

無形資產價值創造決定因子—電腦與週邊企業實證

Key Factors for Intangible Asset Value Creation: The Empirical Study of Computer and Peripheral Firms

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摘要: 世界及台灣科技百大企業其特質為何? 何者之無形資產價值較高? 而無形資產價值高低和入選科技百大企業是否有關聯? 本研究以科技百大企業中的電腦與週邊產業為研究對象, 採用 Sveiby 提出的評價方法, 市價/帳面價值(MV/BV)、Tobin's Q、智慧資本附加價值係數(VAICTM)三種方法, 計算國內外電腦與週邊企業的無形資產價值, 並進一步探討影響企業無形資產價值創造之組成因素, 瞭解其無形資產價值差異的原因。實證結果: 國外電腦與週邊企業無形資產創造的價值明顯優於台灣企業, 其中獲利能力為國內外企業影響無形資產價值創造的共同因素, 但因為對長期投資的看法不同、研發投入認列等問題, 導致無形資產價值創造影響因素有所差異, 而影響台灣企

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業能否追上國外企業的關鍵因素則為研發。

關鍵詞：電腦與週邊產業；無形資產；價值創造；智慧資本；科技百大企業

Abstract: *Business Week* and *Business Next* ranked the world Info Tech 100 and Taiwan Info Tech 100 firms by financial data. What the traits of the Info Tech 100 firms? Did they create more intangible asset value? We chose the Computer & Peripheral industry from the Info Tech 100 for the objects of study and used three methods, MV/BV, Tobin's Q, VAICTM, to evaluate their intangible asset values. Then compare the difference between foreign and domestic firms. The work is to find out the key factors for intangible asset value creation and analyze why the difference existed. The value of foreign firms is significant different from that of the domestic firms and foreign firms' value is higher than domestic firms'. Although financial performance is the same factor of foreign and domestic firms for creating intangible asset values, it the attitude about long term investment and inputs for innovation made the disparities of intangible asset values between foreign and domestic firms. R&D is the key point to short the distance between foreign and domestic firms.

Keywords : Computer and Peripheral Industry; Intangible Asset Value Creation; Intellectual Capital; Info Tech 100.

1. Introduction

In today's knowledge-driven economy, intangible assets are critical for business growth. We can foresee the intellectual resources will dominate future corporate development. The market value of Google in March 2005 was about 50 billion in NYSE. Its P/B ratio was about seventeen times. This tells us that the value of intellectual capital of a firm is existing. *Business Week* and *Business Next* ranked the world Info Tech 100 and Taiwan Info Tech 100 firms by financial data. What the traits of the Info Tech 100 firms? Did they create more intangible asset value? Because knowledge management is so critical today, companies must understand what their intangible assets are worth, how they are being valued, and from where in the company that value is being derived. Both theoretical reasoning and empirical evidence suggest that understanding the determinants of the value

of intangible assets is important to an organization's strategic management.

Taiwan's information electronics industry is a significant part of Taiwan's economy. The long development history of the industry gave birth to the comprehensive industry value chain among the computer and peripheral industries and the sophisticated global specialization. The computer and its peripheral industry is becoming a real global business in Taiwan and production value in 2006 over US\$ 90 billion. The study is based on the corporations which were among the world's top 100 technology corporations selected by *Business Week* and the computer and peripheral companies in the Taiwan top 100 technology corporations selected by *Business Next* from 2002-2006.

Accounting to Sveiby (2002), this study uses three different methods: market return methods MV/BV and Tobin's Q, and asset return methods VAIC™. These methods are applied to the companies each from Taiwan and global to compute the values of their intangible assets. Then compare the difference between foreign and domestic firms. The work is to find out the key factors for intangible asset value creation and analyze why the difference existed. Then, potential value determinants are extracted from financial and intellectual capital metrics using factor analysis. Finally, stepwise regression is used to estimate which of the potential determinants best explain intangible asset value and to what extent.

2. Valuation and Driving Factors of Intangible Assets

The most critical ingredients of firm resource endowment are not tangible such as financial or physical assets, but are intangible and thus rare, valuable, imperfectly imitable and non-substitutable (Barney, 1991). The arise of knowledge-based economy has highlighted the importance of control and management of intellectual resources to today's corporate competitiveness.

The intangible assets discussed in this work adopt the generalized definition that is intellectual capital. According to studies and definitions by Steward(1997), Edvinsson and Malone(1997), Johnson(1999), and Smith and Parr(2002), intellectual capital is comprised of three components: human capital, structural capital (organizational capital) and relational capital (customer capital). The term

human capital refers to the knowledge, seniority, mobility rate, skills, and experiences of the entire organization's staff and management. The term structural capital refers to the general system and procedures of the organization for problem-solving and innovation. It includes assessment of the stored knowledge value, the cycle of liquid capital, as well as accounting of administration expenses. Finally, the term relational capital refers to the organization's establishment, maintenance, and development of public relations matters, including the degree of customer, supplier, and strategic partner satisfaction, as well as the merger of value and customer loyalty.

