

# Interrelationship among Human Capital, Structural Capital and Relational Capital in the Intellectual Capital and Their Effects on Performance of Thai Private Universities

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## Abstract

Today the major role of intellectual capital (comprise of human capital, structural capital and relational capital) that effects and impacts on performance and sustainability in every organization is becoming more and more prominent. It is represented and promoted as the organization's most valuable resource for establishing the sustainable business and organization's wealth; also it is recognized as the most important source of organizations' competitive advantage in bloody business world. Many researchers also agree and approve that intellectual capital is "knowledge" and "experience" that directly contribute to every organization's bottom line, as well as mainly contribute to an organization's survivability and sustainability.

Most IC researches have been conducted in a variety of international settings such as in Europe, USA, and Asia. However, no empirical research has been conducted at the organizational level in the field of IC in Thai educational sector. The purpose of this empirical study is to emphasize the importance of intellectual capital and the main objective is to explore the interrelationship among three components of intellectual capital and their effects on performance within the

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private educational institutions of Thailand. Model development and hypothesis testing was conducted using path analysis on a sample of 131 respondents from 19 Thai private universities. Results demonstrate a confirmation of previous studies as it relates to hypothesis testing but a difference in psychometric item evaluation given the distinctive geographical and sector context. Recommendations are then made for both researchers and practitioners.

**Keywords:** Intellectual Capital, Human Capital, Structural Capital, Relational Capital, University Performance

## ความสัมพันธ์ระหว่างทุนมนุษย์ ทุนทางโครงสร้าง และ ทุนความสัมพันธ์ที่อยู่ในทุนทางปัญญา และผลกระทบ ที่มีต่อการปฏิบัติงานของมหาวิทยาลัยเอกชนไทย

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### บทคัดย่อ

บทบาทสำคัญของทุนทางปัญญา (ซึ่งประกอบด้วยทุนมนุษย์ ทุนทางโครงสร้าง และทุนความสัมพันธ์ที่ส่งผลกระทบต่อการทำงานและต่อความยั่งยืนของทุกองค์การกำลังกลายเป็นสิ่งที่แสดงออกให้เห็นอย่างชัดเจนมากยิ่งขึ้นเรื่อย ๆ ในปัจจุบันนี้ ทุนทางปัญญาได้ถูกนำเสนอว่าเป็นทรัพยากรที่มีคุณค่ามากที่สุดขององค์กรในอันที่จะสร้างความร่ำรวยและความยั่งยืนให้แก่องค์กร อีกทั้งยังถือเป็นทรัพยากรที่จะก่อให้เกิดการมีข้อได้เปรียบทางการแข่งขันในโลกธุรกิจที่มีความรุนแรงมากขึ้น นักวิจัยส่วนใหญ่ล้วนเห็นด้วยและยอมรับว่าทุนทางปัญญา ก็คือ “ความรู้” และ “ประสบการณ์” ที่ส่งผลโดยตรงกับรากฐานขององค์กรและในขณะเดียวกันก็ส่งผลต่อความอยู่รอดและความยั่งยืนขององค์กรด้วย

นักวิจัยเรื่องทุนทางปัญญาส่วนใหญ่ได้ทำการวิจัยเรื่องนี้ในหลายประเทศทั่วโลก เช่นในประเทศแถบยุโรป อเมริกา และในเอเชีย แต่กลับไม่มีการทำวิจัยเกี่ยวกับเรื่องนี้ในองค์กรทางภาคการศึกษาของไทยเลย ดังนั้น จุดประสงค์ของงานวิจัยชิ้นนี้ก็เพื่อเน้นให้เห็นถึงความสำคัญของทุนทางปัญญา โดยมุ่งเน้นที่จะสำรวจความสัมพันธ์ภายในระหว่าง 3 องค์ประกอบหลักของทุนทางปัญญา และผลกระทบที่มีต่อการปฏิบัติงานของมหาวิทยาลัยเอกชนของประเทศไทย การพัฒนาตัวแบบและการทดสอบสมมติฐานทำขึ้นโดยใช้วิธีการวิเคราะห์เส้นทางจากตัวอย่างของผู้ตอบ 131 คน จาก 19 มหาวิทยาลัยเอกชนไทย ผลจากการวิจัยยังคงยืนยันผลตรงตามผลการวิจัยก่อน ๆ แม้จะต่างภูมิภาคและต่างส่วนงานกันก็ตาม ข้อเสนอแนะทำขึ้นเพื่อทั้งนักวิจัยและผู้ปฏิบัติ

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## Introduction

The impact of intellectual capital (IC) on the general performance of the organization has become a very important and critical issue now than ever, this is due to the level of globalization of whose outcomes are privatization and deregulation of markets, high aggressive competition and the ever-rising expectations of all customers. As a result of these, there is need for organizations to be at their best in order to survive in such environment (Uadiale & Uwuigbe, 2011). For Thai business, the two major forces that we currently face include the rapid rate of technological change and increasing industrialization. The rate of change is likely to accelerate in the near future led by AEC (Asian Economic Community). Transforming into a knowledge-based economy, there is an increasing need for Thailand to explore how intellectual capital creates value for companies.

The educational sector, especially in institutions of higher learning (such as in university), is an important and crucial sector in Thai economy. The cultural functions of teaching and research have been the primary function of universities, whereas the human capital function of preparing trained persons has played a secondary role. Etzkowitz and Leydesdorff (1997) stated that in the late twentieth century, universities received attention for their inputs to economic and social development. Thus, this is not a completely new situation: academic institutions in the USA contributed to agricultural innovation during the Experiment Station movement of the mid-nineteenth century and were instrumental in the basis of the chemical industry in Germany during the same time. Nevertheless, the development of knowledge was formerly primarily the concern of the university, whereas capitalization of knowledge was the concern of industry. However, the growing interest of the university and its faculty members, often stimulated and encouraged by government policies, in earning capital from knowledge is moving academic institutions closer in spirit to the corporation, a type of organization whose interest in knowledge has always been closely tied to economic utility (Etzkowitz & Leydesdorff, 1997). Kok (2007) stated that universities are under a commitment to strike a balance between their responsibilities internally to their employee and student inventors, and externally to their prospective commercial partners. The latter could be business organizations, communities, government and semi-government departments, or statutory organizations. As being an employer the university is assured to be rational and

sensible in its dealings with its employees. A difficulty is the point that it is also a guardian of the welfare of its students, taking as a parent role. On the other hand, a university must be responsible and careful (specifically with regard to state sponsorships), and commercially intelligent and realistic (especially when dealing with the corporate world). The supreme challenge is to constitute a balance between these different considerations to guarantee that, eventually, the university stays true to its ideal of searching for knowledge in the spirit of academic freedom, and to applying such knowledge to the advantage of humankind. The question thus rises how universities can administrate themselves successfully without recognizing the significance of intellectual capital.

