ALIGNING HUMAN CAPITAL MEASUREMENT WITH CORPORATE VALUE CREATION: EVIDENCE FROM THE TAIWAN ELECTRONICS INDUSTRY

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ABSTRACT

The aim of this study was to identify appropriate indicators of human capital and clarify the relationship between investment in human capital and corporate value. We examined the relationship between proxy variables and corporate value, using empirical models to analyze the explanatory power of human capital indicators with regard to corporate value. We found that both financial and non-financial indicators of human capital are associated with corporate value. However, this effect is more evident in companies in the electronics industry. A number of managerial implications and research suggestions are also proposed.

JEL: M12, G32

KEYWORDS: Human Capital Effectiveness, Human Capital Measurement, Transferability of Human Capital Indicators, Corporate Value

INTRODUCTION

The advent of the knowledge economy has led to the development of resource-based theory and knowledge-based theory, which encourage companies to invest not only in hardware but also to channel resources and investment into intangible but arguably more valuable assets. By doing so, companies are better able to establish long-term competitive advantage (Wernerfelt, 1984; Barney, 1991; Grant, 1991; Peteraf, 1993; Bontis, 1999; Priem and Bulter, 2001; Schuler and Jackson, 2005). In recent years, there has been a growing gap between the book value of a company and the market value of equity (Lev, 2001). Brooking (1996) and Sveiby (1997) claimed that such gaps are engendered by insufficient coverage of financial information with regard to intangible assets, one of which is human capital. The issue of human capital remains mired in inconsistent measurements and inadequate standards of evaluation (Bontis, 2001). The measurement of human capital is often based on its contribution to the operational performance of a firm, centered on the question of efficacy.

Although most companies have realized the importance of human capital, many remain unwilling to disclose related indicators or data in order to prevent the disclosure of valuable information to rivals. The lack of an appropriate means of measurement and the limited availability of data related to human capital poses considerable challenges in the field of accounting. A knowledge-based economy exposes weaknesses in traditional accounting practices and the measurement of performance; therefore, selecting an appropriate instrument for the measurement and reporting of human capital and identifying the core characteristics of intellectual capital are of the utmost importance (Kamath, 2007; Flamholtz, Bullen and Hua, 2002). The objective of this study was to identify proxy variables in the measurement of human capital based on the "human capital indicators" proposed in earlier studies (Brooking, 1996; Roos et al., 1997; LeBlanc, Rich and Mulvey, 2000; Becker, Husield and Ulrich, 2001; Ulrich, 2005).

This study obtained empirical evidence related to the measure of human capital in the electronics industry that we believe was insufficiently tested in previous research. We examined the relationship between proxy variables and corporate value, using empirical models to analyze the explanatory power of human capital indicators for corporate value. It was our premise that such an approach could help to identify appropriate indicators of human capital, while clarifying the relationship between investment in human capital and corporate value. This study focused on the electronics industry in Taiwan. Previous

researchers have demonstrated that, in the electronics industry, human capital is particularly important to the successful development and implementation of organizational strategies (Bharadwaj, 2000). The electronics industry in Taiwan has gained a reputation for rapid growth and globally competitive capabilities. In recent years, the industry has upgraded from a production orientation to an innovation orientation (Tsan and Chang, 2005). Human capital is the single most valuable asset in the establishment of innovation capabilities and effective global logistics systems.

Taking into account the characteristics of human capital, we decided to categorize the data as financial and non-financial. First, confirmatory factor analysis was employed to test how well the measured variables represent the latent constructs of human capital. Second, multiple regression analysis was used to investigate the relevance of human capital indicators, showing high explanatory power in the evaluation of corporate value. Finally, we analyzed the transferability of information related to human capital among the sample clusters by testing the difference between two regression coefficients across industries. Our empirical findings demonstrate that employee rewards, value-added and sales revenue, and the age of employees are the best indicators of human capital in the electronics industry.

As for traditional industries, employee rewards, sales revenue, education, and the number of professional personnel are the best indicators of human capital. The positive influence of financial indicators on share prices is significantly higher in the electronics industry than in traditional industries. Thus, this study posits that the transferability of financial indicators is more relevant in the electronics industry. Meanwhile, for companies in traditional industries, data from financial indicators should be supplemented with other non-financial indicators to provide an accurate representation of corporate human capital. The remainder of the paper is organized as follows. Following a review of the literature, we describe the development of our hypotheses. We then present our research design and survey setting. This is followed by a presentation of our empirical results with additional analysis. The final section contains a brief summary of the overall study and results, in which we present our key findings.

