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# Intellectual Capital and Financial Returns of Companies

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**Abstract:** *Purpose – The purpose of the paper is to investigate the association between the intellectual capital (IC) of firms and their financial performance.*
*Design/methodology/approach – The paper uses the Pulic framework, has an Asian focus, and draws on data from 150 publicly listed companies on the Singapore Exchange. It is an empirical study using partial least squares (PLS) for the data analysis. The paper tests four elements of IC and company performance.*
*Findings – The findings show that: IC and company performance are positively related; IC is correlated to future company performance; the rate of growth of a company's IC is positively related to the company's performance; and the contribution of IC to company performance differs by industry.*
*Research limitations/implications – The data sample is restricted to 150 companies listed on the Singapore Exchange between the years 2000 and 2002.*
*Practical implications – IC is an area of interest to numerous parties, such as shareholders, institutional investors, scholars, policymakers and managers. The findings help to embolden modern day managers to better harness and manage IC.*
*Originality/value – The study of IC has undergone a number of stages, from early conscious awareness efforts to classification of IC, and to the search for appropriate measures of IC. This paper builds on the current research on IC and provides empirical evidence on the relevance of IC (as measured by the Pulic model) to the financial performance of companies...*

**Keywords:** Intellectual capital, Company performance, Regression analysis

## I. INTRODUCTION

The rise of the "new economy", one principally driven by information and knowledge, has led to an increased interest in intellectual capital (IC) (Stewart, 1997; Thurow, 1999; Petty and Guthrie, 2000; Bontis, 2001). An area that has captured the interest of a number of scholars and practitioners is the utility of IC as an instrument for determining enterprise value (Stewart, 1997; Edvinsson and Malone, 1997; Sveiby, 1998; Thurow, 1999; Lev and Feng, 2001; Guthrie, 2001). This has been a vexed issue, with some writers suggesting that established management and reporting systems are increasingly losing their relevance because they are unable to provide executives with information that is essential for managing knowledge-based processes and intangible resources (Bornemann and Leitner, 2002).

Historically, the distinction between intangible assets and IC has been, at best, vague with intangibles, including IC, being referred to as "goodwill" (Accounting Principles Board, 1970; Accounting Standards Board, 1997; International Accounting Standards Committee, 1998). This can be traced back to the early 1980s when the general notion of intangible value, often labelled as goodwill, began to surface in accounting and business practices (International Federation of Accountants, 1998).

However, traditional accounting practice does not provide for the identification and measurement of these intangibles in organisations, especially knowledge-based organisations (Guthrie et al., 1999; International Federation of Accountants, 1998; Society of Management Accountants of Canada, 1998). New intangibles such as staff competencies, customer relationships, simulation models, computer and administrative systems receive no recognition in the traditional financial and management reporting models (Stewart, 1997, pp. 56-9). Interestingly, even traditional intangibles such as brand equity, patents, and goodwill are rarely reported in the financial statements (International Federation of Accountants, 1998; International Accounting Standards Committee, 1998). In fact, International Accounting Standard

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IAS 38, Intangible Assets, prohibits the recognition of internally generated brands, mastheads, publishing titles, and customer lists. (International Accounting Standards Board, 2004)

The objective of this paper is to empirically examine the relationship between an extant measure of IC – the Value Added Intellectual Coefficiente developed by Pulic (1998) – and traditional measures of corporate performance:

(1) return on equity (ROE);
(2) earning per share (EPS); and
(3) annual share returns (ASR).

The paper also explores the different contributions made by IC to companies operating in different industries. Data for the analysis are drawn from a sample of 150 publicly listed companies from the Singapore Exchange for 2000 and 2002. The first date is associated with the introduction of new reporting requirements in Singapore, requirements that included a number of measures necessary for the Pulic model that informs the paper's methodology. The last date coincides with data availability at the time of writing. Singapore is chosen because of that country's stated objective of developing that country as an important centre in the knowledge economy.

The paper is broken into seven substantive parts. Following this introductory section, the next section examines various classifications and measures that have been used for IC. This is followed by an exposition of the Pulic model that forms the basis of this paper. Section 4 details the research questions examined in this paper and the various measures used. Section 5 describes the methodology used and the results of the data analysis are detailed in Section 6. The final section is by way of summary and conclusion.

## II. CLASSIFYING AND MEASURING IC

There has been an epidemic of research into IC in recent years that has transformed both its focus and scope. The research has also led to a number of frameworks for classifying and measuring the concept. The classificatory models that have been developed include Petrash's (1996) Value Platform model. This classifies IC as the sum of human capital, organisational capital and customer capital. Edvinsson and Malone (1997) developed the Skandia Value Scheme, which classifies IC into structural capital and human capital. Haanes and Lowendahl (1997) classify the IC of a company into competence and relational resources. The Lowendahl's (1997) model refines the above model and divides the competence and relational categories into two subgroups:

(1) individual; and
(2) collective.