Shih, Chen, and Morrison (2010) stated that theoretically, many researchers have emphasized the influence of intellectual capital on business performance; and many of IC researches have been conducted in a variety of international settings including Canada (Bontis, 1996; 1998; 1999), Austria (Bornemann, 1999), Malaysia (Bontis, Keow, and Richardson, 2000), South Africa (Firer & Stainbank, 2003), Taiwan (Chen, Cheng, & Hwang 2005), and Sub-Sahara Africa (Kwasi & Kwesi, 2011) and the USA (Bassi & van Buren, 1999). However, none of them seem to have been conducted empirical researches at the organizational level in the field of IC in the educational sector of Thailand, especially in Thai private universities. Where society, economic, and culture are different from most countries in the aforementioned list. As a result, the researcher is interested in investigating the impact of intellectual capital on the performance (productivity, profitability, and the external quality assessment) of Thai private universities. The paper thus examines the interrelationships among intellectual capital components and their influence on business performance respectively. Also, recommendations are provided to assist Thai private university management in managing the intellectual capital of their universities.

## Intellectual Capital (IC)

For the concept of “intellectual capital” (IC), it was first presented by John Kenneth Galbraith. He was an economic scholar; he named and utilized it to describe the dissimilarity between a company’s market value and book value (Edvinsson & Sullivan, 1996; Roos et al, 1997). After that, when coming to this new “innovation era,” several scholars in academic area, thus, start and initiate to discuss more about the matter of IC. Bontis (1999) states that it is seen to be the greatest valuable economic

resource for the company or any organization and is determined to be a possible source of sustainable competitive advantage. Shih et al., (2010) also confirms that apart from the academics, every sector of the economy in both developing and developed countries, many firms have truly sensed the impact of increased intellectual capital. Furthermore, Luthy (1998) mentions that intellectual capital has led to the formation of whole innovative kinds of businesses and methods of achieving business. Numerous organizations depend almost entirely on intellectual assets for creating revenues in reality, for example, in the software business, it is principally knowledge based with most products taking an intangible form; being generated and transported electronically (Luthy, 1998).

Stewart (1991) notes that the terminology of “intellectual capital” is typically used by the research community as a synonym for intangible assets which can be converted to economic value. However, until now, due to different and various research backgrounds, there is still not having the same mutual accepted unified definition for intellectual capital. There are still having many various definitions of IC. By reviewing many various definitions of IC, Martin-De-Castro, Delgado-Verde, López-Sáez, and Navas-López (2011) can draw some conclusions. Firstly, they say that intellectual capital mostly mentions these three dimensions; the organizational knowledge of the human assets, the organizational structures and the external social partners of an organization. Secondly, intellectual capital is converted to economic value through organizational action. Thirdly, intellectual capital is linked to the existence of competitive advantage because intellectual capital boosts the environmental responsiveness of the organization

For the purposes of this paper, the researcher describes intellectual capital as the stock of organizational knowledge and the cooperative ability to convert this knowledge to operation by leveraging organizational learning occurrences.

## The Component of IC

As already mentioned that although IC may be a moderately new expression, it has an extensive lineage in many different business sectors (Bontis, 1996) and has established a lexicon and categorized the sub-dimension of its own, including such terms as “customer capital”, “organizational capital”, “internal resources”, “intangible assets” and several other terms (Boedker, Guthrie, and Cuganesan, 2005; Houltsel and Nelson,

2005). Among the many studies, the classification of IC remains inconsistent. However, in this new paradigm, many researchers are trying to have commonly mutual analyzed “intellectual capital” is, at least, three dimensions: human capital, structural capital and relational capital (Martín-de-Castro, Delgado-Verde, López-Sáez, and Navas-López., 2011; Bontis, 1999, 2001; Nahapiet and Ghoshal, 1998; Petty and Guthrie, 2000; Sveiby, 1997). Sharabati Jawad, and Bontis (2010) also refer that these sub-dimensions include the intelligence found in human beings, organizational routines and network relationships respectively.

## Human Capital

Human capital is defined by many researchers such as Roos, Bainbridge, and Jacobsen (2001) as the competence, skills, and intellectual agility of the individual employees. Cabrita and Bontis (2008) state that it symbolizes the individual knowledge stock of an organization as showed by its employees. It mentions to the knowledge, capabilities and behaviors of the human determinant (Cabrita and Bontis, 2008; Hsu and Fang, 2009). Human capital as well embraces how effectively an organization uses its employees or its human resources as measured by creativity and innovation (Bollen, Vergauwen, and Schneider, 2005). Human Capital comprises of the people who belong to the organization and who contribute to its achievement through their skills and motivation. At the basis of each organization are the people, or better, the system of knowledge, competences, capabilities, creativity and innovation originated on the knowledge of each person operating in the company and also the entrepreneurial, organizational, and working qualities which come together to establish the business organization (Puntillo, 2009). Johnson (1999) also defines human capital as the power behind the human intellect and innovation of the firm; moreover, he exemplifies general types of intangible assets associated with human capital such as knowledge-based workforce, assembled workforce, R&D projects, experts, and managerial competence. In addition, Martín-de-Castro *et al.* (2011) express that human capital comprises of knowledge, skills, innovativeness and the ability to response effectively at task performance.

Although human capital has been linked to increased firm performance because it finally delivers the direct goods or services that customers need or the solutions to their problems, and recognized as being the heart of creating intellectual capital

(Parrup-Nielson, 2006; Ordonez de Pablos, 2003), it is not adequate alone to create a sustained competitive advantage (Tansley and Newell, 2007). Bontis (1998), highlighting the organizational perspective, refers to human capital as ‘the source of innovation and strategic renewal’, nevertheless, human capital must be integrated with relational and structural components in the firm, to create value. Harris (2000) also confirms that although, human capital is frequently the easiest theoretical basis to recognize and define when criticizing intellectual capital, it alone cannot sustain intellectual capital. This requirement to link individuals with knowledge produces the appearance of the second foundational component of intellectual capital: Structural capital.

According to Wang and Chang (2005), human capital influences business performance through innovation capital, process capital and customer capital because employees are needed to perform and complete the internal process of a company. Employees are also required to manage all customer services. By providing quality of service in the meantime implementing internal processes, the capability of employees would affect process efficacy and customer satisfaction (Wang and Chang, 2005).

For this study (in private universities), human capital is defined as the entirety of the explicit and tacit knowledge of the human resources (lecturers, researchers, management, service and administrative staff in this case) acquired through formal and non-formal education and refresher processes included in their activities and these human resources would bring these knowledge with them if they left the institution.