LITERATURE REVIEW

Human Capital Financial Measurement

Traditional financial indicators have proven inadequate for the interpretation of organizational performance; therefore, non-financial indicators have been the preferred route in the measurement of human capital. As stated by Roos (1997), financial indicators tend not to be best way to measure human capital, because companies do not maintain permanent ownership of employees, as they do with fixed assets. This leads to fluctuations in human capital over time, which can be measured only according to the production and financial performance that is a direct result of employee rendered services. Becker (1964) stated that human beings are the most valuable form of capital investment, and that training and development are the most important investments related to human capital. Bassi and Buren (1999) regarded corporate human capital as a measure of investment in training and development, determined by the average hours and total expenses invested. Hansson (2004) asserted that the input provided by manpower fluctuates, which can lead to substantial fluctuations in share prices. Ballester (2002) claimed that human capital has greater mobility than other assets, as supported by the fact that companies must constantly deal with the threat of employees being lured to other organizations.

According to expectancy and motivational theories, appropriate remuneration serves as an incentive to employees. Higher remuneration not only attracts better talent, but also elicits greater effort from employees in the betterment of the company (Roos et al., 1997; Erez and Isen, 2002; Chen and Min, 2004; Ramlall, 2005; Sáenz, 2005).This study defined the financial indicators of human capital as follows: Items quantifiable in monetary terms and accessible through financial statements. Employee productivity is a composite indicator measured in terms of ratio, which has also been commonly employed in previous studies as a measurement of manpower output value (Becker, 1964). Grossman (2000) suggested that employee productivity is the return on investment in human capital. For investors, higher employee productivity is a reflection of greater profitability. A higher return on investment in human capital

indicates better human capital output, which in turn helps to maintain corporate competitiveness and profitability.

Human Capital Non-Financial Measurement

Human capital input refers to the knowledge or skills obtained from outside the company, in which requisite human capital is introduced via recruitment and screening. Intangible assets such as human capital, knowledge, skills, and competence act as a catalyst in the creation of products and services that are valued by customers (Wright and Snell, 1991). Colombo and Grilli (2005) claimed that the non-financial indicators of human capital compel high-level managers to manage quality more scrupulously in order to facilitate growth. Non-financial indicators of human capital refer to education and prior job experience, which represent the core drivers behind corporate growth. A number of studies have referred to the level of education as an important indicator of human capital input. Higher education can be used as an indicator of employees of higher competence and quality.

Turnover rate is an alternative factor used to examine the relationship between employees and human capital. Higher seniority renders a curve effect between experience and learning. From another perspective, higher seniority reflects a shared value among employees, which could be viewed as stronger team spirit. Needless to say, this would be preceded by high employee satisfaction. This study proposes seniority in a company as a proxy variable for employee satisfaction; higher seniority indicates higher employee satisfaction and higher corporate value. Nonetheless, the two items differ fundamentally: corporate seniority is categorized as human capital input, whereas satisfaction belongs to human capital output. This study defined non-financial indicators of human capital as follows: Items quantifiable and accessible through publicized reports. Based on previous literature dealing with the indicators of human capital, this study proposes the following hypotheses and provides empirical evidence regarding the financial and non-financial indicators of human capital. Hypothesis 1: Financial and non-financial indicators hold significant explanatory power for corporate human capital.

Human Capital Measurement and Corporate Value

With regard to linear information dynamics, Ohlson (1995) postulated that the future intrinsic value of a company is quantifiable. That study introduced the residual income valuation model, a theoretical framework in which corporate value is measured using data from balance sheets and income statements. Wang (2008) adopted the Ohlson model in an examination of the relationship between intellectual capital and corporate value, using employee productivity as a proxy variable to measure human capital. The empirical results demonstrate the significant influence of human capital on corporate value. Overall, the empirical findings support a positive relationship between human capital and corporate value. Information related to human capital is indirectly involved in the evaluation of corporate value by investors, which is subsequently reflected in share prices. Thus, disclosing information related to investment in human capital (financial or non-financial) can facilitate a more accurate evaluation of intrinsic corporate value. Indicators selected as intellectual capital, non-financial information, or a combination of financial and non-financial information are subject to re-evaluation, in the same manner that financial information is (Edvinsson and Malone, 1997). Hypothesis 2: Financial and non-financial indicators of human capital are relevant to corporate value.

