grant, 1991; Amit and Schoemaker, 1993; Bharadwaj, 2000; Fahy, 2000; Russo and Fouts, 1997). Structural resources are difficult to duplicate because of their asset specificity and time compression diseconomies (Dierickx and Cool, 1989). In this study, structural capital is defined as "everything that gets left behind at the office when employees go home" (Bontis, 2001) comprising of 4 sub-components: (1) organizational culture, (2) organizational structure, (3) organizational system, and (4) organizational information technology.

Structural capital is a supportive mechanism of the company. Organizational culture is crucially important to success of a firm (Barney, 1986; Reed and DeFillippi, 1990) because it unifies value and behavior of a firm. Corporate culture is a bonding mechanism that holds together the firm. Organizational structure is value as it shapes the blueprint of the business which refers to the operating and reporting structure of the firm (Barney, 1991) which includes authority, role and task definitions and accountability (Galbraith, 2000). Organizational structure includes organizational design and development. Organizational structure is a set of means and processes devoted to

the formal organization of the firm (CIC, 2003). Organizational system is a combination of activities that make up organizational operations. The main tasks of organizational system are coordination and integration, learning, and reconfiguration (Teece et al., 1997). IT infrastructure is a combination of knowledge, methods, and technique which organization incorporates into its processes to make them more efficient and effective.

Structural capital has been identified as the most important intangible resource for explaining firm performance variance. It is important to analyze how the causal relationship between structural capital and firm performance in Thailand. Thus, the following hypotheses are proposed:

H2: A positive association exists between structural capital and firm performance.

Relational Capital (RC)

Relational capital is factors that relates to the firm with its outside stakeholders which can also be embedded in relationships with customers, suppliers, industry associations or any other stakeholders that influence the organisation's life. Ittner et al. (2003) found a positive but non-linear relationship between measures of customer satisfaction and financial performance. Barth and Clinch (1998) and Seethamraju (2003) reported that brands have significant correlations with the firm's market values. Nagar and Rajan (2005) pointed out that today intangibles, such as customer relationships, account for more than one half of total assets of firms in the USA. In this study, relational capital is defined as "firm's relations to its stakeholders" comprising of 4 sub-components: (1) corporate reputation, (2) market orientation, (3) customer loyalty, and (4) partnership among stakeholders.

Reputation is the perception that describes the firm's overall appeal by other stakeholders resulting from its past actions and future prospects (Fombrun, 1996:72). Corporate reputation has a direct effect on firm performance; but also has indirect effects through the firm's ability to form alliances and exploit networking association (Stuart, Hoang, and Hybels, 1999; Podolny, 1993). Next, market orientation can be an important determinant of business performance because market-oriented firms can better satisfy customers and reach superior financial performance (Kohli and Jaworski, 1990). Market orientation is defined as the organization-wide generation, dissemination and responsiveness to market intelligence pertaining to the current and future needs of customers (Kohli and Jaworski, 1990).

Moreover, customer loyalty is important for firm success and consists of two sub-dimensions: (1) attitude, a desire to continue a relationship with the company, and (2) behavior, a repeat patronage (Ball et al., 2004). Harrison-Walker (2001) found a positive relationship between market orientation and customer retention, customer willingness to pay a price premium, customer propensity to spread positive word-of-mouth communication and customer propensity not to switch to brands/service providers. In addition, partnership is defined as a relationship that attempts to

build interdependence, enhance coordination, improve the market position focus (by broadening or deepening), or to achieve other shared goals; and sharing benefits and burdens over an agreed time horizon (Cooper and Gardner, 1993). Business alliances through partnership can improve performance as partnering with other firms with technical knowledge or expertise may allow the organization to leverage their skills and increase their competitiveness (Tsai and Wang, 2008).

Relational capital (RC) has been identified as the most important intangible resource for explaining firm performance variance. It is therefore important to analyze the causal relationship between relational capital and firm performance in Thailand. Thus, the following hypotheses are proposed:

H3: A positive association exists between relational capital and firm performance.

Inter-relationship among Components of IC

Previous studies have indicated that the inter-relationships between main components of intellectual capital do exist (Bontis, 1998; Bontis et al., 2000; Carbrita and Bontis, 2008; Chen et al., 2005; Huang and Hsueh, 2007; Tovstiga and Tulugurova, 2007). Bontis (1998) tested the inter-relationship among the components of intellectual capital with the MBA students in Canada and found that human capital is found to be positively associated with structural and relational capital; and the structural capital does have positive association with relational capital. Wang and Chang (2005) found a cause-effect relationship among the components of intellectual capital and their effects on firm performance in the information industry in Taiwan. Similarly, Huang and Hsueh (2007) investigated the inter-relationship among components of intellectual capital in Taiwan's engineering consulting firms and found that human capital has significant and positive correlation with both structural capital and relationship capital. These studies found that human capital is a source of other dimensions as human capital is found to have no direct effect on firm performance.