According to Roos (1996,1997,1998) , intellectual capital and intangible assets theories fall into two areas: strategy and valuation. Using Luthy (1998) and William (2000) as a foundation, Sveiby (2002) organized the existing tools for measuring the value of a company's intangible assets value into four primary categories of 28 methods. This paper was to evaluate the results of three methods of quantifying intangible value when they are applied to the same knowledge-intensive industry.

Market Value/Book Value (MV/BV)

Steward(1997) pointed out if dividing a company's market capitalization by its book equity yields a quotient greater than one, there is intangible asset value in the company.

$$\frac{MV}{BV} = \frac{\text{Market Share Price} \times \text{Number of Common Shares Outstanding}}{\text{Total Assets} - \text{Total Liabilities}}$$

Tobin's Q

Nobel economist Tobin first developed this measure to help companies identify good investment or sell-off opportunities. Tobin's Q compares, through a ratio, the market value of the firm to its replacement cost. A value greater than one suggests that a company can purchase more assets because it is worth more than the price paid for their current ones. Because the original Tobin's Q is complicated to calculate, Chung and Stephen (1994) proposed an approximate q

that was shown to explain 96.6% of the variability of Tobin's Q. This study uses the approximate Tobin's Q for its computations

Approximate Tobin's Q = (MVE + PS + DEBT) / Total Asset Book Value;

where: MVE = share price × number of common shares outstanding;

PS = liquidating value of firm's outstanding preferred stock;

DEBT = (short-term liabilities – short-term assets) + book value of LT debt.

Value Added Intellectual Coefficient (VAIC™)

Management, stockholders, and other stakeholders use VAIC™ to how much and how efficiently surplus value is created from various forms of capital. Specifically, these various forms of capital are intellectual, structural, and financial capital (Pulic, 2000). Firer *et al.*, (2003) summarized arguments for using VAIC™. It is an appropriate standard for comparison across multi-national, multi-industry companies. VAIC™ uses audited financial data. Conceptually VAIC™ is easy for relevant stakeholders to grasp and easy to calculate (Pulic & Borneman, 1999; Pulic, 1998, 2000).

VA = Depreciation + Dividends + Taxes + Retained Earnings + Wages

VAIC™ = Capital Efficiency Index + Human Efficiency Index + Structural Efficiency Index

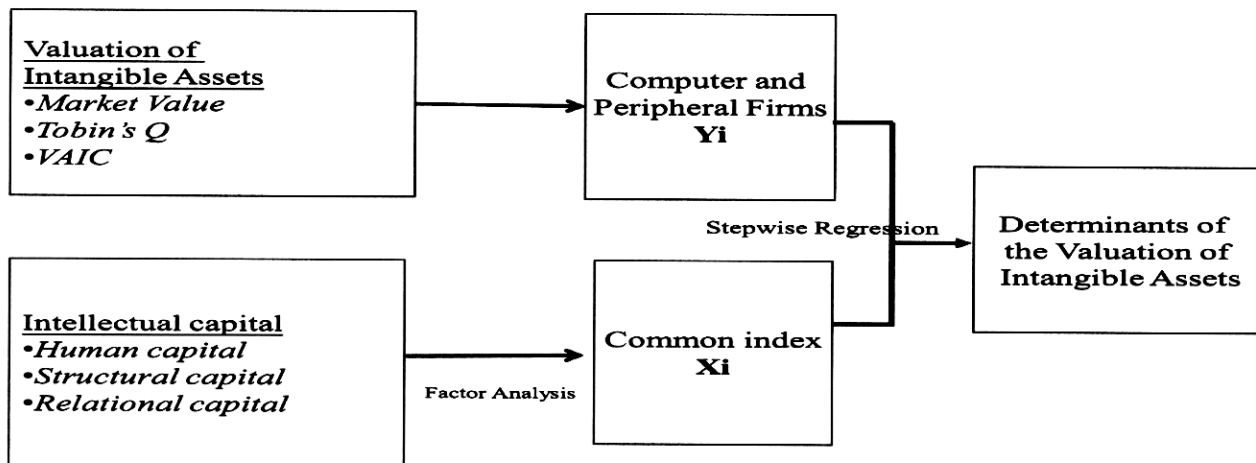
$$= \frac{VA}{\text{Book Equity}} + \frac{VA}{\text{Wages}} + \frac{VA - \text{Wages}}{VA}$$

3. Methodology

The study compares the creation factors of intangible assets between computer and peripheral companies in Taiwan and overseas and tries to carry out an in-depth analysis of the reasons behind the different factors. The study first selects the three types of quantitative evaluation methods for intangible assets to calculate the value of the intangible assets, which are then used as the variables in the regression formula. After that, 24 effect indexes from four major aspects are selected to find the 8 major common factors through factor analysis. Lastly, the

stepwise regression method is used to filter the variables in order to find the real driving factors for the value of intangible assets.