DATA AND METHODOLOGY

The study distinguishes financial and non-financial indicators as latent constructs of human capital measurement. An initial measurement model is composed of suitable variables, using confirmatory factory analysis to test how well the measured variables represent the number of constructs. After establishing the basis of measurement, the study extends the Ohlson's (1995) valuation model, incorporating different human capital indicators to examine the effect the modified model has on corporate value relevance. The following models examine the value relevance of human capital indicators of the electronics industry:

$$CORP\_VALUE_i = \beta_0 + \beta_1 FMIHC_i + \beta_2 NFMIHC_i + \Sigma\gamma_i CONTROL_i + \varepsilon_i \quad (1)$$

Our dependent variable, *CORP_VALUE*, is measured as the share price (*P*), market to book ratio (*MTB*) and Tobin's q (*TOBINQ*). Based on Ohlson's (1995) valuation model, after converting with abnormal earnings and "clean surplus" relation, share prices can be explained by current book value and earnings of a given period. In other words, corporate value can be explained by the basic components of financial statements that provide a valuation perspective to explain the fluctuation of share prices. The increasing gap in the market to book ratio has argued the insufficiency of accounting information to explain the market value. Moreover, Swartz (1997) suggest that intellectual capital such as human capital provides additional explanation to market value. Tobin's q is often employed as a proxy variable to measure the growth of investment opportunity (Lindenberg and Ross, 1981). The ratio can also serve as a proxy of human capital value, reflecting the positive return from human capital investment. To consider whether corporate value is affected by the human capital indicators, we regress CORP_VALUE on the two sets of test variables (FMIHC and NFMIHC) and a number of control variables. Table 1 presents definitions of variables used in equation (1).

Table 1: Variable Definitions

Corporate Value (*CORP_VALUE*)	
P	The closing share price.
MTB	Market to book ratio is measured by the market value divided by the book values represents an initial valuation of intellectual capital
TOBINQ	The study adopts a modified version of the Tobin *q* (Chung and Pruitt, 1994): $q = (MV + PS + DEBT)/TA$ where *MV* is the market value of common shares outstanding, *PS* is the liquidating value of outstanding preference shares, *TA* is the book value of total assets, *DEBT* is the current liabilities net of current assets, plus the book value of the long-term liabilities.
Financial Measure Indicators of Human Capital (*FMIHC*)	
EMP_SALARY	Employee salary is the total wages and salaries expenses divided by the average number of total employees.
EMP_TRAIN	Employee training expense is the total training expense divided by the average number of total employees.
EMP_BONUS	Employee bonus is the bonus compensation, health coverage and perquisites divided by the average number of total employees.
EMP_PENSON	Employee pension expense is the total pension expense divided by the average number of total employees.
EMP_REV	Sales revenue per employee is the total revenue divided by the average number of total employees. Sales revenue per employee is commonly used measure of employees' productivity.
EMP_OPRAT	Operating income per employee is the total operating income divided by the average number of total employees. Operating income per employee is used to measure the employees' productivity.
EMP_VALUE	Value added human capital is the value creation efficiency of human capital. Following Pulic (2000) and Kujansivu and Lonnqvist (2007), the efficiency of human capital is used to measure the employee productivity. $VA = OP + EC + D + A$ $HCE = VA / HC$ where *VA* is the value added efficiency of capital employed. *OP* is the operating profit; *EC* is the total employee costs; *D* is the depreciation expense; and *A* is the amortization. *HCE* is the human capital efficiency coefficient for company. *HC* is the total employee costs.
Non-financial Measure Indicators of Human Capital (*NFMIHC*)	
EMP_EDU	Employee education is the sum of years of employee education divided by the average number of total employees.
EMP_AGE	Employee age is the average age of employees.
EMP_TENUR	Employee tenure is the average years of employee tenure.
EMP_PROF	Professional worker ratio is the proportion of professional employees. In order to simplify confounding job titles, as well as discrepant meaning of literal titles and assumptions made by the study, professional worker ratio has been defined as the proportion of employees with a junior college degree or above.
EMP_TNOVR	Employee turnover ratio is the number of employees replaced in a fiscal year to the average number of total employees.

This table shows definitions of the variables used in the study.