Stewart (1997) classifies IC into three basic forms:

(1) human capital;
(2) structural capital; and
(3) customer capital.

The Danish Confederation of Trade Unions (1999) classifies IC as people, system and market. The European Commission (MERITUM, 2001) classifies IC as human capital, structural capital and relationship capital. Leliaert et al. (2003) developed the 4-Leaf model, which classifies IC into human, customer, structural capital and strategic alliance capital. This non-exhaustive list serves to show the similarities and differences in the classificatory systems that have been developed.

IC measuring methods can be grouped broadly under two categories:

(1) those that do not use a monetary valuation of IC; and
(2) those that put a monetary value on IC.

The latter includes not only methods that attempt to estimate dollar values of IC, but also those that derive the monetary values through the use of financial ratios. A selective list of key measures is shown below.

The key non-dollar valuation of IC models are:

the Balance Scorecard, developed by Kaplan and Norton (1992);
Brooking's (1996) Technology Broker method;
the Edvinssion and Malone (1997) Skandia IC Report method;
the IC-Index developed by Roos et al. (1997);
Sveiby's (1997) Intangible Asset Monitor approach;

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the Heuristic Frame developed by Joia (2000);
Vanderkaay's (2000) Vital Sign Scorecard; and
the Ernst & Young Model (Barsky and Marchant, 2000).
The key dollar valuation of IC models are:
the EVA and MVA model (Bontis et al., 1999);
the Market-to-Book Value model (various authors);
Tobin's q method (Luthy, 1998);
Pulic's VAICTM Model (1998, 2000);
calculated intangible value (Dzinkowski, 2000); and
the Knowledge Capital Earnings model (Lev and Feng, 2001).
Other methods from accounting bodies and practitioners are:
Human Resource Costing & Accounting (Johanson and Grojer, 1998);
Accounting for the Future (Nash, 1998);
Total Value Creation (McLean, 1999); and
The Value Explorere and Weightless Weights (Andriessen and Tissen, 2000; Andriessen, 2001).

The measuring techniques for IC are still evolving and researchers are now attempting to apply the concept to competitive advantage. The classificatory and measurement model of interest to this paper is the Pulic model. This is outlined in the next section.

## III. THE PULIC MODEL

Pulic (1998, 2000) developed the "Value Added Intellectual Coefficient" (VAICe) to measure the IC of companies. He is concerned with two other important aspects of valuation and value creation yet unsolved by other methods:
(1) Market-based IC value cannot be calculated for companies that are not listed on the stock market. Such companies need an alternative way to determine their market-based IC value.
(2) There is no adequate system of monitoring the efficiency of current business activities performed by employees, or whether their potential is directed towards value creation or value destruction.
The VAICe method is designed to provide information about the value creation efficiency of tangible and intangible assets within a company. The model starts with a company's ability to create value added (VA). VA is the difference between sales (OUT) and inputs (IN) and is represented by the following equation:

VA ¼ OUT 2 IN.

Outputs (OUT) represent the revenue and comprise all the products and services sold on the market. Inputs (IN) contain all the expenses incurred in earning the revenue except manpower costs. It is important to note that in this model labour expenses are not included in IN. Due to its active role in the value creating process, intellectual potential (represented by labour expenses) is not counted as a cost. Thus, a key aspect in Pulic's method is to treat labour as a value creating entity. The result is that VA expresses the new created wealth of a period. VA is influenced by the efficiency of Human Capital (HC) and Structural Capital (SC).
The second relation of VA, one employing physical capital (CA), is called the 'value added capital coefficient' (VACA). This is an indicator for the VA created by one unit of physical capital:
Pulic assumes that if a unit of CA generates greater returns in one company than another, then the first company is better at utilisation of its CA. Thus, better utilisation of CA is part of the IC of companies. When compared over a group of companies, VACA becomes an indicator of the intellectual abilities of the company to better harness physical capital. The next relation is VA and HC. The 'human capital coefficient' (VAHU) shows how much VA is created by a dollar spent on employees. The relation between VA and HC indicates the ability of HC to create value in a company. Consistent with views of other leading IC authors (Edvinsson, 1997; Sveiby, 1998), Pulic (1998) argues that total salary and wage costs are an indicator of a firm's HC. Pulic posits that since the market determines salaries as a result of performance, it is only logical that the success of HC should be expressed by the same criteria. Thus, the relation between VA and HC indicates the ability of HC to create value in a company:

VAHU ¼ VA/HC.