Cabrita and Bontis (2008) examined the inter-relationships among intellectual capital components and business performance in the Portuguese banking industry. The result of this study also indicated that human capital also influences business performance indirectly through structural capital and relational capital. The results of their study show a confirmation of previous studies that all three constructs: human capital, structural capital, and relational capital indeed affect one another. The inter-relationship between the components of intellectual capital has been studied in various international settings including Canada (Bontis, 1998), Taiwan (Huang and Hsueh, 2007), Portuguese (Cabrita and Bontis, 2008), and Jordan (Sharabati et al., 2010).

Hence, a series of hypotheses are posited to test the inter-relationship between main components of intellectual capital in Thai firms as follows:

H4: Human capital (HC) is positively associated with relational capital (RC)

H5: Human capital (HC) is positively associated with structural capital (SC)

H6: Structural capital (SC) is positively associated with relational capital (RC)

Tangible Resources

Tangible resources are defined as those factors that have physical properties, can be observed in a company's financial statement, and owned and controlled by the firm. Tangible resources are the firm's basic factor stocks (Amit and Schoemaker, 1993). Limited studies have examined tangible resources as a moderator on the intellectual capital-firm performance relationship. Although tangible resources are claimed not to be sources of competitive advantage or value creation in the new economy, tangible resources hold value and been accepted by the traditional accounting method. Thus, this study asserted that tangible resources-physical resources and financial resources-moderate the relationship between intellectual capital and firm performance in Thailand.

Physical Resources

Physical resources include a company's land, including the geographical location, infrastructure assets such as buildings, information and communication technology, physical networks and other equipment, as well as access to raw materials, energy and other important inputs (Barney, 1997; Faulkner and Bowman, 1992). Physical resources are used in the production of goods and services, and superior physical resources allow the firm to produce goods or services more effectively than their competition. Schroeder et al. (2002) asserted that physical can be source of competitive advantage in manufacturing firms as they found a cause-effect relationship between proprietary processes and equipment and performance in their study. Hence, the following hypotheses are posited to test the moderating effect of physical resource on the relationship between the main components of intellectual capital and firm performance in Thai firms:

H7.1: Physical resources moderate the relationship between human capital and firm performance.

H7.2: Physical resources moderate the relationship between structural capital and firm performance.

H7.3: Physical resources moderate the relationship between relational capital and firm performance.

Financial Resources

Financial resources can be a source of company's competitive advantage as they allow the firm to capitalize on market opportunities and thus enhance the strategic position (Barney, 1997). Financial resources are the firm's assets with financial properties which can be represented by an accounting-based monetary value and captured on the firm's financial statement including cash, capital, debt, equity and retained earnings. Financial resources enhance the firm's ability to expand into new markets, develop new product or service initiatives (Aaby and Slater, 1989; Bonaccorsi, 1992). Hence, the following hypotheses are posited to test the moderating effect of financial resource on the relationship between the main components of intellectual capital and firm performance in Thai firms:

H8.1: Financial resources moderate the relationship between human capital and firm performance.

H8.2: Financial resources moderate the relationship between structural capital and firm performance.

H8.3: Financial resources moderate the relationship between relational capital and firm performance.

3. Research Methodology

This study used a survey questionnaire as the instrument to obtain responses related to attitudes of respondents. The use of perceptual measurement technique is often used to examine organizational factors that contribute to organizational performance (Sharabati et al., 2010). The survey instrument was developed with measurement items adapted from previous research (Bontis, 1998; Bontis, 2001; Cabrita and Bontis, 2008; Maditinos et al., 2009; Chudhury, 2010; Surroca, et al., 2010; Carmeli and Tisherler, 2004; Sharabati, et al., 2010). The translation and back-translation protocol was done between Thai and English. The questionnaire was reviewed by faculty members of the Department of Management of the University of Nebraska-Lincoln and Bangkok University, Thailand. The questionnaire was pre-tested by a convenient sample of 63 mid-level managers of firms in various industry sectors in Thailand. In addition, face-to-face interviews with 3 respondents from each industry sector including manufacturing, service, and trading were conducted to evaluate the pilot questionnaire item-by-item for both the Thai and English versions. Due to the length of the questionnaire, some excess and redundant items in certain constructs were eliminated; thus, the final questionnaire contains 82 items. The firm performance construct contained 10 items.