To test the hypotheses and proposed arguments, we begin by collecting data of companies listed on the Taiwan Stock Exchange from 2003 to 2007. The research object of this study was electronics companies in Taiwan, covering the information hardware industry, the optoelectronic and communication industry, the semiconductor industry, and the consumer electronics and electronic component industry. Our sample comprises 291 companies. After deleting observations with incomplete data and extreme values, the final sample consists of 1,455 firm-year observations. All data are collected from the Taiwan Economic Journal (TEJ) database, InfoTimes database and annual reports. Some missing items are supplemented by the company website. Table 2 provides descriptive statistics for all variables in our models. On average, companies in electronics industry devote greater investment to employee wages and salaries (*EMP_SALARY*), training expenses (*EMP_TRAIN*) and bonus (*EMP_BONUS*) than their counterparts in traditional industries. Overall, employee productivity (*EMP_REV*) indicates that electronics industry

enjoys better performance than its traditional counterpart. However, it should also be noted that the opposite is true for employee pension expense (*EMP_PENSON*), age (*EMP_AGE*) and tenure (*EMP_TENUR*). In other words, traditional industries contribute more than electronics industry to support the employee pension plan. Regarding human capital structure, employee age and seniority indicate that employees of electronics industry are younger and with lower seniority. This indicates a higher turnover rate (*EMP_TENUR*) in electronics industry and in turn greater changes in the human capital structure.

In addition, employee quality is apparently reflected in the education level (*EMP_PROF*). Employees in electronics industry have on average higher education level than their traditional counterparts. This also explains abundant professional workers with high education in electronics industry. Table 3 represents the pair-wise Pearson correlations. Overall, both financial and non-financial indicators are positively correlated with *P* and *MTB*, except *EMP_AGE* and *EMP_TENUR* are negatively correlated with *P* and *MTB*. This indicates that employee quality is apparently reflected in the younger employee age and lower corporate seniority of the human capital structure in electronics industry. The correlation between indicators and *TOBINQ* is weaker. However, we acknowledge that all these are merely univariate associations and we should rely on the multiple regression analyses for our inferences.

Table 2: Descriptive Statistics

	Electronics Industry (N=1455)		**Traditional Industries (N=830)**	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
EMP_SALARY	638.92	225.95	616.54	298.67
EMP_TRAIN	13.22	2.92	9.65	3.83
EMP_BONUS	143.53	178.32	61.11	53.79
EMP_PNSON	34.13	30.67	70.25	207.22
EMP_VALUE	1682.06	3295.92	1308.58	3412.73
EMP_REV	19479.47	32807.05	13141.47	16571.38
EMP_OPRAT	1010.42	1871.12	659.63	1429.03
EMP_EDU	14.36	1.15	12.56	0.95
EMP_AGE	33.26	2.87	38.71	4.16
EMP_TENUR	4.59	2.22	9.85	4.69
EMP_PROF	0.69	0.21	0.38	0.16
EMP_TNOVR	0.07	0.24	-0.01	0.13
EPS	2.48	4.14	1.04	2.04
BV	17.90	9.29	14.19	6.27
P	39.79	54.59	18.11	18.19
MTB	2.06	1.56	1.23	0.86
TOBINQ	1.61	0.87	1.11	0.45

Note. EMP_SALARY is the total wages and salaries expenses divided by number of employees. EMP_TRAIN is the total training expense divided by number of employees. EMP_BONUS is the employee insurance and perquisites divided by number of employees. EMP_PENSON is the total pension expense divided by the number of employees. EMP_VALUE is the net income before wages and salaries divided by wages and salaries. EMP_REV is the sales revenue divided by number of employees. EMP_OPRAT is the total operating income divided by number of employees. EMP_EDU is the average years of employee education. EMP_AGE is the average age of employees. EMP_TENUR is the average years of employee tenure. EMP_PROF is the proportion of employees with a junior college degree or above. EMP_TNOVR is the number of employees replaced in the fiscal year to number of employees. EPS is the earnings per share. BV is the book value. P is the closing share price. MTB is the market value to book values. TOBINQ is the sum of market capitalization, preference shares and liabilities divided by total assets.

EMPIRICAL RESULTS

Panel A of Table 4 presents the results of confirmatory factory analysis of human capital measurement. Chi-square test is used to extract the human capital indicators appropriate to the measurement model in question. The extraction process consists of the following standardized steps. First, if the chi-square statistic for the model is not reduced to $P>0.05$ and $\chi^2/df<3$ after modification, the lowest indicator of factor loading (λ) is deleted. Next, repeat the step until chi-square reach the threshold. Apply the same process to other indicators to examine their "majority vote" standard and examine whether the λ is greater than 0.5. If the measurement model is saturated and the λ of some variables exceed 0.7, all variables under the saturated model will be preserved for subsequent verification.