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Similarly, when VAHU is compared over a group of companies, VAHU becomes an indicator of the quality of the human resources of the company and their abilities to generate VA for every dollar spent on HC.

The third relation is "structural capital coefficient" (STVA), which shows the contribution of structural capital (SC) in value creation. In Pulic's model, SC is VA minus HC. The lesser the contribution of HC in value creation the greater is the contribution of SC. According to Pulic (2000), this has been verified by empirical research that shows in traditional industrial sectors. In heavy industry and mining for example, VA is only slightly bigger than HC with an insignificant SC component. On the other hand, in the pharmaceutical industry and software sectors, an entirely different situation is observed. HC creates only 25-40 percent of the entire VA and the major contribution is due to SC. Therefore, the third relation between VA and employed SC is calculated in a different way because HC and SC are in reverse proportion as far as value creation is concerned. STVA measures the amount of SC needed to generate a dollar of VA and is an indication of how successful SC is in value creation. Unlike VACA and VAHU, VA is in the denominator for STVA. Thus, the third relation between VA and SC is calculated as:

STVA = SC/VA.

The final ratio is the calculation of the intellectual ability of a company. It is the sum of the previously mentioned coefficients. This results in a new and unique indicator – the VAICe:

VAICe = VACA + VAHU + STVA.

Pulic's method has the attraction of ease of data acquisition and enables further analysis to be conducted on other data sources. Data needed to derive the various ratios are standard financial numbers that are normally available from audited financial reports of companies. Alternative IC measures are limited in that they involve unique financial and non-financial indicators and are usually customised to fit the profile of individual firms (Roos et al., 1997). Some of these indicators, especially non-financial ones, are not readily available or may not be recorded by other firms. Consequently, the ability to apply alternative IC measures consistently across large and diversified samples for comparative analysis is diminished (Firer and Williams, 2003). Also, to enhance the external validity of a study, data sources must be available for a sufficient sample size and tests can be replicated to other data sources.

## IV. RESEARCH QUESTIONS AND MEASURES

Using Pulic's model, this paper addresses four research propositions:

H1. There is a positive correlation between a company's IC and its performance.

H2. The higher the value of a company's IC, the higher the company's future performance.

H3. There is a positive correlation between the rate-of-growth of a company's IC and the company's future performance.

H4. The contribution of IC to a company's future performance will differ by industry.

The statistical validation test for H1 is contemporaneous, namely company's performance correlated with same year data of IC. Contemporaneous correlation indicates the relevance of the information to investors (Lev and Feng, 2001). However, if the information is already priced, its value will be minimal to investors. To test whether IC can be used to gain "abnormal returns" one must use a multi-period predictive test (Lev and Feng, 2001). H2 is formed to test for the predictive capability of IC. If IC is a major driver of corporate value, then logically the growth rate of IC should also correlate with the increase in future performance. H3 will be tested to validate this prediction. Although IC is seen to be crucial to the success of companies, other assets and capabilities will also contribute to the profitability and market value of companies. Hence, companies from different industries will have a different range of assets and capabilities to operate their businesses and compete effectively. Some will rely more on IC, while others will depend more on their financial or physical assets for their success. H4 is formulated to test whether the contribution of IC differs for companies from different industries.

The Pulic model determines that measures for the IC of a company will be VACA, VAHU and STVA. The rate of growth of IC (ROGIC) is taken to be the year-on-year growth rate of VACA, VAHU and STVA of the company.

Thus, for the purpose of this research, three financial ratios are selected as proxy measures for a company's performance. These cover return on investments, earnings and also the shares' performance on the stock market:

(1) Return on equity (ROE) measures how much profit a company can generate for each dollar of shareholders' equity. ROE is a profitability ratio relating profits to investments. This ratio provides an indication on the earning power of

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shareholders' book investment and is frequently used when comparing two or more firms in an industry (Van Horne, 1989, p. 129). ROE is also chosen instead of rate of return on assets (ROA) because a company's assets are used in deriving VACA. Thus, to minimise possible multicollinearity, ROE is selected. The formula to obtain the ROE is:

Profit to shareholders ROE = Total shareholder's funds .

(2) Earnings per share (EPS) is a commonly used measure by analysts in the evaluation of companies in the financial market. It is also a requirement for companies listed on the Singapore Stock Exchange (SGX) to state EPS in companies' annual reports. It gives a measure of profitability that incorporates the result of operating, investing, and financing decisions (Stickney and Weil, 1997, p. 288). Also, EPS is a compulsory disclosure item in the quarterly and annual reports for all companies listed on the SGX (Singapore Stock Exchange, 2003). It is a commonly cited item in most analysts' reports and recommendations in Singapore. The formula to obtain the EPS is:

Profit to shareholders

EPS = Weighted average number of shares .