Firm Performance (DV)

The dependent variable of this research is firm performance measured by using a set of perceptual self-report data. Prior research has indicated that subjective measures of performance can be consistent with objective measures (Dess and Robinson, 1984; Bontis et al., 2002). Firm performance is defined as a multidimensional construct including financial, market, operational, and customer-related performance domains (Chakravarthy, 1986; Venkatraman and Ramanujam, 1987). In this study, firm performance contains 10 self-report items: (1) sales growth, (2) profit growth, (3) overall business performance, (4) new product or new service launch, (5) cost reduction, (6) quality improvement, (7) new market penetration, (8) new customer attainment, (9) customer satisfaction improvement, and (10) customer retention improvement.

Respondents were asked to evaluate performance improvement of their own firm in comparison with its target or expectation over the past three years. The three years time frame is applied as it reflects the sustainability of competitive advantage and represents a long-term period (Robbins and Coulter, 2005). All measurement items of firm performance were based on 5-point Likert scales, ranging from 1 (much lower) to 5 (much higher).

Human Capital (IV)

Human capital is a set of values, attitudes, aptitudes and capacities of employees with which they can generate the firm's value (Bontis et al., 2000). Operationalization of human capital consisted of 24 items that capture dimensions of 4 sub-variables namely: (1) employees' competence (6 items), (2) employees' education (6 items), (3) employees' attitude (6 items), and (4) employees' creativity (6 items). The human capital measures were adapted from various previous studies (Bontis, 1998; Carmeli and Tishler, 2004; Jardon and Martos, 2009; Choudhury, 2010; Sharabati et al., 2010).

All measurement items of human capital were based on 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree). Example of these items are: (1) employees' competence: "Our employees have enough knowledge and skills to finish their own job"; (2) employees' education: "Our employees have suitable education to fulfill their duties"; (3) employees' attitude: "Our employees hold a high sense of responsibility to the organization"; and (4) employees' creativity: "Our employees are considered creative, innovative, and bright".

Structural Capital (IV)

Structural capital refers to infrastructure of the organization which "remains in the company when employees go home for the night" (Roos et al., 1997, p.42). Operationalization of structural capital consists of 24 items that capture dimensions of four sub-variables namely: (1) organizational culture (6 items), (2) organizational structure (6 items), (3) organizational systems (6 items), and (4)

organizational IT infrastructure (6 items). The structural capital measure was adapted from various previous studies (Bontis, 1998; Carmeli and Tishler, 2004; Jardon and Martos, 2009; Choudhury, 2010; Sharabati et al., 2010).

All measurement items of structural capital were based on 5-point Likert scales, ranging from 1 (strongly disagree) to 5 (strongly agree). These items include: (1) organizational culture: “Our company has clear vision, mission, core values, and objectives”; (2) organizational structure: “Our company adapts its structure and the way it functions to changes in the external environment”; (3) organizational systems: “Our company has a well-developed reward system related to performance”; and (4) organizational IT infrastructure: “Our company has an IT system for reporting timely business performance”.

Relational Capital (IV)

Relational capital refers to the firm’s relations to its stakeholders including corporate reputation, market orientation, and partnership and collaboration among stakeholders. Operationalization of relational capital consists of 24 items that capture dimensions of three sub-variables namely: (1) corporate reputation (6 items), (2) market orientation (6 items), (3) customer loyalty (6 items) and (4) partnership (6 items). The relational capital measures were adapted from various previous studies (Fombrum and Shanley, 1990; Bontis, 1998; Carmeli and Tishler, 2004; Jardon and Martos, 2009; Morgan et al., 2004; Choudhury, 2010; Sharabati et al., 2010).

All measurement items of relational capital were based on 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree). Example of these items are: (1) corporate reputation: “Our company has the credibility and reputation in term of high quality of products or services offered”; (2) market orientation: “If a major competitor were to launch an intensive campaign targeted at our customers, we would implement an immediate response”; (3) customer loyalty: “our customers usually repeated their purchase in our products or services”; and (4) partnership: “Our company is able to learn and add value through our partners”.

Physical Resources (MV)

Physical resources are firm’s assets that contain physical properties, which can be represented by an accounting-based monetary value and captured on the firm’s financial statement. Physical resource is measured by using the secondary data from the firm’s financial balance sheet through the amount of total assets (Barney, 1997).