## Structural Capital

Among different components of intellectual capital, Bontis (2001) determines structural capital as the most challenging as it is connected to other capital in terms of description. Bontis et al. (2000) explain that structural capital comes from processes and organizational value, reflecting the external and internal emphases of the organization, plus renewal and development value for the future. According to Bontis (1998), if an organization has bad systems and measures by which to track its performances, the total intellectual capital will not reach its fullest capability. Organizations with well-built structural capital will have a helpful culture that permits individuals to test and try new things, to learn, and to fail. Structural capital is the crucial link that allows intellectual capital to be measured at the organizational level of analysis (Bontis et al., 2000). Structural

capital is identified as the structural capability of the organization to utilize human intelligence and innovation to create prosperity (Johnson, 1999). It comprises the knowledge merged into technological infrastructures (Edvinsson and Malone, 1997; Sveiby, 1997) and organizational structures (Chang *et al.*, 2008); and the capability to develop it. Cabrita and Bontis (2008) mention structural capital is a valued strategic asset, which is consisted of non-human assets such as information systems, routines, procedures and databases. In addition, Bontis et al. (2000) also state that structural capital embraces all the non-human warehouses of knowledge in organizations which comprise the databases, organizational charts, process manuals, strategies, routines and anything whose value to the firm is greater than its substantial value. Structural capital is possessed by a company and still exists with a company even when people depart (Luthy, 1998). Riahi-Belkaoui (2003) confirms that, in contrast with human capital, structural capital is the property of the firm. It is the knowledge that belongs to the organization as a whole for instance technologies, inventions, databases and files, publications, patents, licenses, copyrights, trademarks, brands, organizational strategies and culture, structures and systems, internal networks, organizational routines and procedures (Riahi-Belkaoui, 2003). Structural capital can be developed when organizations invest more in technology and improve processes and other internal initiatives (Knight, 1999). Structural capital can be conceptualized as the changeable intangible assets such as processes, routines, culture, and the more officially preserved structural capital is categorized in an organization's policies, procedure booklets, and intellectual property (Carson, Ranzijn, Winefiel, & Marsden 2004). Johnson (1999) also exemplifies general types of intangible assets associated with structural capital such as intellectual property, firm infrastructure, corporate practices and procedures, trade secret, and internal relations.

Structural capital emphasizes on the organized knowledge founded of the company. Structural capital also reflects the firm's capability to transform the innovation and energy of its people (human capital) into firm assets while taking advantage of that innovation to make prosperity (Seleim et al., 2004). Johnson (1999) mentions structural capital allows for the construction of prosperity through the transformation of the work of human capital. Bontis (1998) also support that structural capital is function of human capital. It is the supportive structure that empowers people to perform their work because structural capital is the hardware, software, databases, organizational structure, patents,

trademarks and the whole thing that supports employees' productivity. In addition, Huang and Hsueh (2007) mention that structural capital is proposed to share knowledge efficiently, expand collective knowledge, reduce learning and training time and increase the productivity of human capital. It is essential to share knowledge and experience consistently, and through the assistance of instruments (for example job descriptions, operational manuals, hardware, and Internet), then utilize them repeatedly and creatively in an organized method. Huang and Hsueh (2007) further suggest that the structural capital contains 4 components that are system, structure, strategy and culture, and because these 4 components are closely interconnected, they must be appropriately fitted to bring structural capital into full play, and increase the efficiency of human capital through fast knowledge-sharing, preservation and effective measures. Therefore, structural capital and human capital assist and cooperate with each other to organizations that as coordinate develop and operate and form the thirdfoundational component of intellectual capital: Customer capital.

For this study (in private universities), structural capital is defined as the explicit knowledge relating to the internal process of dissemination, communication and management of the scientific and technical knowledge at the university. This knowledge stays within the institution at the end of the working day. It comprises the governance principles, the organizational routines, procedures, systems, cultures, databases, intellectual property.

## Relational Capital

Cabrita and Bontis (2008) describe relational capital is the knowledge rooted in relationships with customers, suppliers, industry associations or any other stakeholders that effect the organization's life. Bontis (1999) also approves that relational capital characterizes the potential a company has due to ex-firm intangibles. In addition, same as the opinion of Dr. Bontis, Ahangar (2011) insists that relational capital is a firm's relationship with its customers and with its network of suppliers, strategic partners and shareholders. The value of these assets is defined by the firm's reputation or image.

In the knowledge based society, intellectual capital presents an important character in the formation of intangible and knowledge towards value creation. Especially, the previous literature clarify human, organizational (or structural) and customer

(relational) capital as dissimilar objects and recommend that they are interrelated causality so that human capital creates knowledge which then can develop continuous in organizational capital (structural capital) to boost customer relations (relational capital) (Ahmad & Mushraf, 2011). Chen, Zhu, and Xie (2004) insist that relational capital cannot be accomplished without human capital as investments are made in human capital, more experienced and talented people improve better structural capital, leading to the growth of further productive external capital, causing in superior financial performance. Bontis (1998) also agrees that progress of relational capital relies on the assistance of human capital and structural capital. Relational capital usually performs as a link and intermediate in intellectual capital process. It is the key element and transformation of intellectual capital to market value and as an outcome business performance of company (Chen et al, 2004). Under an atmosphere with an aggressive business competition, the crucial point for a company to make profit and develop its performance is to gain the loyalty and trustworthiness of customers, and form long-term pleasant relationships with them. If a company understands better than others what customers' desire and need in a product or a service, is what creates that company to become a business leader as opposite to a follower. Customer and supplier loyalty, target marketing, longevity of relationships and satisfaction are all assessable components of this form of intellectual capital (Bontis, 1996).

For this study (in private universities), relational capital is defined as all resources linked to the external relationships of the institution such as customers(i.e. students, parent), suppliers, other private universities as the competitors, partners(i.e. enterprises, non-profit organizations, community), government, and society.

In summary for the interrelation of these three components (human capital, structural capital, and relational capital), Martín-de-Castro, Delgado-Verde, López-Sáez, and Navas-López (2011) pinpoint that the three components or dimensions of intellectual capital are extremely interrelated. Human capital is an input to structural and social capital (they use the term of social capital for representing the term of relational capital). Finally, they confirm that the interaction of intellectual capital with the surroundings goes through relational capital. Cabrita and Bontis (2008) agree to this statement by state that a general agreement harmonizes that none of these dimensions is valuable by itself. Value is established and fostered through the efficient collaboration of the three

dimensions of intellectual capital. Harris (2000) also confirms that once a firm becomes arranged and well-adjusted in these three significant components, it is able to create the greatest possible financial performance.