Figure 1
The framework of research



The samples are from the world's top 100 technology corporations selected by US magazine, *Business Week*, in 2002-2006, and the Taiwan company samples are from the Taiwan top 100 technology corporations selected by *Business Next* using the same criteria as *Business Week* during the same period. The financial raw data is from TEJ and Compustat data bases. As there are only a handful of corporations which were on the top 100 lists for 5 consecutive years and on both the Taiwan list and the world list, the study selects the corporations which were on either list at least two years from 2002-2006, in order to take in more samples. The study takes the broad definition for company and peripheral companies, so that all corporations that provide computer related products or services are all in the scope. As a result, the world-listed computer and peripheral corporations include computer and peripheral industry, service industry, communication industry and networking industry; while those on the Taiwan list include those in the computer and peripheral industry and electronic part industry.

The study isolates the dually listed Taiwan companies in the computer and

peripheral industry on the world list and Taiwan list of the top 100 corporations. This is aimed to achieve a clear picture of the different factors of intangible asset value between the computer and peripheral firms of Taiwan and the world through the information of the study. The study period is the five years from 2002-2006 and the samples are divided into three clusters, which are 29 World-listed companies, 54 Taiwan-listed companies and 12 dually listed companies (as shown in Appendix 1).

The study shows that the mean of the world-listed corporations is significantly higher than Taiwan-listed corporations through the MB/BV method. Under Tobin's Q, the value of the world-listed corporations is also higher than that of Taiwan-listed corporations. Through the VAIC method, the mean of the dually listed corporations is obviously higher than for the world-listed corporations and also with smaller standard deviation. As VAIC is to evaluate the value-creation ability and the operation performance of the corporations, and these are the strengths of Taiwan corporations, their VAIC is naturally higher (as shown in Appendix 2).

As suggested by the different valuation methods and results presented above, both financial capital and intellectual capital (structural, relational, and/or human) affect intangible asset value. These two arenas constituted the scope of measurement indices for this study. Based on the the related literatures and Edvinsson & Malone (1997), 24 variables were selected and their values calculated as a starting point for the next analysis. The mean values and standard deviations for the companies in each subject group are shown in Appendix 3.

4. Results

4.1. Factor Analysis on Financial and Intellectual Capital Items

This next section groups the 24 variables into sets through a process of elimination and then names each set according to the commonality of its contained variables. It is these sets, or attributes, which will be evaluated by stepwise regression as to how they contribute to the value of computer and

peripheral firms' intangible assets. These attribute sets will also facilitate discussing management implications.

Table 1
Summary of Factor Analysis

Set	Variable	Factor Loading	Attribute Name	Eigen-value	Percent of Variance	Cumulative Percent of Variance
Set 1	Revenue per employee	0.826	Worker Productivity (Human Capital)	3.238	13.493%	13.493%
	Assets per employee	0.821				
	OPEX per employee	-0.754				
	Revenue per employee	0.700				
	OPEX per employee	0.560				
	Total assets turnover	0.527				
Set 2	OPEX/Sales	0.848	R&D Resources (Human Capital)	2.887	12.029%	25.522%
	R&D exp./Total assets	0.805				
	R&D Expenses/Sales(%)	0.795				
	Employee count	0.697				
Set 3	Quick ratio	0.918	Solvency (Financial Capital)	2.678	11.160%	36.682%
	Current ratio	0.903				
	Debt to equity ratio	-0.601				
Set 4	ROE	0.937	Profitability (Financial Capital)	2.169	9.036%	45.718%
	ROA	0.866				
Set 5	Capital Structure Ratio	0.938	Equipment Sufficiency (Structural Capital)	2.155	8.981%	54.699%
	Fixed assets turnover	0.931				
Set 6	Fixed assets per employee	0.756	Resource Sufficiency (Structural Capital)	2.117	8.822%	63.522%
	EPS	0.729				
Set 7	Gross Margin Growth(%)	0.869	Sales Growth Rate (Relational Capital)	1.649	6.869%	70.391%
	Sales growth rate	0.637				
	Operating Profit Margin(%)	0.588				
Set 8	R&D Exp. / OPEX	-0.824	R&D Investment (Structural	1.464	6.098%	76.489%

Set	Variable	Factor Loading	Attribute Name	Eigen-value	Percent of Variance	Cumulative Percent of Variance
	R&D Exp./Net Income	0.555				

We used the standard rules for Principal Component Analysis and conducted orthogonal rotation with Varimax. Only those variables with Eigenvalues greater than one as generated by SPSS software were retained, resulting in eight attribute groupings for both countries' companies. The accumulated variance of these eight attributes was 76.49% for the firms. We also performed the KMO test to verify that the original data was suitable for a factor analysis; the value of KMO was 0.624.