Financial Resources (MV)

Financial resources are the firm's assets with financial properties, which can be represented by an accounting-based monetary value and captured on the firm's financial statement including cash, capital, debt, equity and retained earnings. Financial resource is measured by using the secondary data from the firm's financial balance sheet to calculate the leverage ratio-total debt divided by total equity (Waddock and Graves, 1997).

Data Collection and Analysis

The target population of this research is for-profit business firms operating in Thailand across industries. Another criterion for sample selection in this study is firm age; so, only firms that had been in business for at least three years were included. Previous resources-based research used three years of firm age to approximate the sustainability of firm success (Hall, 1992; Spanos and Lioukas, 2001; Galbreath, 2005). Based on the 2009 business database of the Thai Ministry of Commerce, there were a total of 562,816 firms. The required sample size of this study is at least 400 based on the Taro Yamane sampling table at the 95% confident level. With an anticipation of a response rate of at least 8%, 4,800 firms were randomly selected across industries.

Data gathering process took about a month during mid-February until mid-March, 2011. The questionnaire package including a cover letter, the questionnaire, and a prepaid return envelope was mailed to 4,800 firms in the sampling frame. The target respondents of this study were the company's Chief Executive Officer and Managing Director as they are the most knowledgeable about their firms.

4. Results

By the end of the data-gathering period, 591 companies were completed and returned. Of the 591 responses, 19 were ineligible and excluded from the analysis because they did not meet the minimum requirement of 3 years operations, were not for-profit organizations, or the respondent failed to complete more than 10 items or the section on firm performance. The usable surveys for data analysis were 572 surveys giving an effective response rate of 12.67 percent after adjusting for wrong address (4,513 usable sample after deducted 287 returned as "unknown address"). Some blank information pertaining to company profiles was found in secondary sources from business online database (www.bol.co.th) and the Stock Exchange of Thailand (www.set.or.th). Several statistical tests were carried out to analyze data by using statistical program SPSS V.17.0.

Nonresponse Bias

To test for the existence of nonresponse bias (Armstrong and Overton, 1977), two key demographic variables; namely, firm size (number of employees) and firm age (number of years in operation) of 420 early respondents were compared with 152 late respondents by using Levene's test for equality of variance and t-test for equality of Means. The results show that there is no significant difference in firm age ($t = .291, p = .771$) and firm size ($t = -.520, p = .604$) between early and late respondents. Hence, there is unlikely to be any nonresponse bias.

Common Method Bias

Harman's one-factor test is used to test the presence of common method effect (Podsakoff and Organ, 1986). After entering all items of the independent variables and the dependent variable into factor analysis, un-rotated principal component, the result shows: (1) more than one factor emerged and (2) the general factor accounts for only 35.716 percent of total explained variance. Hence, there is unlikely to be any common method bias.

Demographic Data of Firms and Respondents

General information about demographic characteristics of firms including firm age, firm size, sales turnover, and registered capital; and respondents including age, experience, and service years with the company are shown in Table 1.

Table 1: Demographic Data of firms and respondents

	Valid	Missing	Mean	Median	Std. Deviation	Minimum	Maximum
Firm age	557	15	21.50	18.00	16.00	4.00	135.00
Firm size	523	49	434.89	50.00	2,356.07	2.00	30,000.00
Sales Turnover	528	44	1,556.61	172.26	13,200.28	1.00	274,324.00
Register Capital	523	49	389.64	5.00	3,259.82	.03	57,664.10
Respondent Age	481	91	41.10	40.00	10.30	21	75
Work Experience	517	55	17.89	17.00	9.69	1	50
Service Years	516	56	10.99	10.00	7.81	1	50

Construct Reliability and Validity

Construct reliability tests the degree to which individual items used in a construct are consistent in their measurements (Nunnally, 1978). Construct reliability was measured using Cronbach's Alpha coefficient. The result (Table 2) shows that Cronbach's Alpha coefficient of all variables exceeding the minimum threshold of .70 (Nunnally, 1978). Thus, the reliability of constructs of this study is acceptable.

Convergent validity refers to the degree to which a measure is correlated with other measures that it is theoretically predicted to correlate with (Carmines and Zeller, 1979). Discriminant validity refers to the degree to which the operationalization of a variable does not correlate with the operationalization of another variable that it theoretically should not be correlated with (Churchill, 1979). Factor analysis is a statistical method for testing convergent validity and discriminant validity. All items of intellectual capital are put in principal component factor analysis with VARIMAX rotation. Items were not retained and dropped from the analysis because they did not load on any factor with a value of 0.45 or greater (Hair et al., 1987), or loaded on the wrong factor, or had cross-loadings on two factors.