(3) Annual stock return (ASR) – measures the changes in stock price inclusive of dividends and adjusted for any stock splits. The total return from owning stock arises from two sources: dividends and other cash distributions, and capital gains (Siegel, 2002). Thus, the formula to obtain the ASR is:

[Share price (year x + 1) 2 Share price (year x)] + Dividends

## V. METHODOLOGY

The data is gathered from 150 companies publicly listed on the SGX. At the start of year 2000, there were a total of 327 companies listed on the main-board of the SGX. Table I summarises the companies list on the main-board of the SGX at the start of 2000.

Not all companies are useable for this study, for a variety for reasons. The performance of a company is dependent on internal factors, but is also affected by

Table I.: Companies List on SGX in 2000

| Sector | Total number of companies | | Number of foreign companies | Singapore companies | Available companies |
|---|---|---|---|---|---|
| 1 Multi-industry | 19 | 1 | 18 | 13 | |
| 2 Manufacturing | 110 | 25 | 85 | 49 | |
| 3 Commerce | 43 | 8 | 35 | 23 | |
| 4 Tpt/Stor/Comm | 24 | 4 | 20 | 12 | |
| 5 Finance | 47 | 12 | 35 | 10 | |
| 6 Construction | 23 | 2 | 21 | 10 | |
| 7 Properties | 27 | 3 | 24 | 12 | |
| 8 Hotels/restaurants | 17 | 2 | 15 | 9 | |
| 9 Services | 14 | 2 | 12 | 12 | |
| 10 Others | 3 | 2 | 1 | 0 | |
| Total | 327 | 61 | 266 | 150 | |

Source: Singapore Stock Exchange (2000)

external factors that may be beyond the company's control. To isolate the effect of external factors, companies to be analysed will be Singapore companies, listed on the main-board of the SGX and which generate most of their revenue from the local market. There were a total of 61 foreign companies listed on the SGX at the start of year 2000. These were eliminated from the sample.

Also, over the three-year period from 2000 to 2002, several companies were delisted, merged or acquired. Some companies which incurred huge losses and whose balance sheets degenerated into negative net worth were eliminated. A few companies were also suspended from trading while others did not submit their annual reports for at least one of the three years to the SGX. Further, some companies did not register any trading of their shares for a whole year, and so it is impossible to determine their ASR for that year. Given these limitations and constraints, all other remaining companies were selected which yielded a sample of 150 companies for this study.

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For this research, 450 annual reports from the 150 selected companies between 2000 and 2002 were gathered from the SGX. It is argued that 150 companies is a reasonable representation of the 327 companies listed on the SGX starting from the year 2000.

As some of the sectors are relatively small, the companies were grouped into four related industry groups to increase the sample size of each group. The groupings have merely brought companies in the SGX industries together. The number of companies from each sector is shown in Table II.

A two-fold approach was adopted to the analysis of the data. Initially this involved multiple regression using the following equation:

$Yi = b0 + b1VACA + b2VAHU + b3STVA + m;$

where Yi is the dependent variable (the dependent variables ROE, EPS and ASR were tested sequentially using the regression model), and the independent variables are VACA, VAHU and STVA were derived from information available in the companies' annual report for the years 2000 and 2001.

The results from using multiple regression were inconclusive. Of the 21 multiple regression tests conducted, only nine produced statistically significant results. The results were statistically significant for some years but were not for others. Thus, multiple regression was not considered adequate for this study and further analysis was undertaken using PLS. In this, the companies' performance was treated as a latent variable with ROE, EPS and ASR as indicators. The model treats both IC and a companies' performance as latent variables each with three indicators. Multiple regression is not able to provide this type of analysis.

## VI. SUMMARY AND CONCLUSIONS

Drawing upon a sample of 150 publicly listed companies on the Singapore Exchange, this paper has examined the relationship between IC and company performance. In doing so, it has examined four aspects of the relationship:

(1) a positive correlation between a company's IC and its performance;

(2) a positive relationship between increased value of a company's IC and that company's future performance;

(3) a positive correlation between the rate of growth of a company's IC and that company's future performance; and

(4) that the contribution of IC to company performance will differ from industry to industry.

There are a number of classifications and measures of IC. For the purposes of this paper the Pulic model was used. In this, the Value Added Intellectual Coefficient (VAICe) is used to measure the IC of companies. This method is designed to provide information about the value creation efficiency of tangible and intangible assets within a company during operations. In this model, the value added intellectual coefficient (VAICe) is the sum of three other coefficients:

(1) physical capital coefficient (VACA);

(2) the human capital coefficient (VAHU); and

(3) the structural capital coefficient (STVA).

The method has the attraction of ease of data acquisition and the development of ratios from standard financial data available in company annual reports.

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