Private universities rely on good stable and long lasting relationships with their clients, especially with their students and parents. This largely depends on human resources (including academic and non-academic staff). In this context, employees' performance is a critical differentiator in university performance (i.e. the quality of university relationships depends on the quality of these staff and their ability to satisfy client needs). Hence, interaction between human capital and relational capital is a crucial strategic issue in the educational industry.

## University Performance

The major concept of university performance for this research comes from the original concept of "corporate performance". It is a significant conception that relates to the way and manner in which both financial and non-financial resources available to an organization are carefully utilized to accomplish the overall corporate objective of an organization. It is consequently crucial that organization's performance be measured on a consistent basis in order to guarantee sustainability (Uadiale & Uwuijbe, 2011).

Syed (2005) mentions theorists of resource-based theory suggest corporate performance is an operation of the effective and efficient use of the particular tangible and intangible assets of the company.

However, many researchers call and also group corporate performance in different name such as Gilaninia and Matak (2012) tell that many articles and books state that the output organization is called "performance". Researchers in studies related to the commercial performance used the different components for its measuring. Few researchers closely put performance components in groups and have named them. For example in the work of Pelham (1997) performance components have put in three categories: organizational effectiveness, growth / share, and profitability. Guo (2002) divides performance components to two categories:

1) Market performance: including a component of customer retention, attract new customers.

2) Financial performance: including components of return on assets rate, market share, and sales growth.

For this study, regarding university performance, there are two important references. One is financial reference that is business performance (focus in productivity and profitability). The other is non-financial reference that is the external quality assurance. It is the criterion of the education standards and quality assurance for Thai universities.

## **Business Performance**

Uadiale and Uwuigbe (2011) state that business performance is an important concept that relates to the way and manner in which financial resources available to an organization are carefully used to achieve the overall corporate objective of an organization. It is therefore important that organization's performance be measured on a regular basis in order to ensure sustainability.

According to the work of Bontis in 1998, there were 10 items for measuring the business performance related to key competitors in the industry and then these items have been adopted and adapted for many times until the work of Sharabati et al. in 2010. These researchers were revised these 10 items to become the qualified and reliable items to measure business performance and these items still have been popular until now. These 10 items comprise of industry leadership, future outlook, overall response to competition, success rate in new product launches, overall business performance and success, employee productivity, process (transaction) productivity, sales growth, profit growth, and company's market valuation (stock value).

For this study, the researcher will adopt and revise these items to represent the measurement of the university performance.

## **The External Quality Assurance**

Thai Office for National Education Standards and Quality Assessment (2012) declares that the external quality assurance is defined that it is the assessment and monitoring of the educational quality and standards of the institutions from outside. Such assessment and monitoring are to be managed and carried out by the Office for

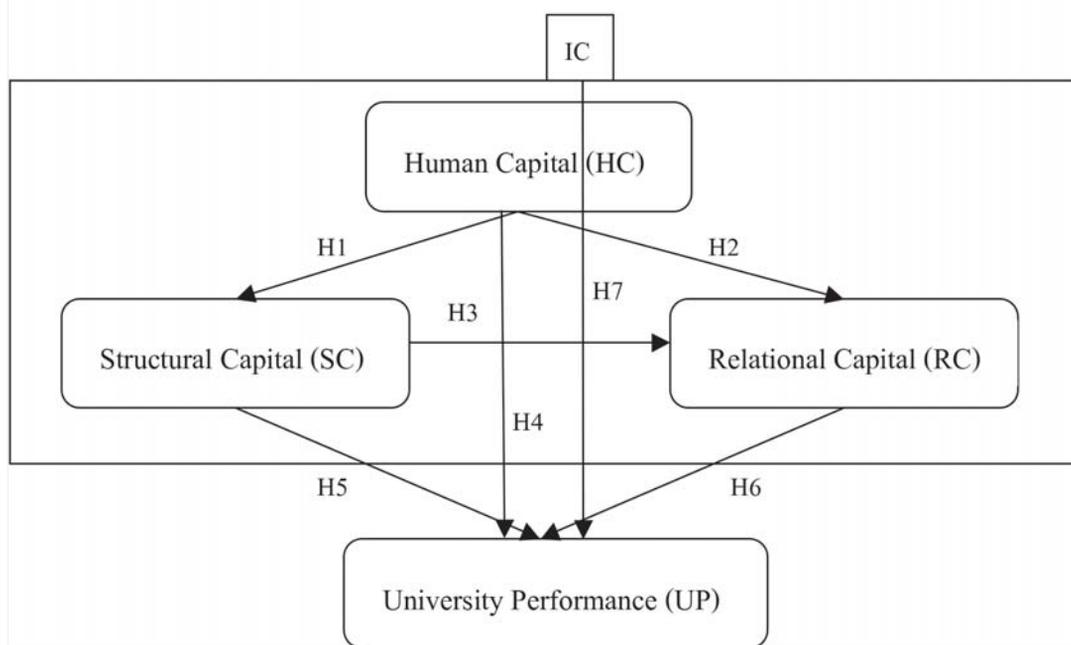
National Education Standards and Quality Assessment(ONESQA) (2012) or by persons or external agencies certified by this office. These measures (including-quality of graduates, research and creativity, academic service, supporting art and culture, developing organization and staffs, courses and teaching/ learning, and quality assurance) ensure the quality desired and further development of educational quality and standards of these institutions.

Similar to the operation of other concerns, education provision needs the proper administrative and managerial principles for the whole cyclical functioning. It has been well recognized that evaluation is truly indeed and essential step for feedback information, which provides us with the basis for assessing the extent of target achievement. It also enables us to identify any weaknesses or problems for which remedial measures are needed so as to support and facilitate subsequent planning and actions required to achieve the goals effectively and efficiently (Office for National Education Standards and Quality Assessment, 2012).

Therefore, it is crucial and necessary that the importance of evaluation be recognized, particularly quality assessment by an external and neutral body. Such mechanism will provide meaningful assessment. For Thai national education, it also gives all agencies responsible for education provision from those at the national level to the smallest - i.e. educational institutions and classrooms, the incentives for self-evaluation so that the quality of education will be more continuously enhanced (Office for National Education Standards and Quality Assessment, 2012).

## Conceptual Framework

This research framework was developed in accordance with the literature review. From the review, it was noticed that intellectual capital is related to corporate performance. The Intellectual Capital Variables defined in the study are in relation to Cabrita and Bontis' (2008) classification of intellectual capital: Human Capital, Structural Capital, and Relational Capital. Their interrelation and their impact on university performance will be tested.



Source: Revised From Cabrita and Bontis, 2008

**Figure 1:** Conceptual Framework

Therefore, the following hypotheses are developed.

- H1. Human capital is positively associated with structural capital.
- H2. Human capital is positively associated with relational capital.
- H3. Structural capital is positively associated with relational capital.
- H4. Human capital is positively associated with university performance.
- H5. Structural capital is positively associated with university performance.
- H6. Relational capital is positively associated with university performance.
- H7. Intellectual capital is positively associated with university performance.