Each attribute was named in accordance to the factor loadings of the variables it contained— those variables with higher factor loadings were given more weight in considering the attribute's name. The results of the naming are shown in Table 1. The eight attributes that affect the value of Taiwan computer and peripheral firms' intangible assets are (in order of their variance-explained): Worker Productivity, R&D Resources, Solvency, Profit Ability, Equipment Sufficiency, Resource Sufficiency, Sales Growth Rate and R&D Investment. The results of the naming are shown in Table 1 below.

4.2. Stepwise Regression of Determinants of Intangible Asset Value

In the stepwise regression, the independent variables are the attributes (eight for each subject group) extracted and named in the preceding section. The dependent variables are the values generated by the three valuation methods discussed in following section. The regression's purpose is to quantify how various attributes of a firm's financial and intellectual capital structure affect intangible asset value. Similarities and differences among the three group's determinants and their strengths are discussed and form a starting point for subsequent research.

4.2.1 MV/BV

Profitability is the key index which affects the intangible asset value of the world's top 100 corporations. It shows that the ability of the world-listed corporations to create profits for themselves and the investors affects the growth of their intangible asset value in a directly proportional way. Resource sufficiency and equipment sufficiency signify internal resource allocation and usage efficiency, both of which also affect the intangible asset value. However, the increase in cost does not bring significant benefits. This inversely proportional relationship might be because the expenses cannot be clearly reflected immediately.

Profitability, worker productivity, resource sufficiency and solvency are the factors affecting the intangible asset value of Taiwan corporations. For Taiwan corporations, profitability on the financial statement is directly proportional to their intangible asset value. Worker productivity represents the degree of contributions and the production value of each employee to the corporation; resource sufficiency represents the efficiency of using resources in the company; solvency represents the company's ability to repay short-term debts and the operational stability. All these three factors are directly proportional to the creation of intangible asset value.

Profitability, R&D resource, resource sufficiency and equipment sufficiency are the criteria for a corporation to get onto the top 100 technology corporations on both the world-list and Taiwan-list. It can be seen from the result that apart from strong profitability, resource allocation and management efficiency, Taiwan corporations also need to embrace and recognize creative development and research (R & D), in order to become a world-class corporation in terms of intangible asset value. As a result, all four factors, which are profitability, R&D resource, resource sufficiency and equipment sufficiency, carry obvious directly proportional results on the creation of intangible asset value.

4.2.2 Tobin's Q

Sales growth rate, profitability and solvency are the factors affecting the

intangible asset value of the world-listed corporations. For these corporations, apart from the financial performance of profitability, the financial factors of the corporations, such as short-term debt repaying ability and the debt management ability, also affect the ups and downs of their intangible asset values. Profit growth is also one of the major factors supporting intangible asset value creation for the corporations. As a result, the sales growth rate is also directly proportional with intangible asset value.

Profitability, resource sufficiency and solvency are the three major factors affecting the intangible asset value of Taiwan-listed corporations. For Taiwan-listed corporations, profitability, debt management ability and short-term debt repaying ability have crucial directly proportional effect on their intangible asset value. Per capita fixed assets and benefits are the incentives for the employees to work hard to create intangible asset value for the corporations. As a result, resource efficiency is also directly proportional to the creation of intangible asset value.

For the dually-listed corporations, the major factors affecting the creation of intangible asset value, as divided through the regression formula, are profitability, R&D resource, equipment sufficiency and resource sufficiency. The factors are the same as the result from MV/BV, and the only difference is on the degree of influence. The relationships with the creation of intangible asset value are obviously directly proportional from both methods.

4.2.3 VAIC

Solvency, profitability, equipment sufficiency and resource sufficiency are the major factors affecting intangible asset value. As VAIC measures the ability of the corporation to create intangible asset value through the use of resources, the effect from short-term debt management ability, resource efficiency and the per capita resource allocation of the corporation have significant effects. As a result, all solvency, profitability, equipment efficiency and resource efficiency are directly proportional to the creation of intangible asset value. The profitability of a corporation reflects the domino effect on the ups and downs of intangible asset value from the profitability of the corporation. The result from the regression

method shows directly proportional relations.