Thus, some items were dropped from the analysis, as the factor score of these variables did not pass the construct validity. The factor analysis result (Table 2) indicates that the factor score of sub-components of intellectual capital are found to have higher loadings with their corresponding factors in comparison to their cross-loadings; thus, the evidence suggests convergent validity and discriminant validity are acceptable.

Table 2: Analysis for Construct Reliability, Construct Validity, and its Correlation

Variables	Items	Mean	S.D.	Reliability	Validity		Correlation Matrix (Listwise N = 514)				
				Alpha	Eigen Value	%VE	FP	HC	SC	RC	
DV: Firm Performance	10	3.575	0.572	0.890	5.036	50.359	-				
IV: Human Capital	18	3.467	0.599	0.943	9.209	51.163	0.492**	-			
IV: Structural Capital	12	3.523	0.712	0.910	6.066	50.549	0.520**	0.660**	-		
IV: Relational Capital	16	3.241	0.740	0.935	8.105	50.657	0.603**	0.600**	0.697**	-	

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

Correlations between Key Measures

Pearson correlations were calculated to provide a general overview of the relationship between the research variables. Table 2 represents a correlation matrix across all variables with statistically significant ($p < 0.01$). As seen from the correlation matrix, there are positive correlations between all three components of intellectual capital and firm performance. The highest positive correlation exists between relational capital and firm performance ($r = 0.603$, $p < 0.01$). In addition, there are positive correlations among the three components of intellectual capital as shown in Table 2. The correlation coefficients among the main-components of IC exceed 0.60 showing a strong level of correlation. The highest positive correlation exists between structural capital and relational capital ($r = 0.697$, $p < 0.01$).

Hypotheses Testing

The first research question of this study investigates the relationship between three main-components of intellectual capital and business performance of Thai firms. The multiple regression analysis was conducted to investigate the relationship between the main-components-human capital, structural capital, and relational capital--of intellectual capital and firm performance. The three main-components of intellectual capital were entered simultaneously into the analysis. The result from multiple regression analysis (Table 3) shows that a significant model emerged ($F_{3,514} = 111.720$, $p < 0.001$) suggesting that main-components of intellectual capital are positively associated with firm performance in Thai firms. The adjusted R^2 indicates that main-components of intellectual capital together explain 39.3 percent of the variation of firm performance. The results from the multiple regression analysis suggest that all three main-components of intellectual capital have positively and significantly association with firm performance with $\beta_{HC} = 0.157$ ($p < 0.01$); $\beta_{SC} = 0.120$ ($p < 0.05$); $\beta_{RC} = 0.425$ ($p < 0.001$). Hence, H1, H2, and H3 are supported.

The second research question of this research studies the inter-relationship between each main component of intellectual capital in Thai firms. Two models were examined. First, the relationship between human capital and structural capital was test by using regression analysis. The results (Table 3) shows that a significant model emerged ($F_{1,546} = 422.792$, $p < 0.001$), suggesting that human capital has a positive and significant association with structural capital. The adjusted R^2 indicates that human capital explains only 43.6 percent of the variation of structural capital. Human capital is significantly and positively associated with structural capital with beta coefficient of 0.661 ($p < 0.001$); hence, H4 is supported.

The second model used the multiple regression analysis to test the impact of structural capital and relational capital on firm performance. The results from multiple regression analysis (Table 3) showed that a significant model emerged ($F_{2,522} = 289.281$, $p < 0.001$) suggesting that relational capital has a positive and significant association with both human capital and structural capital. The adjusted R^2 indicates that the two predictors--human capital and structural capital--explain only 52.5 percent of the variation of relational capital. The results suggest that there is a significant relationship between human capital and relational capital with beta coefficient of 0.247 ($p < 0.01$); hence, H5 is supported. Also, structural capital has a significant and positive association with relational capital with beta coefficient of .537 ($p < 0.001$); hence, H6 is supported.