## Research Design

This paper intends to verify if human capital, structural capital and relational capital can improve the university performance of an organization which is composed of both financial and non-financial performance. This study also explores the correlation between 3 kinds of intellectual capital: human capital, structural capital and relational capital. And because these capitals are complementary to each other, the intellectual

capital can create value only by combining these 3 capitals and also the final performance of an organization is influenced by the interactions of the 3 dimensions of the intellectual capital (Stewart, 1999).

Therefore, in this research intellectual capital and its dimension are independent variables and university performance is the dependent variable.

## Questionnaire Design

**Table 1:** Dimensions, Sub-dimensions and Items of the Measurement Scale (Revised from Chen, 2001)

Dimension	Sub-dimension	Items in the sub-dimension
Human capital	Learning and education(hc1)	10
	Experience and expertise(hc2)	10
	Innovation and creation(hc3)	10
Structural capital	Systems and programs(sc1)	10
	Research & development(sc2)	10
	Intellectual Property Rights(sc3)	10
Relational capital	Strategic alliances, licensing and agreement(rc1)	10
	Customer and supplier relations(rc2)	10
	Customer knowledge(rc3)	10
University performance(up)		10

As Table 1 shows, the measurement scales are divided into human capital, structural capital, relational capital, university performance, which are then subdivided into several sub-dimensions.

The original questionnaire items came from the empirical study of Bontis (1998). Then, they were adopted and adapted by the work of Bontis, et al. (2000); Cabrita and Bontis (2008); and Sharabati et al. (2010), which were 100 items in total. For this study, all items are revised by experts to suit the study and also, a pilot test, review by four experts in this field (all are deans from different faculties: Business Administration, Economics, Accountancy, and Information Technology). In addition, the items are placed

categorically as Bontis (1998); and Cabrera and Bontis' (2008) classification of intellectual capital. See table 2 in the appendices.

## Sampling Method

This research according to study design is analytical –descriptive (because it tries to describe the phenomena while concerns with cause-effect relationships), with emphasis on the correlation based on the objectives is applied research. In present study, statistical society is Thai private universities' performance in Bangkok. The analysis is based on a sample of all 19 Thai private universities in Bangkok. Therefore, sample size was 167 all deans in all faculties that would be studied.

## Data Collection

In this research, data were collected through quantitative survey approach. This data were collected through field survey and data collection tool were questionnaire and also financial documents in enterprises.

The questionnaires were distributed among respondents to answer the questions in the questionnaire. The respondents were all the deans of all faculties in Thai private universities in Bangkok. The questionnaire contained 100 statements to which respondents indicated the extent of their agreement on a five-point Likert scale (1 = strongly disagree and 5 = strongly agree). The covering letter asked respondents to “take on the role as their employer’s representative” and to respond to items from an overall company perspective. In effect, each respondent would act as a proxy respondent for their whole organization.

The questionnaire was six pages in length and was accompanied by a covering letter from NIDA which introduced the concept of IC. The items were developed to encompass the underlying meaning of their respective latent constructs and were revised from their original form to suit the study. The items of performance were remained the same and added on the issue of the external quality assessment. Research has shown that perceived measures of business performance can be:

- a rational substitute for objective measures of performance (Dess and Robinson, 1984); and

- have a substantial correlation with objective measures of financial performance (Hansen and Wernerfelt, 1989).

## Analytical Methods

According to Huang and Hsueh (2007) the reliability and validity of scale were confirmed through reliability analysis. With Pearson correlation analysis, various dimensions and sub-dimensions of intellectual capital were analyzed with respect to their correlation with the university performance. Then, regression analysis was used to verify the theoretical model, and identify the cause-effect relationship between 3 dimensions of intellectual capital and university performance.

The correlation analysis was used to check linear relationship between variables, which constituted the basic assumptions of path analysis. Thus, the degree of correlation is firstly confirmed through correlation analysis, and then the cause-effect relationship is confirmed through regression analysis (Brown, Adams, and Amjad, 2007).

## Survey Results

In this study, 100% of the sample universities are situated in Bangkok. They are all Thai private universities. Overall, the scale of these universities is relatively small compared to their competitors nationwide. 167 copies of the questionnaire were sent to all these universities for all their deans in all faculties, of which 133 copies were returned, and 131 copies (78.44%) were valid.

## Scores of Intellectual Capital

The statistical data of various dimensions and sub-dimensions of intellectual capital are listed in Table 3, wherein the mean score of human capital is 3.84, which include the highest mean score “experience and expertise” (3.96), and the lowest mean “innovation and creation” (3.63). The average score of structural capital is 3.46, which include the highest mean score “systems and programs” (3.94), and the lowest mean “Intellectual Property Rights” (2.71). The average score of relational capital is 3.98, which include the highest mean score “strategic alliances, licensing and agreement” (4.14), and the lowest mean “customer knowledge” (3.80). Among the three dimensions of intellectual capital, relational capital (3.98) and human capital (3.84) show a better

performance than structural capital (3.46).

The average score of university performance is 3.86, may indicate that the universities are quite satisfactory in their performance.

## Correlation Analysis

Table 4 lists the correlation analysis results for intellectual capital, three dimensions of it and the university performance. A Pearson correlation analysis was performed on the dependent and independent variables in order to determine the degree of relationship between them.

The results reveal that university performance is positively and significantly correlated to intellectual capital at 0.518\*\* ( $p < 0.01$ ). And there is also a positive correlation between three dimensions of intellectual capital and the university performance, of which a higher positive correlation exists in relational capital vs university performance, and structural capital vs. university performance, ie 0.511\*\* and 0.458\*\*. These results reveal support for hypothesis 4, 5, 6, and 7.

In addition, there is also a positive correlation among the three dimensions of intellectual capital; especially the coefficient of structural capital and relational capital is 0.645\*\* showing a remarkable level of correlation. However, the coefficient of human capital and relational capital is 0.026 showing a low level of correlation.

Table 5 shows the results of correlation analysis between various sub-dimensions of intellectual capital and dimension of university performance. There are high positive correlations between “university performance” and “customer knowledge (rc3)” under relational capital, “Strategic alliances, licensing and agreement(rc1)” under relational capital, and “systems and programs (sc1)” under structural capital, with the coefficients separately up to 0.527\*\*, 0.506\*\* and 0.416\*\* respectively.