The strength of the human capital indicators displayed in Table 4 can be further analyzed. These significance indicators that serve to explain human capital support hypotheses 1. In summary, *EMP_SALARY*, *EMP_BONUS*, *EMP_VALUE*, *EMP_REV* and *EMP_OPRAT* are representative indicators that measure the human capital in electronics industry, while *EMP_EDU*, *EMP_AGE* and *EMP_PROF*

are the non-financial indicators of human capital, are used to conduct subsequent regression analysis. Panel B of Table 3 presents the Goodness-of-fit indices in both initial and modified models. Modified model exhibits better goodness-of-fit as compared with initial model, in terms of structural reliability and the average variance extracted, both of which are above the recommended values. The regression analysis of sample electronics companies in Table 5 shows that financial indicators, such as *EMP_BONUS* and *EMP_OPRAT* are positively and significantly associated with *P*, *MTB* and *TOBINQ*, consistent with the expectation. Also, *EMP_VALUE* is positively and significantly associated with *P* and *TOBINQ*. However, it should be noted that *EMP_SALARY* and *EMP_REV* are negatively and significantly associated with *P*, *MTB* and *TOBINQ*. This may be explained by the influence of current perspective that denotes human capital as an "expense", resulting in a negative association between wages and salaries and company's profits. The negative association is manifested in the lackluster share prices that reflect investor confidence

Table 3: Correlation Matrix

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
EMP_SALARY (A)	1																
EMP_TRAIN (B)	0.54**	1															
EMP_BONUS (C)	0.42**	0.35**	1														
EMP_PNSON (D)	0.33**	0.22**	0.13**	1													
EMP_VALUE (E)	0.23**	0.19**	0.76**	0.05*	1												
EMP_REV (F)	0.44**	0.23**	0.53**	0.21**	0.49**	1											
EMP_OPRAT (G)	0.33**	0.29**	0.79**	0.06*	0.76**	0.43**	1										
EMP_EDU (H)	0.61**	0.93**	0.42**	0.21**	0.25**	0.33**	0.34**	1									
EMP_AGE (I)	0.37**	0.07*	0.14**	0.41**	0.04	0.28**	0.04	0.15**	1								
EMP_TENUR (J)	0.19**	0.16**	-0.03	0.37**	-0.06*	0.06*	-0.07*	-0.04	0.73**	1							
EMP_PROF (K)	0.62**	0.79**	0.33**	0.22**	0.19**	0.33**	0.25**	0.89**	0.24**	0.01	1						
EMP_TNOVR (L)	-0.31**	-0.02	0.04*	-0.22**	0.14**	-0.04	0.16**	-0.01	-0.26**	-0.27**	-0.06*	1					
EPS (M)	0.08**	0.06*	0.47**	-0.04	0.57**	0.14**	0.60**	0.08**	-0.16**	-0.17**	0.01	0.25**	1				
BV (N)	0.05	0.07*	0.45**	-0.04	0.52**	0.21**	0.53**	0.05*	-0.17**	-0.13**	-0.02	0.20**	0.84**	1			
P (O)	0.08**	0.06*	0.46**	-0.04	0.48**	0.17**	0.53**	0.07**	-0.17**	-0.17**	-0.01	0.22**	0.87**	0.81**	1		
MTB (P)	0.08**	0.05	0.38*	-0.04	0.39**	0.12**	0.39**	0.09**	-0.12**	-0.17**	0.01	0.24**	0.61**	0.45**	0.73**	1	
TOBINQ (Q)	0.02	-0.06*	0.01	-0.02	0.01	-0.01	0.02	0.04	0.01	-0.02	-0.05	0.02	0.08**	0.06**	0.07**	0.11**	1

*Note: **,* indicates significance at the 0.01, and 0.05 levels (two-tailed). See table 1 for variable definitions.*

Table 4: Confirmatory Factor Analysis

Panel A: Parameter Estimates

	Initial Model			Modified Model		
Variables	**Factor Loadings (λ)**	**Critical Ratio**	**Standard Error (δ)**	**Factor Loadings (λ)**	**Critical Ratio**	**standard Error (δ)**
EMP_SALARY	0.62	-	0.39	0.59	-	0.35
EMP_TRAIN	0.47	14.69**	0.22		Remove	
EMP_BONUS	0.92	25.03**	0.86	0.92	22.83**	0.85
EMP_PNSON	0.42	13.25**	0.18		Remove	
EMP_VALUE	0.93	25.06**	0.86	0.94	23.01**	0.88
EMP_REV	0.65	19.47**	0.43	0.63	22.07**	0.40
EMP_OPRAT	0.80	22.74**	0.64	0.81	20.60**	0.66
EMP_EDU	0.74	-	0.55	0.77	Saturated	
EMP_AGE	0.21	8.62**	0.04	0.22	Saturated	
EMP_TENUR	-0.04	-1.67*	0.00		Remove	
EMP_PROF	1.19	10.44**	1.42	1.14	Saturated	
EMP_TNOVR	-0.06	-2.73**	0.00		Remove	