For Taiwan-listed corporations, profitability, solvency and resource efficiency have a directly proportional effect on the creation of intangible asset value, which is the same as the world's corporation. Worker productivity and sales growth rate also reflects the ability of the corporation to create profit and

Table 2
Results of Stepwise Regression

Index	Formula of Regression Estimation	Adjusted-R ²
MV/BV	World $MV/BV = 0.458(\text{Profitability}) - 0.192(\text{Resource Sufficiency}) - 0.166(\text{Equipment Sufficiency})$	29.0%
	Taiwan $MV/BV = 0.631(\text{Profitability}) + 0.180(\text{Resource Sufficiency}) + 0.13(\text{Worker productivity}) + 0.104(\text{Solvency})$	47.8%
	Dually $MV/BV = 0.551(\text{Profitability}) + 0.617(\text{R\&D Resources}) + 0.280(\text{Resource Sufficiency}) + 0.279(\text{Equipment Sufficiency})$	50.7%
Tobin's Q	World $\text{Tobin's Q} = 0.260(\text{Sales Growth Rate}) + 0.487(\text{Profitability}) + 0.377(\text{Solvency})$	37.5%
	Taiwan $\text{Tobin's Q} = 0.576(\text{Profitability}) + 0.221(\text{Resource Sufficiency}) + 0.169(\text{Solvency})$	43.7%
	Dually $\text{Tobin's Q} = 0.595(\text{Profitability}) + 0.585(\text{R\&D Resources}) + 0.264(\text{Equipment Sufficiency}) + 0.246(\text{Resource Sufficiency})$	53.0%
VAIC	World $VAIC = 0.419(\text{Solvency}) + 0.297(\text{Profitability}) + 0.254(\text{Equipment Sufficiency}) + 0.205(\text{Resource Sufficiency})$	27.0%
	Taiwan $VAIC = 0.769(\text{Worker Productivity}) + 0.428(\text{Resource Sufficiency}) + 0.294(\text{Profitability}) + 0.197(\text{Solvency}) + 0.161(\text{Sales Growth Rate}) - 0.098(\text{R\&D Resources}) - 0.084(\text{R\&D Investment})$	71.0%
	Dually $VAIC = -0.539(\text{R\&D Resources}) + 0.345(\text{Worker Productivity}) - 0.259(\text{R\&D Investment})$	46.5%

growth from resources, carrying a directly proportional effect on the creation of intangible asset value. Investment on R&D might not have an immediately effect on the financial statements apart from increasing the expenditure, and Taiwan corporations place insufficient priority on R & D. As a result, R&D resource and R&D investment are inversely proportional to the creation of intangible asset value for Taiwan-listed corporations.

For the dually-listed corporations, although the benefits from the investment and expenditure on R&D cannot be seen in the short-run, and R&D might even lead to reduced intangible asset value for the current financial term, the world-listed Taiwan corporations still highly emphasize R & D. As a result, it has a significant effect although it has a negative impact on the intangible asset value. Apart from that, dually-listed corporations have outstanding competitiveness on production, so worker productivity has a significant directly proportional effect on their creation of intangible asset value.

Summary of This Part

The combination and distribution of factors affecting intangible assets resulted from the three methods are different. Take the overall regression explanation formula as an example; the explanation power of VAIC under the asset return method on Taiwan-listed computer and peripheral corporations is obviously much higher than those of MV/BV and Tobin's Q of market capitalization method. Despite this, these two evaluation methods do not have much difference on explanation power for the world-listed corporations and dually listed corporations of computer and peripheral corporations (as shown in Table 2).

4.3. The Difference of Intangible Asset Formulation

Under MV/BV and Tobin's Q, profitability is the most important factor for computer and peripheral corporations in both the world list and Taiwan list. It shows that intangible asset value can only be recognized by the market with operation performance reflected on the profitability index. The relationship

between intangible asset value and profitability is directly proportional. The world-listed Taiwan corporations emphasize R&D resources but the capital market only recognizes the existence of intangible asset value if there is an increase in profit in the market. This is reflected on the market capitalization and the stock price of the corporation. The R&D expenditure, human resources and related resources can only be continuously supported by stable profitability of the corporation, and, in turn, equip the corporation with advanced technology and market share to sustain continuous profit and growth. The benefits brought by R&D investment are the value created by the intangible asset. For those Taiwan companies that aim to get onto the world list, they have to catch up with the world on R&D investment besides possessing strong profitability. This is the only way for them to turn into world class corporations. As a result, the world-listed corporations are different from Taiwan-listed corporations, and R&D resources are the most important factor for intangible asset creation for the dually listed corporations.

Among the intangible asset evaluation methods adopted in the study, MV/BV and Tobin's Q belong to the market capitalization method. In this method, the value calculation and the market value concept of intangible assets are the market expectation, which always fluctuate along with the external factors, such as overall environment, international situation and market sentiment. This is the reason why regression has less explanation power on the world-listed corporations. For Taiwan-listed and dually listed corporations, overall regression has better explanation power because the domestic market is more stable; with a special industrial structure and value creation model (the ability to control the cost and quality is the key for profitability for Taiwan companies).