Table 3: The Multiple Regression Analysis Result

RQ	Model (IV-DV)	B	Std. Error	Beta	t	R	Adj. R ²	F		Result			
RQ1	HC-FP	0.157	0.048	0.157	3.307**	0.630	0.393	111.720***	H1	Support			
	SC-FP	0.123	0.054	0.120	2.278*				H2	Support			
	RC-FP	0.432	0.050	0.425	8.567***				H3	Support			
RQ 2	HC-SC	0.658	0.032	0.661	20.562***	0.661	0.436	422.792***	H4	Support			
	HC-RC	0.245	0.040	0.247	6.104***				0.726	0.525	289.281***	H5	Support
	SC-RC	0.535	0.040	0.537	13.261***							H6	Support
RQ	Log(PR)xHC-FP	0.081	0.027	0.170	2.964**	0.557	0.306	67.622***	H7.1	Support			
3.1	log(PR)xSC-FP	0.033	0.029	0.071	1.142				H7.2	Not Support			
	log(PR)xRC-FP	0.164	0.026	0.372	6.252***				H7.3	Support			
RQ	log(FR)xHC-FP	0.036	0.102	0.025	0.351	0.149	0.016	3.367*	H8.1	Not Support			
3.2	log(FR)xSC-FP	0.258	0.114	0.167	2.270*				H8.2	Support			
	log(FR)xRC-FP	-0.079	0.114	-0.052	-0.699				H8.3	Not Support			

* p<0.05; ** p<0.01; *** p<0.001

The third research question of this study investigates the moderating effect of tangible resources-physical resources and financial resources-on the relationship between intellectual capital and business performance of Thai firms. For the moderating effect of physical resources on the IC-FP relationship, the results from the multiple regression analysis (Table 3) show that a significant model emerged ($F_{3,454}=67.622$, $p<0.001$), suggesting that physical resources have a moderating impact on the relationship between intellectual capital and firm performance. The adjusted R^2 indicates that the interaction between physical resources and intellectual capital together explain 30.6 percent of the variation of firm performance. The results suggest that physical resources moderate the relationship between human capital and firm performance ($\beta_{8,1}=0.170$, $p<0.01$) and the relationship between relational capital firm performance ($\beta_{8,3}=0.372$, $p<0.001$); hence, the H7.1 and H7.3 are supported. Whilst, the physical resources do not moderate the SC-FP relationship ($\beta_{7,2}=0.071$, $p=0.254$); hence, the H7.2 is not supported.

Testing the moderating effect of financial resources on the IC-FP relationship, the results from the multiple regression analysis (Table 4) show that a significant model emerged ($F_{3,447}=3.367$, $p<0.05$), suggesting that financial resources have a moderating impact on the relationship between intellectual capital and firm performance. The adjusted R2 indicates that the interaction between physical resources and intellectual capital together explain only 1.6 percent of the variation of firm performance. The results suggest that financial resources moderate the SC-FP relationship ($\beta_{8,2}=0.167$, $p<0.05$); hence, the H8.2 is supported. However, financial resources do not moderate the HC-FP relationship ($\beta_{8,1}=0.025$, $p=0.726$) nor the RC-FP relationship ($\beta_{8,3}=-0.052$, $p=0.485$); hence, the H8.1 and H8.3 are not supported.

Path Analysis Model

Path analysis is a statistical method that represents and analyses the relationship among variable in a model. It is a simplified type of structural equation modeling (SEM). The analysis method for verifying the theoretical model composed of a series of regression analysis, and all prediction variables can be proceeded in the regression model simultaneously (Huang and Hsueh, 2007). The model proposed in this study is divided into 2 parts as shown in Figure 3. For the first part, the path analysis diagram indicates that among the 3 paths to firm performance, all three components of intellectual capital have direct and significant influence on firm performance with a path coefficient of 0.157 ($p < 0.01$) for human capital, 0.120 ($p < 0.05$) for structural capital, and 0.425 ($p < 0.001$) for relational capital.