Panel B: Goodness of Fit Indexes in Modified Model

	χ^2	χ^2/ *df*	*P*	*GFI*	*RMR*	*RMSEA*	*AGFI*	*NFI*	*CFI*	*IFI*
Initial model	707.67	50.55	0	0.83	0.01	0.21	0.67	0.86	0.86	0.86
Modified model	2.28	0.76	0.52	0.99	0.01	0	0.99	0.99	1	1

*Note: **,* indicates significance at the 0.01, and 0.05 levels. See table 1 for variable definitions.*

Table 5: Regression Results

	(1)	(2)	(3)
EMP_SALARY	-0.14***	-0.08**	-0.07**
	(-5.93)	(-2.32)	(-2.04)
EMP_BONUS	0.16***	0.16***	0.11**
	(4.78)	(3.53)	(2.51)
EMP_VALUE	0.26***	0.08	0.27***
	(7.33)	(1.50)	(5.67)
EMP_REV	-0.18***	-0.11***	-0.27***
	(-8.21)	(-3.66)	(-9.33)
EMP_OPRAT	0.19***	0.09***	0.090***
	(7.82)	(2.70)	(2.76)
EMP_EDU	0.02	0.05	0.07
	(0.65)	(1.12)	(1.57)
EMP_AGE	-0.10***	-0.07***	-0.07***
	(-5.88)	(-2.75)	(-3.12)
EMP_PROF	-0.03	-0.05	-0.03
	(-0.97)	(-1.02)	(-0.65)
EPS	0.18***	0.70***	0.61***
	(6.02)	(16.59)	(15.35)
BV	0.37***	-0.23***	-0.19***
	(13.47)	(-6.02)	(-5.06)
F-test	339.73***	113.85***	141.01***
Adj. R^2	0.74	0.49	0.54
Durbin-Watson	1.82	1.94	2.00

*Note: ***,**,* indicates significance at the 0.01, 0.05 and 0.1 levels. See table 1 for variable definitions.*

In addition, the negative association between sales revenue and share price is consistent with Wang's (2008) findings. It is evident that investors are unable to predict a company's future performance based on the current revenue, because higher net sales reflect potentially higher operating costs. Confronted with uncertainty, investors are unable to foresee the trends of corporate value. Another possible reason is that sales revenue is being diluted by employee numbers as denominator, resulting in a disproportionally increase in employee headcount. As for human capital's non-financial indicators, empirical findings show non-significant association on *EMP_EDU* and *EMP_PROF*; significant negative association to *EMP_AGE* in electronics industry, indicating a shift towards younger demographics, which indeed better meets the industry's need to keep abreast of innovation.

The regression result supports Hypothesis 2 which indicative of the value relevance of financial indicators of human capital. These financial indicators include *EMP_SALARY*, *EMP_BONUS*, *EMP_VALUE*, *EMP_REV* and *EMP_OPRAT*. The regression result also supports Hypothesis 3 which partially substantiates the value relevance of non-financial indicators of human capital, because only *EMP_AGE* is included. Research has suggested that human capital is quite immobile, so it is difficult to obtain, trade, imitate and substitute (Barney, 1991). Accordingly, investment in human capital is evidenced to be the major value drivers of knowledge intensive industry. It can thus be concluded that in knowledge intensive industry, human capital indicators demonstrate higher relevance to equity returns than in non-knowledge intensive industry. The study postulates that the financial information provided by financial-based human capital measurement is more relevant to electronics companies.

The study analyzes the transferability of human capital information across the industries. Table 6 present the confirmatory factor analysis for traditional industries. As displayed in Table 7, regression analysis of traditional industries shows less overall significance than of electronics industry. Financial indicators in traditional industries are less significantly associated with corporate values. Only *EMP_OPRAT* demonstrates significance and the predicted direction. *EMP_REV* negatively associated with *P*, *MTB* and *TOBINQ*, albeit with significance. This differs from the result in electronics industry. A point worth mentioning is that *EMP_EDU*, *EMP_PROF* are positively and significantly associated with *P*, *MTB* and *TOBINQ*. Such association is nonexistent in the electronics industry. This demonstrates the difference between electronics and traditional industries. A potential explanation for these findings is that electronic companies boast higher and less discrepant employee education level, which is the basic human capital structure in the electronics industry. The opposite is true in the traditional industries, with a generally lower education level and fewer professional workers. Against such backdrop, a company from the

traditional industries with highly educated and professionally skilled staff naturally stands out, which is subsequently reflected in the corporate values.