From the VAIC method adopted in the study, the three types of corporations have different major factors of intangible asset value. Profitability and solvency are the top two factors for the world-listed corporations; worker productivity and resource efficiency are the top two factors for Taiwan-listed corporations; and R&D resource and worker productivity are the top two factors for the dually listed corporations. VAIC evaluates the resource efficiency and asset efficiency of the corporation and the value created. As solvency and profitability are the key

factors for the world-listed corporations to create intangible asset value, profitability is the incentive for them to invest into intangible assets. High R&D expenditure needs to keep the corporation's profitability and financial performance unaffected. Short-term debt repaying ability, inventory control and liquidity are also very important factors.

In sum, the difference of the driving factors divided from the three methods are: profitability and solvency are the major factors for world-listed corporations; profitability is also the most important factor for Taiwan-listed corporations, followed by resource efficiency, which is the common result from all three methods; profitability and R&D resources are the important driving factors from all three methods for the dually-listed corporations. For Taiwan-listed corporations, worker productivity and resource efficiency are the major factors affecting the creation of intangible asset value. The strengths of Taiwan-listed corporations are on cost and resource control and human resources, efficiently producing the maximum value with the minimum human and non-human resources. The dually listed Taiwan corporations represent worker productivity, which is the existing cost control and resource efficiency of Taiwan corporations. R&D resources are also one of the factors that separate them from ordinary Taiwan corporations. Value R&D and invest resources into R&D are the signals that these corporations have started to embrace the globalization concept, from which enable them to successfully take on the global market. This is where the value of intangible assets lies.

5. Conclusions and Implication

World-listed Computer and Peripheral Corporations

There are different effects on the creation of intangible asset value from different evaluation methods due to different focus aspects. For the world-listed computer and peripheral corporations, profitability, resource efficiency, equipment efficiency, sales growth rate and solvency are the important factors for and directly proportional to the intangible asset value. It shows that corporate

profit and growth, short-term debt management and the ability to repay debt have a significant impact on intangible asset value. Resource efficiency and equipment efficiency have different relations under different evaluation methods. Under MV/BV, they are inversely proportional but they are directly proportional under Tobin's Q and VAIC.

Taiwan-listed Computer and Peripheral Corporations

The same results from all the methods on the impact of the factors on intangible asset value. Seven out of the eight major factors are the important factors for and directly proportional to intangible asset values. These seven factors are profitability, resource efficiency, worker productivity, solvency, sales growth rate, R&D resource and R&D investment. It shows that profitability, cost control and resource efficiency promote the accumulation and creation of intangible assets for Taiwan corporations. As R&D factors do not have an immediate effect and most of the Taiwan corporations do not value R&D, R&D resource and R&D investment have an inversely proportional relationship with intangible asset value.

Dually Listed Computer and Peripheral Corporations

The importance placed on R&D is the key for Taiwan-listed corporations to move up to the world list. Among the eight major factors, profitability, resource efficiency, equipment efficiency, worker productivity, R&D resource and R&D investment are the six factors which affect intangible asset value. The world-listed Taiwan corporations' R&D factors have more obvious effects on intangible asset value. Since investment in R&D does not have an immediate effect, it takes time for the R&D to launch in the market and the investment expenditure affects profitability in the current financial period, R&D has an adverse effect under VAIC evaluation. However, its effect is positive from MV/BV and Tobin's Q methods. It shows that apart from having the existing strengths, Taiwan corporations also need to invest in R&D in order to differentiate from the ordinary Taiwan corporations and move up to the world-listed corporations through the creation of intangible asset value.

Different Evaluation Methods on Intangible Asset Value Creation Factors

The result shows that under MV/BV and Tobin's Q, profitability is the most important factor on intangible asset value for both world-listed and Taiwan-listed corporations. For the dually listed corporation, apart from profitability, R&D resource also affects intangible asset value. Under VAIC, the world-listed and Taiwan-listed corporations have different most important factors for intangible asset value, for the world-listed corporations is solvency while for Taiwan-listed corporations is worker productivity. For the dually listed corporations, apart from worker productivity, R&D resource also affects intangible asset value. From the two major evaluation perspectives, the major factors for the creation of intangible asset value for the world-listed and Taiwan-listed computer and peripheral corporations are different.

The factors affecting the intangible asset value for the dually listed corporations contain R&D resource apart from profitability and worker productivity, which are the same as the Taiwan corporations. It shows that Taiwan-listed corporation need to put more effort on R&D in order to get rid of the difference resulted from the traditional Taiwan corporation image of focusing on manufacturing but not on creativity. This is the only way for them to move up to the world-list and create more intangible asset value.