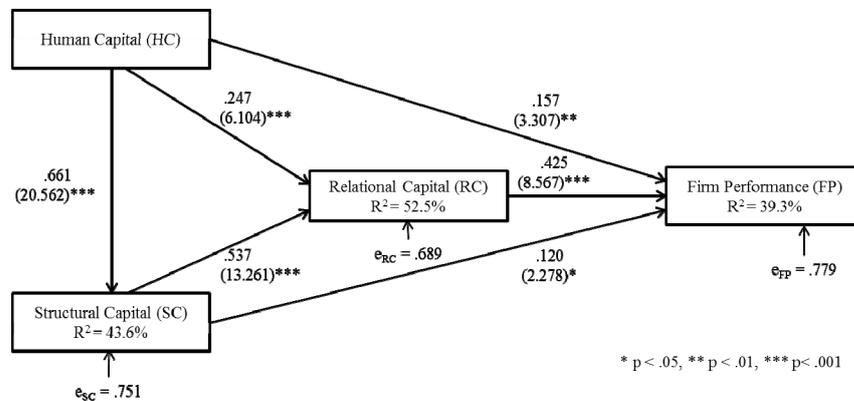


Figure 3: Path Analysis of IC and FP

Table 4: Result for Path Analysis

Paths	r	Direct path	Indirect path	Total Effect
HC=>SC	0.661	0.661	0	0.661
HC=>RC	0.610	0.247	$(0.661)(0.537) = 0.355$	0.602
SC=>RC	0.705	0.537	0	0.537
HC=>FP	0.491	0.157	$(0.105)^a + (0.079)^b + (0.151)^c = 0.335$	0.492
SC=>FP	0.502	0.120	$(0.537)(0.425) = 0.228$	0.348
RC=>FP	0.609	0.425	0	0.425

Remark: Indirect effect of HC = > FP path was calculated as follows:

- a. $HC=>RC=>FP = (0.247) \times (0.425) = 0.105$
- b. $HC=>SC=>FP = (0.661) \times (0.120) = 0.079$
- c. $HC=>SC=>RC=>FP = (0.661) \times (0.537) \times (0.425) = 0.151$

In the second part of the model, human capital is an independent variable, while structural capital and relational capital are dependent variables with path coefficient of 0.247 ($p < 0.001$) and 0.661 ($p < 0.001$). This indicates that human capital has immediate and considerable influence on structural capital and relational capital. Beside, human capital has indirect influence

on firm performance via both structural capital and relational capital. The indirect influence effect of human capital on firm performance is 0.105 (0.247 x 0.425) via relational capital and 0.079 (0.661x0.120) via structural capital. In addition, structural capital also has indirect impact on firm performance via relational capital. The indirect impact of structural capital on firm performance is 0.228 (0.537x0.425) via relational capital. Table 4 shows the total effect of the path analysis among variables.

5. Discussion

The results from this study mostly support the research hypotheses which reveal a picture of the relationship between intellectual capital and firm performance in Thailand. The empirical results provide strong overall validation and suggest the importance of intellectual capital on business performance in Thailand. Interestingly, the findings suggest that in the Thai context, human capital was found to be a source of intellectual capital similar to the study in Canada (Bontis, 1998), Malaysia (Bontis et al., 2000), and Portugal (Jardon and Martos, 2009).

For the moderating effect of tangible resources: physical resource and financial resource, the findings suggest that tangible resources subside the relationship between intellectual capital and firm performance as the change in r-square was reduced for both physical resource and financial resource. The impact of tangible resource on the relationship between main components of IC and firm performance is varied.

Table 5: the Comparison of Correlations among constructs

	Current Study	Sharabati et al. (2010)	Jardon and Martos (2009)	Cabrita and Bontis (2008)	Huang and Hsueh (2007)	Bontis (1998)
Country	Thailand	Jordan	Argentina	Portuguese	Taiwan	Canada
Sample	572 firms	15 firms	113 firms	53 Banks (253 respondents)	101 firms	n.a.
Industry	across industries	Pharmaceutical	Wood	Banking	Consulting	MBA Students
HC-SC	0.661*	0.659*	0.397*	0.755*	0.685*	0.492*
SC-RC	0.705*	0.699*	0.481*	0.700*	0.503*	0.197
HC-RC	0.610*	0.687*	0.463*	0.697*	0.506*	0.499*
HC-FP	0.491*	0.647*	0.055*	0.568*	0.439*	0.509*
SC-FP	0.502*	0.557*	0.455*	0.634*	0.286	0.508*
RC-FP	0.609*	0.670*	0.034*	0.592*	0.418*	0.639*

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

6. Research Implication

Research Implication for Academic Researchers

The contribution of this study to intellectual capital management research is the validation of the base theoretical models proposed by Bontis (2002). This study represents a first attempt in elevating intellectual capital concept for Thai business context and supports that the intellectual capital is a key strategic intangible resources affecting firm performance as asserted by RBV. The findings of this study support and generalize the significance of intellectual capital and its impact on performance variance of firms in the emerging-economy like Thailand. Its empirical testing highlights the extent to which the intellectual capital sub-constructs investigated by the model explain variances in firm performance of firms in Thailand. The study, through the proposed enhanced model, provides a better understanding of how intellectual capital sub-constructs interact among each other and their impacts on firm performance in Thailand. Moreover, it adds to the existing body of knowledge on intellectual capital by examining how the tangible resources moderate the relationship between intellectual capital and firm performance. In addition, this study also contributes to the psychometric measurement of intellectual capital research by further developing and validating a set of operational measurements with strong support in terms of its properties of validity and reliability.