In addition, table 5 also shows the negative correlations among various sub-dimensions of intellectual capital. There is low negative correlation between “learning and education (hc1)” under human capital and “Customer knowledge (rc3)” under relational capital which is -0.240\*\*. There is low negative correlation between “experience and expertise (hc2)” under human capital and “Intellectual Property Rights (sc3)” under structural capital which is -0.352\*\*. There is low negative correlation between “Innovation

and creation (hc3)” under human capital and “Customer knowledge (rc3)” under relational capital which is  $-0.260^{**}$ . Also, there is low negative correlation between “research & development (sc2)” under structural capital and “customer knowledge (rc3)” under relational capital which is  $-0.262^{**}$ . In addition, there is moderate negative correlation between “experience and expertise (hc2)” under human capital and “customer knowledge (rc3)” under relational capital which is  $-0.590^{**}$ .

## Regression Analysis

For the section of regression analysis, the researcher separates it into two parts.

(1) University performance vs. three dimensions of intellectual capital University performance is regressed against three dimensions of intellectual capital namely (human capital, structural capital and relational capital).

The equation for university performance is expressed by the following regression equation:

$$Y_s = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3, \text{ where}$$

$Y_s$  – University performance,

$X_1$  – Human capital,

$X_2$  – Structural capital,

$X_3$  – Relational capital,

$b_0$  – constant (coefficient of intercept).

$b_1, b_2, b_3$  – regression coefficient of three dimensions,

Table 6 shows summary of the regression model. To predict the goodness-of fit of the regression model, the correlation coefficient (R), coefficient of determination ( $R^2$ ), and F ratio are examined in Table 6. First, the R of independent variables (human capital, structural capital and relational capital) on the dependent variable (university performance, or  $Y_s$ ) is 0.550, which shows that the university performance has positive and high overall association with the three dimensions. Second, the  $R^2$  is 0.302, suggesting that more than 30% of the variation of university performance is explained by the three dimensions. Last, the F ratio in Table 7, which explains whether the results of the regression model could have occurred by chance, has a value of 18.322 ( $p = 0.00$ ) and is considered significant. The regression model achieves a satisfactory level of

goodness-of-fit in predicting the variance of university performance in relation to the three dimensions, as measured by the below – mentioned R, R<sup>2</sup>, and F ratio. In other words, at least one of the three dimensions is important in contributing to university performance. Table 8 presents the regression analysis, the beta coefficients can be used to explain the relative importance of the three dimensions (independent variables) in contributing to the variance in university performance (dependent variable). As far as the relative importance of the three intellectual capital dimensions is concerned, relational capital, B3=0.412, p=0.000) carries the heaviest weight for university performance, followed by structural capital, B2=0.159, p=0.130, and human capital, B1=0.121, p=0.132. The results shows that a one-unit increase in relational capital will lead to a 0.412 unit increase in university performance, one-unit increase in structural capital would lead to a 0.159 unit increase in university performance, one-unit increase in human capital would lead to a 0.121 unit increase in university performance. In conclusion, the results of multiple regression analysis agree hypothesis 4 (Human capital is positively associated with university performance), 5 (Structural capital is positively associated with university performance) and 6 (Relational capital is positively associated with university performance), that there is relationship between intellectual capital dimensions and the overall university performance. So, there is a relationship, which is what the researcher expected.

## (2) University performance vs. intellectual capital

University performance is regressed against intellectual capital. The regression model is represented as follows:

$$IC = a_0 + a_1 HC + a_2 SC + a_3 RC$$

$$Y_1 = b_0 + b_1 IC$$

Where:

IC - Intellectual capital,

Y1 – University performance,

HC – Human capital,

SC – structural capital,

RC – relational capital,

a<sub>0</sub>, b<sub>0</sub> – constant (coefficient of intercept),

a<sub>1</sub>, a<sub>2</sub>, a<sub>3</sub>, b<sub>1</sub> – coefficient for each of the independent variables.

Table 9 presents summary of regression model result. The value of R and  $R^2$  are 0.518 and 0.268 respectively. The R value of 0.518 represents the correlation between university performance and the intellectual capital. The  $R^2$  which indicates the explanatory power of the independent variables is 0.268. This means that about twenty-seven percent of the variation in university performance is explained by the independent variable. The  $R^2$  value as revealed by the result is not so high which means that about seventy-three percent (73%) of the variation in the dependent variable is unexplained by the model. The standard error of the estimate is 0.391, which explains how representative the sample is likely to be of the population. The strength of the model was also considered by examining the goodness-of-fit of the model. Results show that that model designed for the study is good as evidenced by the result in Table 10 which has F value of 47.234 and  $p = 0.000$ . Table 11 shows the results of the coefficients of regression model with university performance as dependent variable. The beta coefficient for intellectual capital is 0.518,  $p = 0.000$ . It can be deduced from the results that intellectual capital impact positively and significantly on university performance. The result also reveals support for hypothesis 7 (Intellectual capital is positively associated with university performance).

## Results

The results pinpoint that the three constructs (human capital, structural capital and relational capital) that forms intellectual capital correlated one another. Two paths (human capital to structural capital, structural capital to relational capital) have shown significance, although human capital might not correlate relational capital at a very significant level.

In addition, after analysis of the theoretical model, it is found that, among the 4 paths to university performance (intellectual capital, human capital, structural capital, and relational capital), the path of intellectual capital and relational capital to university performance are obvious, they have a direct and significant influence on university performance, with a beta coefficient of 0.518\*\* and 0.412\*\* respectively. These also prove that of intellectual capital and relational capital have direct cause-effect relationships with university performance more than the others.

## Discussion and Recommendations

The researcher found that all of the hypotheses were supported except hypothesis 2 (H2. Human capital is positively associated with relational capital). This finding was similar to the work of Shih Chen, and Morrison in 2010. They explored the impact of IC on business performance in Taiwanese design industry and found that for some companies that had not much employees, human capital was not positively associated with relational capital too. Unlike the samples of previous studies (Bontis, 1998; Bontis et al., 2000; Cabrita & Bontis, 2008; Chen, 2001), Thai private universities have many characteristics that are not possessed by other industries. Such as, in terms of the relationship between lecturers and their students, it is not really “customer service”. In Thai, this relationship are about teaching, educating and moreover it also concerns about “respect “more” than “service”. And because of the business issue, Thai private universities themselves need more profit so one lecturer has to lecture and take care students more than 100 students per one class, thus, how do they know each other well. For these reasons, it is not surprising for this study that why hypothesis 2 was failed (especially, in “Customer and supplier relations”(rc2) and “Customer knowledge(rc3)”. But one limitation lies in the results is that the samples in the study contain only Thai private universities that situated in Bangkok. It is possible that Thai private universities in other areas of Thailand, whose human capital has significant influence on relational capital. That is to say, an inclusion of these samples might lead to different research results.

However, among human capital, structural capital and relational capital of Thai private universities, the relational capital has a direct and substantial influence on university performance more than the others. This indicates that improving relational capital performance will directly contribute to university performance. Furthermore, the human capital has an influence especially on structural capital. The theoretical model shows some important paths respectively, ie structural capital ➡ relational capital; human capital ➡ structural capital.