Although R&D factors do not have significant effect on the creation of intangible asset value for the world-listed and Taiwan-listed corporations, it does not mean that the world-listed corporations do not value R & D. The world-listed corporations' R&D expenditure against total asset ratios and R&D expenditure rates are much higher than the Taiwan-listed corporations. It shows the importance and investment placed on R&D from the world-listed corporations. They view R&D and creativity as the base and they have the long-term vision of investing in the future and sustainable operation. As the investment on R&D does not have any immediate effect on the creation of intangible asset value, the R&D factors are not obvious in the overall regression formula. It is different from Taiwan-listed corporations which value less on R&D but focus on cost control and production quality. Taiwan-listed corporations aim to achieve instant effect. These are the reasons behind the significant difference of intangible asset value between domestic and overseas corporations in the computer and peripheral

industry.

The main reason for the difference on intangible asset value between domestic and overseas corporations is the strategic ideology of the corporation. World-class computer and peripheral corporations have long-term vision and they are willing to bear short-term expenditure and cut on profit for future investment. They view the R&D expenditure and the management fee of brand investment as capital expenditure. As a result, these might reduce the financial performance. Taiwan computer and peripheral corporations have less long-term vision. They focus on short-term profit and they are relatively less willing to invest in R&D and brand marketing which carry high uncertainty. They view R&D and marketing expenditure as expenses, and they are comparatively strong on financial performance. Despite of that, it can be seen from the creation of intangible asset value that the financial advantages of Taiwan computer and peripheral corporations over the world-class computer and peripheral corporations might not be able to sustain in the longrun. As a result, continuous investment in R&D is very important.

This study was unable to obtain information contained outside of financial reports in developing its metrics for intellectual capital. For example, a better metric for the quality of a customer relationship, a type of relational capital, was unavailable. Future researchers may want to investigate this in order to increase the field's understanding of how intellectual capital differs between different countries.

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Appendix 1: Sample Companies

World (29)	Taiwan(54)	Dually(12)
Appendix 1: Sample Companies		
APPLE INC	CORETRONIC CORP	ACER INC
ARROW ELECTRONICS INC	AU OPTRONICS CORP	ASUSTEK COMPUTER INC
CANON INC	TRIPOD TECHNOLOGY CORP	CHI MEI OPTOELECTRONIC CORP
CASIO COMPUTER CO LTD	TRANSCEND INFORMSTION INC	COMPAL ELECTRONIC INC
CISCO SYSTEMS INC	EVERLIGHT ELECTRONICS CO LTD	HIGH TECH COMPUTER CORP
DELL INC	FSP GROUP	HON HAI PRECISION IND CO LTD
EMC CORP/MA	MOTECH INDUSTRIES INC	INVENTEC CO LTD
HARRIS CORP	FOXCONN TECHNOLOGY CO	LITEON TECHNOLOGY CORP
HEWLETT-PACKARD CO	WINTEK CORP	MITAC INTERNATIONAL CORP)
JABIL CIRCUIT INC	UNIMICRON CORP	QISDAJ CORP
KDDI CORP	DELTA ELECTRONICS INC	QUANTA COMPUTER INC
L-3 COMMUNICATIONS HLDGS INC	ASIA OPTICAL CO INC	WISTRON CORP
LEXMARK INTL INC	BIOSTAR GROUP	
LG ELECTRONICS INC	GOLD CIRCUIT ELECTRONICS	
LOGITECH INTERNATIONAL SA	EPISTAR CORP	
MOTOROLA INC	KINKO OPTICAL CO LTD	
NIDEC CORP	GLOBAL BRANDS MANUFACTURE LTD	
NOKIA (AB) OY	SIMPLO COMPANY LTD	
QUALCOMM INC	LITEON GROUP	
RESEARCH IN MOTION LTD	JESS_LINK PRODUCTS CO LTD	
SAMSUNG ELECTRONICS CO LTD	DYNAPACK CO LTD	
SANDISK CORP	RADIANT OPTO-ELECTRONICS CORP	
SHARP CORP	OPTIMAX TECHNOLOGY CORP	
SYNNEX TECH INTL CORP	MIN AIK TECHNOLOGY CO LTD	
TOSHIBA CORP	CAREER TECHNOLOGY (MFG.) CO LTD	
TPV TECHNOLOGY LTD	HARVATEK CORP	
UTSTARCOM INC	CHAUN CHOUNG TECHNOLOGY CORP	
VTECH HLDGS LTD	TAIFLEX SCIENTIFIC CO LTD	
WESTERN DIGITAL CORP	LARGAN PRECISION CO LTD	
	ASIA VITAL COMPONENTS CO LTD	
	SOLAR APPLIED MATERIALS TECHNOLOGY CORP	
	KINSUS INTERCONNECT TECHNOLOGY	
	TXC CORP	
	FORHOUSE CORP	
	I-SHENG ELECTRONIC WIRE & CABLE CO LTD	