Table 6: Confirmatory Factor Analysis for Traditional Industries

Panel A: Parameter Estimates

Variables	Initial model			Modified model		
	Factor Loadings (λ)	Critical Ratio	Standard Error (δ)	Factor Loadings (λ)	Critical Ratio	Standard Error (δ)
EMP_SALARY	0.81	-	0.66	0.80	-	0.64
EMP_TRAIN	0.48	11.91**	0.23		Remove	
EMP_BONUS	0.70	18.58**	0.49	0.72	22.83**	0.52
EMP_PNSON	0.52	13.04**	0.27		Remove	
EMP_VALUE	0.88	25.03**	0.78	0.88	23.00**	0.77
EMP_REV	0.77	20.81**	0.59	0.76	22.07**	0.58
EMP_OPRAT	0.76	20.55**	0.58	0.84	20.60**	0.71
EMP_EDU	1.15	-	1.32	1.37	Saturated	
EMP_AGE	0.08	2.39 *	0.01		Remove	
EMP_TENUR	0.26	4.98**	0.07	0.21	Saturated	
EMP_PROF	0.72	8.24**	0.52	0.60	Saturated	
EMP_TNOVR	-0.03	-1.04	0.00		Remove	

Panel B: Goodness of Fit Indexes in Modified Model

	χ^2	χ^2/ *df*	*P*	*GFI*	*RMR*	*RMSEA*	*AGFI*	*NFI*	*CFI*	*IFI*
Initial model	331.25	23.66	0	0.85	0.01	0.19	0.71	0.86	0.86	0.86
Modified model	7.04	2.35	0.07	0.99	0.01	0.05	0.98	0.99	0.99	0.99

*Note: **,* indicates significance at the 0.01, and 0.05 levels. See table 1 for variable definitions.*

Table 7: Regression Results for Traditional Industries

	(1)	(2)	(3)
EMP_SALARY	-0.02	-0.09*	-0.02
	(-0.49)	(-1.77)	(-0.43)
EMP_BONUS	0.06**	0.07*	0.05
	(2.17)	(1.89)	(1.15)
EMP_VALUE	0.06	-0.14**	-0.15**
	(1.27)	(-2.36)	(-2.39)
EMP_REV	-0.29***	-0.26***	-0.32***
	(-8.63)	(-5.80)	(-7.02)
EMP_OPRAT	0.13***	0.10**	0.10**
	(3.62)	(2.18)	(2.21)
EMP_EDU	0.10**	0.16***	0.15***
	(2.48)	(2.86)	(2.69)
EMP_ TENUR	-0.05	-0.01	0.01
	(-1.60)	(-0.21)	(0.04)
EMP_PROF	0.07*	0.12**	0.12**
	(1.73)	(2.14)	(2.18)
EPS	0.52***	0.94***	0.89***
	(12.38)	(17.41)	(16.15)
BV	0.29***	-0.34***	-0.28***
	(8.38)	(-7.31)	(-5.91)
F-test	157.07***	62.38***	56.60***
Adj. R^2	0.72	0.50	0.48
Durbin-Watson	1.47	1.49	1.46

*Note: ***,**,* indicates significance at the 0.01, 0.05 and 0.1 levels. See table 1 for variable definitions.*

While association between high education level and share prices is lacking in the electronics industry, it takes prominence in the traditional industries. Personnel or human resource department in the traditional industries ought to place greater emphasis on employee education level. The study infers that any changes of employee quality in the traditional industries is quickly noted by the investors and other stakeholders, and thus reflected in the corporate values. In other words, traditional industries benefits from recruitment of people with higher education level and professional skills, because they accelerate the accumulation of

human capital and thus maximize corporate value. Most employees in the traditional industries are high in seniority with abundant experience in the field. In such context, a group of young knowledge workers may serve to carry the torch and compensate for a shrinking labor force. Currently in the traditional industries, senior workers have lower education level than their junior counterparts; therefore, introducing knowledge workers with high education into the industry is the way forward.Based on the result of the coefficient difference test, as shown in column (1) of Table 8, *EMP_BONUS*, *EMP_VALUE*, *EMP_OPRAT*, all display significantly positive coefficient differences. Overall, financial indicators in electronics industry have greater significant and positive coefficient differences on share prices than those in traditional industries. It is thus evident that human capital's financial indicators in different industries offer significantly different information.