In conclusion, the empirical findings of this research suggests that the human capital of Thai private universities have positive influence on structural capital, and structural capital have positive impact on relational capital. The path of human capital to relational capital and structural capital to university performance is not shown to be

significant. However, relational capital is a significant mediator that contributes to Thai private universities' performance instead of structural capital. That is to say, the talents of Thai private universities are helpful in building the universities—information systems, routines, procedures and databases—instead of maintaining good relationship with the organizations' stakeholders. However, good relationship with the universities' customer, competitor, and sector association is vital to Thai private universities' good performance.

Furthermore, the empirical findings of this research are also in support of the fact that the human capital of Thai private universities has positive influence on structural capital and relational capital (the mediators). Structural capital also positively influences relational capital as hypothesized. Besides, relational capital shows a positive association with university performance, while the positive impact of structural capital on university performance is not significant. This might result from the characteristics of Thai private universities' organizational structure. Their organic structure brought the university the advantage of high flexibility and adaptability, however, the efficiency of the organization is sacrificed as it is difficult and it takes much cost to maintain such a structure.

The previous empirical research present that human capital has an influence on structural capital and relational capital (Bontis, 2001). For this reason, the universities should make additional investment in this area, for example, to strengthen innovation and creation, universities should support employee education and the training system and also university's employees should be continuously encouraged and motivated to bring new knowledge and ideas to the business and commit to share their knowledge with their colleagues.

In addition, similar to others researches, the researcher might conclude that intellectual capital considerably contributes to an improved competitive position of the university. Moreover, intellectual capital enables the university to enhance more value to significant status thus leads to increase its competitive advantages. The value added beginnings from the improvement of effectiveness and efficiency of organizational routines. Consequently, intellectual capital is the main factor in succeeding in that. To gain competitive advantage it is critical for the university to apply knowledge professionally and to develop their innovation potential. Managing intellectual capital is therefore becoming increasingly important for every oriented organization.

As being the educational sector which specialized in providing knowledge services, the most valued asset is the knowledge and experience of the employees. Therefore, the researcher would like to propose the policy recommendations - the first and major step is the university must promote and support all human capital and then allow it to be utilized through structural capital and relational capital, for example through structural capital: by storing systematically the academic documents and records well. Through relational capital: by focusing more on strategic alliances, licensing and agreement with its partners.

For future research, it will be needed to point out the positive and negative correlations among subfactors which may be affected by the differences of positions, organizations, cultures such as good to prove if the 3 components of IC working together or not for the Thais in Thai culture.

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## Appendix

**Table 2:** Summary of Survey Items

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### Human capital

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1. competence ideal level (from Bontis, et al., 2000)
2. employees cooperate in team (from Bontis, et al., 2000)
3. employees undergo training programs (from Sharabati et al., 2010)
4. employees learn from others (from Cabrita and Bontis, 2008)
5. The ratio of educated person (from Sharabati et al., 2010)
6. update and develops knowledge and skills (from Sharabati et al., 2010)
7. market share improving (from Cabrita and Bontis, 2008)
8. learning and education affect productivity (from Sharabati et al., 2010)
9. learning and education affect profitability (from Sharabati et al., 2010)
10. learning and education affect the external quality assurance
11. employees are experts (from Sharabati et al., 2010)
12. employees perform at their best (from Cabrita and Bontis, 2008)
13. employees generally give it their all (from Cabrita and Bontis, 2008)
14. turnover is low (from Sharabati et al., 2010)
15. university being efficient (from Bontis, et al., 2000)
16. employees are professional (from Sharabati et al., 2010)
17. lowest costs per transaction (from Bontis, et al., 2000)
18. experience and expertise affect productivity (from Sharabati et al., 2010)
19. experience and expertise affect profitability (from Sharabati et al., 2010)
20. experience and expertise affect the external quality assurance
21. employees are creative and bright (from Bontis, et al., 2000)
22. employees voice their opinions (from Cabrita and Bontis, 2008)
23. employees come up with new ideas (from Cabrita and Bontis, 2008)
24. new projects are launched (from Sharabati et al., 2010)
25. employees are encouraged to bring and share new knowledge and ideas  
(from Bontis, et al., 2000)
26. employees are satisfied (from Bontis, et al., 2000)
27. employees are motivated and committed to share new great ideas  
(from Sharabati et al., 2010)

28. innovation and creation affect productivity (from Sharabati et al., 2010)
29. innovation and creation affect profitability (from Sharabati et al., 2010)
30. innovation and creation affect the external quality assurance

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### **Structural capital**

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1. succession training programs (from Bontis, et al., 2000)
2. culture and atmosphere are supportive (from Bontis, et al., 2000)
3. recruitment programs are comprehensive (from Cabrita and Bontis, 2008)
4. well-developed reward system (from Sharabati et al., 2010)
5. upgrading employees skills and education (from Cabrita and Bontis, 2008)
6. sufficient influence over decisions made (from Sharabati et al., 2010)
7. not a “bureaucratic nightmare” (from Cabrita and Bontis, 2008)
8. systems and programs affect productivity (from Sharabati et al., 2010)
9. systems and programs affect profitability (from Sharabati et al., 2010)
10. systems and programs affect the external quality assurance
11. research leader (from Sharabati et al., 2010)
12. develops work processes (from Sharabati et al., 2010)
13. develops and re-organizes based on R&D (from Sharabati et al., 2010)
14. follows up and adopts the latest scientific and technical development (from Sharabati et al., 2010)
15. systems and procedures support innovation (from Cabrita and Bontis, 2008)
16. appropriate and adequate budget for R&D (from Sharabati et al., 2010)
17. management trust and support the R&D department (from Sharabati et al., 2010)
18. R&D affects university’s productivity (from Sharabati et al., 2010)
19. R&D affects university’s profitability (from Sharabati et al., 2010)
20. R&D affects university’s the external quality assurance
21. clear strategies and procedures for IPRs management (from Sharabati et al., 2010)
22. monitors performance of the IPRs portfolio (from Sharabati et al., 2010)
23. licensing IPRs create new organizations (from Sharabati et al., 2010)
24. encourages and rewards creation (from Sharabati et al., 2010)
25. IP is a key intellectual asset (from Sharabati et al., 2010)
26. utilizes the IPRs to maximum level (from Sharabati et al., 2010)
27. high number of IPRs per year (from Sharabati et al., 2010)

28. IPRs affect university's productivity (from Sharabati et al., 2010)
29. IPRs affect university's profitability (from Sharabati et al., 2010)
30. IPRs affect university's the external quality assurance