MERRY ELECTRONICS CO LTD
SINTEK PHOTRONIC CORP
QUANTA STORAGE INC
GENIUS, KYE SYSTEMS CORP
TERA AUTOTECH CORPORATION INC
ELITEGROUP COMPUTER SYSTEMS
KINPO ELECTRONICS INC
AV TECH CORP
FIRICH ENTERPRISES CO LTD
GETAC TECHNOLOGY CORP
SHUTTLE COMPUTERS
PORTWELL INC
ADVANTECH CO LTD
ALTEK CORP
CHICONY ELECTRONICS CO
ACTION ELECTRONICS CO LTD
AMTRAN TECHNOLOGY
ABICO GROUP
LITE-ON IT CORP

Appendix 2: Mean Values and Standard Deviations of Intangible Asset Values

Index		2002	2003	2004	2005	2006
MV/BV	World	3.27 (3.18)	4.01 (3.23)	3.89 (3.19)	4.00 (2.40)	4.13 (3.15)
	Taiwan	2.45 (1.49)	3.01 (1.32)	2.27 (1.10)	3.01 (2.73)	2.88 (2.69)
	Dually	2.18 (1.36)	2.18 (1.00)	1.94 (1.10)	2.88 (2.21)	2.59 (1.52)
	World	1.27 (1.14)	1.76 (1.44)	1.81 (1.65)	1.88 (1.35)	1.95 (1.94)
	Taiwan	1.30 (0.81)	1.60 (0.88)	1.19 (0.75)	1.80 (2.10)	1.72 (1.87)
	Dually	0.92 (0.62)	0.86 (0.40)	0.80 (0.41)	1.12 (1.25)	0.96 (0.91)
VAIC	World	7.08 (3.79)	8.76 (4.20)	9.87 (4.39)	10.69 (5.11)	11.62 (5.32)
	Taiwan	6.80 (5.28)	7.35 (4.94)	7.23 (4.86)	7.45 (6.55)	9.31 (11.69)
	Dually	11.91 (1.46)	11.43 (1.35)	13.22 (1.81)	15.94 (1.74)	20.55 (2.58)

Appendix 3: Variables of Intangible Asset Values – Mean Values and Standard Deviations

Variable	World		Taiwan		Dually	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Financial Indicators						
Earnings Per Share (NTD)	362.34	1725.63	4.55	3.86	4.09	6.78
Return on Assets (%)	6.75	6.36	14.98	8.48	7.13	7.16
Return on Equity (%)	14.51	15.37	21.39	13.60	13.97	22.76
Revenue per employee	20,713	17,596	20,477	37,912	71,957	62,354
R&D Exp./Net Income (%)	773.3	4181.71	701.87	834.36	453.07	636.25
Op.Profit per employee	1,402.97	2,020.08	1,742.41	2,778.31	2,703.32	3,178.29
Current Ratio (%)	212.73	152.23	221.38	125.38	147.97	37.76
Quick Ratio (%)	161.93	145.31	172.52	106	106.99	37.17
Debt to equity ratio (%)	151.51	137.72	75.13	40.56	145.66	76.58
Structural Capital						
OPEX/Sales (%)	19.08	10.46	5.30	2.53	4.91	2.74
OPEX/Employee	3,619.82	2,951.63	775.74	937.48	3,677.41	4,065.91
R&D Expenses/Total Assets (%)	5.93	3.99	2.54	1.48	2.92	2.12
Assets Per Employee	19,587.48	18,304.46	16,008.26	20,155.36	42,370.41	32,089.39
R&D Expenses/OPEX (%)	32.75	25.52	56.02	38.56	46.85	27.83
R&D Expenses/Sales (%)	6.29	4.57	2.62	1.66	1.87	1.24
Operating Profit Margin (%)	9.31	9.02	9.67	8.67	18.36	30.00
Capital Structure Ratio	602.43	473.10	3,799	21,264	374.24	260.02
Total Assets Turnover (%)	1.36	0.70	1.27	0.65	1.85	0.58
Fixed Assets Per Employee	3,826.20	7,062.19	1,945.02	2,384.40	7,493.24	7,677.72
Fixed Assets Turnover (%)	14.19	14.24	152.83	1127.94	13.92	8.38
Employee Expenses (%)	3.87	0.83	4.77	3.55	1.51	1.12
Relational Capital						
Sales Growth (%)	18.33	22.37	42.71	64.65	40.50	45.59
Gross Margin Growth (%)	19.31	27.99	70.61	319.96	141.71	375.75
Human Capital						
Employee Count	40,688.27	42,903.63	1,127.08	1,958.65	4,135.39	3,236.86

Note: Non-percentage items are in Thousands NTD (except for EPS)