Research Implication for Business Practitioners

Regarding the marketing research discipline, the relational capital integrates the concept of corporate reputation, market orientation, and partnership and affirms that the notion that the marketing resources are important key intangible resources generate competitive advantage and in turn enhance firm performance. Especially, the market orientation concept should be emphasized because it is important to understand the preferences of customers and disseminate the information throughout the organization. Thai firms should pay attention to attaining customers' needs by responding and offering products and services to fulfill their preferences. In addition, collaboration and alliance with partners can facilitate organizations to acquire and utilize information and knowledge on the demand of customers and the market. Moreover, firms should be concerned about building good corporate reputation through corporate governance, green technology, or social responsiveness in order to secure positive perceptions and awareness of their stakeholders.

Regarding the human resource management discipline, this study suggests that human capital helps organization understand how employees create value. Even though employees as individuals may not be regarded as a strategic asset, their characteristics and attributes as a collective unit suggest that employees' competence, attitudes, and creativity can generate value to the organization and affect firm performance directly and indirectly. Thus, firms should focus on how

to utilize effective HR management through reward and compensation to improve motivation and attitudes of their employees. In addition, organizational training programs should be emphasized to nurture employees' competence. Moreover, employees' creativity should be fostered through team building and brainstorming activities, reward systems, and an encouraging environment and innovative atmosphere.

Regarding the organizational management discipline, this study indicates that structural capital also directly affect firm performance. The structural capital plays an important role in the inter-relationship between human capital and relational capital. Structural capital is a fundamental resource of the organization that acts as a supportive mechanism to enhance value to the organization. Specifically, organizational systems may not be a value generator in the customer perception. However, organizational systems such as ISO, TPM, and TQM help organization generate competitive advantage through cost reduction and quality improvement. Similarly as information technology, customers may not have direct perceptions of the company's IT system but it would have indirect effect on products or services offered to customers.

7. Limitation and Future Research

This study certainly had some limitation from trade-off decisions made in the research design process. First and foremost, the use of self-rating data for both intellectual capital and firm performance may cause common method bias. Even though, the Harman's one-factor test is used to test the presence of common method effect of this study. The secondary data such as sales growth, ROA, Tobin Q can be used to avoid common method bias. Second, using single informant from each firm might have opened the possibility of self-serving bias. Thus, future research should conduct by getting more informants from each company to mitigate the self-serving bias issue. Third, the questionnaire instrument of this study might have been too long due to multiple items for each variable, which increase the possibility of a low response rate. As this study had low response rate, it might have raised an issue of non-response bias in which the Levene's test for equality of variance and t-test for equality of Means is used to test the existence of nonresponse bias on this study. Then, future research should reduce some questionnaire items in order to get higher response rate and cope with the non-response bias issue. Lastly, this study may have a multicollinearity issue due to large number of independent variables. The multicollinearity issue can be alleviated by reducing independent variables, combining variables, and increasing sample size.

In addition, several future research directions can possibly be investigated in order to enhance the generalizability of this study. First, possible future research can be done in different context settings in Thailand in order to understand how intellectual capital affects firm performance

of Thai firms in greater details such as (1) industry setting, (2) firm size, (3) firm age, (4) business type, and (5) industry structure characteristics. Second, other research methodology can be applied to compare with the results of this study. The qualitative research method with in-depth interviews with top executives should be applied to understand how the intellectual capital is leveraged in the company's strategies. Moreover, a longitudinal study can be used to investigate the relationship between intellectual capital and firm performance over time. Other statistical method such as structural equation modeling (SEM) or partial least square regression (PLS) in order to test the confirmatory factor analysis of the psychometric construct especially on the high-order and low-order constructs and also test the statistical fit of the model. Last, other variables in RBV and intellectual capital theory such as leadership, organizational learning, knowledge management, distinctive capabilities, dynamic capability, and organizational capability can be further studied as independent variables in order to explain the remaining portion of firm performance variance.

8. Conclusion

Intellectual capital should be recognized as a major corporate asset capable of attaining and sustaining competitive advantage and superior performance. The empirical evidence of this study suggests that there are significant positive relationships between firm performance and major components of intellectual capital. Thus, firms should focus on developing and nurturing their intellectual capital and also deploying them effectively and efficiently in order to achieve competitive advantage. This study indicates that relational capital is the most important predictor of firm performance variance in Thai firm. Thus, Thai businesses should emphasize on developing and nurturing its relational capital through market orientation, partnerships, and reputation to compete in the new economy.

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