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### Relational capital

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1. working on joint projects with many organizations (from Sharabati et al., 2010)
2. university has diverse distribution channels (from Sharabati et al., 2010)
3. ratio of business is done with strategic alliances (from Sharabati et al., 2010)
4. university has many and diverse alliances (from Sharabati et al., 2010)
5. People from outside are consulted when decisions are made (from Sharabati et al., 2010)
6. able to learn and add value through its partners (from Sharabati et al., 2010)
7. prides on being partnership-oriented (from Sharabati et al., 2010)
8. strategic alliances affect productivity (from Sharabati et al., 2010)
9. strategic alliances affect profitability (from Sharabati et al., 2010)
10. strategic alliances affect the external quality assurance
11. customers be loyal (from Cabrita and Bontis, 2008)
12. customers have selected university's products (from Bontis, et al., 2000)
13. capitalizes on customers' wants and needs (from Bontis, et al., 2000)
14. devotes time to select suppliers (from Sharabati et al., 2010)
15. long-standing relationship with suppliers (from Sharabati et al., 2010)
16. reduce time to resolve customer's problem (from Cabrita and Bontis, 2008)
17. feels confident with their customers (from Cabrita and Bontis, 2008)
18. relationship with customer and supplier affects university's productivity (from Sharabati et al., 2010)
19. relationship with customer and supplier affects university's profitability (from Sharabati et al., 2010)
20. relationship with customer and supplier affects the external quality assurance
21. share knowledge with its partners (from Sharabati et al., 2010)
22. gets feedback from customers (from Cabrita and Bontis, 2008)
23. customer knowledge is distributed (from Bontis, et al., 2000)
24. Data of customers are updated (from Sharabati et al., 2010)
25. complete data about the suppliers (from Sharabati et al., 2010)
26. meets with customers (from Cabrita and Bontis, 2008)

27. information system in use (from Sharabati et al., 2010)
28. knowledge about customers and suppliers affects productivity (from Sharabati et al., 2010)
29. knowledge about customers and suppliers affects profitability (from Sharabati et al., 2010)
30. knowledge about customers and suppliers affects the external quality assurance

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**University performance** (from Sharabati et al., 2010)

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1. industry leadership
  2. future outlook
  3. response to competition
  4. rate in new product launches
  5. business performance and success
  6. employee productivity
  7. process (transaction) productivity
  8. sales growth
  9. profit growth
  10. university's the external quality assurance
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**Table 3:** Reliability and Average Score of Various Dimensions and Sub-dimension in the Scale

Dimension/sub-dimension	Cronbach's a	Mean	S.D.
<b>Human capital</b>	0.796	3.84	0.39
Learning and education(hc1)	0.766	3.95	0.39
Experience and expertise(hc2)	0.548	3.96	0.38
Innovation and creation(hc3)	0.394	3.63	0.33
<b>Structural capital</b>	0.913	3.46	0.63
Systems and programs(sc1)	0.685	3.94	0.36
Research & development(sc2)	0.907	3.72	0.37
Intellectual Property Rights(sc3)	0.983	2.71	0.28
<b>Relational capital</b>	0.780	3.98	0.29
Strategic alliances, licensing and agreement(rc1)	0.692	4.14	0.31
Customer and supplier relations(rc2)	0.750	4.00	0.30
Customer knowledge(rc3)	0.901	3.80	0.16
<b>University performance(up)</b>	0.857	3.86	0.31

**Table 4:** Correlation Matrix of Measured Dimensions

		up1	ic	hctotal	sctotal	rctotal
up1	Pearson Correlation	1	.518**	.154	.458**	.511**
ic	Pearson Correlation	.518**	1	.462**	.732**	.758**
hctotal	Pearson Correlation	.154	.462**	1	.270**	.026
sctotal	Pearson Correlation	.458**	.732**	.270**	1	.645**
rctotal	Pearson Correlation	.511**	.758**	.026	.645**	1

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

**Table 5:** Correlations Matrix of Measured Sub-dimensions

	up1	ic	hc1	hc2	hc3	sc1	sc2	sc3	rc1	rc2	rc3
up1	1	.518**	.301**	-.059	.146	.416**	.289**	.354**	.506**	-.042	.527**
ic	.518**	1	.392**	.231**	.578**	.739**	.538**	.777**	.485**	.769**	.451**
hc1	.301**	.392**	1	.844**	.628**	.427**	.623**	-.217*	.314**	.315**	-.240**
hc2	-.059	.231**	.844**	1	.596**	.397**	.589**	-.352**	.239**	.313**	-.590**
hc3	.146	.578**	.628**	.596**	1	.320**	.832**	.184*	.102	.519**	-.260**
sc1	.416**	.739**	.427**	.397**	.320**	1	.333**	.403**	.628**	.455**	.140
sc2	.289**	.538**	.623**	.589**	.832**	.333**	1	.171	-.012	.363**	-.262**
sc3	.354**	.777**	-.217*	-.352**	.184*	.403**	.171	1	.151	.589**	.715**
rc1	.506**	.485**	.314**	.239**	.102	.628**	-.012	.151	1	.226**	.179*
rc2	-.042	.769**	.315**	.313**	.519**	.455**	.363**	.589**	.226**	1	.237**
rc3	.527**	.451**	-.240**	-.590**	-.260**	.140	-.262**	.715**	.179*	.237**	1

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

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

**Table 6:** Summary of Regression Model

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.550 <sup>a</sup>	.302	.286	.38474

Note: a. Predictors: (Constant), rctotal, hctotal, sctotal

**Table 7:** Summary of ANOVA

ANOVA <sup>b</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.136	3	2.712	18.322	.000 <sup>a</sup>
	Residual	18.799	127	.148		
	Total	26.936	130			

Note: a. Predictors: (Constant), rctotal, hctotal, sctotal

b. Dependent Variable: up1

**Table 8:** Summary of Coefficients of Regression Model

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients		
1	(Constant)	.497	.618		.805	.422
	hctotal	.144	.095	.121	1.515	.132
	sctotal	.117	.077	.159	1.522	.130
	rctotal	.596	.146	.412	4.084	.000

Note: a. Dependent Variable: up1

**Table 9:** Summary of Regression Model

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.518 <sup>a</sup>	.268	.262	.39095

Note: a. Predictors: (Constant), ic

**Table 10:** Summary of ANOVA

ANOVA <sup>b</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.219	1	7.219	47.234	.000 <sup>a</sup>
	Residual	19.716	129	.153		
	Total	26.936	130			

Note: a. Predictors: (Constant), ic

b. Dependent Variable: up1

**Table 11:** Summary of Coefficients of Regression Model

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	.980	.420		2.336	.021
	ic	.764	.111	.518	6.873	.000

Note: a. Dependent Variable: up1