Table 8: Equality of Regression Coefficients between Electronics and Traditional Industries

	Difference in *bs*		
	(1)	(2)	(3)
EMP_SALARY	-0.12	0.02	-0.04
	(-1.27)	(0.03)	(-0.13)
EMP_BONUS	0.09*	0.09	0.06
	(1.83)	(0.29)	(0.36)
EMP_VALUE	0.20***	0.22	0.41**
	(3.66)	(0.66)	(2.21)
EMP_REV	0.11***	0.15	0.05
	(3.85)	(0.93)	(0.56)
EMP_OPRAT	0.06**	-0.01	-0.02
	(2.41)	(-0.05)	(-0.17)
EMP_EDU	-0.08	-0.10	-0.08**
	(-0.50)	(-0.80)	(-1.97)
EMP_PROF	-0.11	-0.17***	-0.15
	(-0.37)	(-3.11)	(1.35)
EPS	-0.34***	-0.24***	0.09***
	(-9.34)	(-17.48)	(45.69)
BV	0.08***	0.10***	-0.28***
	(7.61)	(11.34)	(-8.49)

Note: Difference in bs is slope coefficient differences between high-tech and traditional industries; the t value of difference are in parentheses. See table 1 for variable definitions.

As demonstrated in the result of column (3) coefficient difference test, *EMP_VALUE* and *EMP_EDU* have significant coefficient differences. Therefore value added human capital has greater significant and positive difference on Tobin's Q in electronics industry than in the traditional one, while the remaining indicators display non-significant coefficient differences. The regression coefficient difference test shows an insignificant difference between employee wages and salaries, indicating a minor degree of difference in the inter-industrial transferability of information with unstable outcome. This reflects a non-significant influence of employee salaries on the accumulation of human capital.

As demonstrated in our additional analysis, the differences between electronics and traditional industries can be summarized as follows. First, the overall explanatory power of financial indicators related to human capital exerts a higher level of influence in the electronics industry than in traditional industries. Such influence is more significant with indicators such as employee bonus, value added human capital, sales revenue, and operating income per employee. Second, employee education level and the professional worker ratio demonstrate a significant and positive influence on intrinsic value in traditional industries, but not in electronics. One possible explanation lies in the influx of college graduates into electronics companies, resulting in near saturation levels of knowledge workers. Third, employee age is negatively associated with corporate value in the electronics industry but not in traditional industries.

CONCLUSION

This study employed human capital, the centerpiece of intellectual capital, as a point of departure, in an attempt to "transform" human capital into a valuable indicator. This study sought to provide external stakeholders with a means of measuring human capital by identifying proxy variables (related to human capital) in the annotation of financial reports and other publicized information. We also sought to differentiate financial from non-financial indicators of human capital. The findings of this study can be

divided into three parts. First, our results reaffirm the accounting-based valuation model of Ohlson (1995), which still holds considerable explanatory power for the share prices of companies listed in Taiwan and supports the relevance of accounting information in valuation. We also extended Ohlson's model by incorporating proxy variables of human capital, thereby providing a systemic approach to identifying the most important indicators for the measurement of human capital. Finally, this study corroborates the hypothesis that both financial and non-financial indicators of human capital contribute to the assessment of intrinsic corporate value. In a knowledge-based economy, industry specific characteristics often manifest in statistical differences. Proxy variables have been shown to be even more applicable in the electronics industry than in traditional industries. Thus, this study suggests that financial indicators be regarded as the primary source of reference in the electronics industry; whereas both financial and non-financial indicators could be used to reflect corporate human capital. Only through appropriate measurement can companies evaluate the need to disclose information related to human capital in order to enhance the relevance of financial reporting. This study confirmed the importance and practicality of various indicators of human capital. We believe that the application of these indicators would be beneficial to both external users and internal managers.

In conclusion, our empirical findings demonstrate the relevance of human capital indicators with regard to corporate value. Companies should give priority to investment in human capital and develop it systematically through the on-going cultivation and enhancement of talent. Because human capital is relevant to corporate value and investors expect to be informed, regulatory bodies should seek to ensure the corporate disclosure of information related to human capital in financial reports. Corporate managers must understand that disclosing information related to human capital enhances transparency, which is conducive to lowering capital costs and enhancing the trust of important stakeholders. The results of the study should be considered in light of the following limitations. First, the study was limited with regard to the selection of indicators to publicly available data as a proxy for human capital. More suitable indicators, such as the characteristics of individual employees and performance appraisals would require proprietary data. Moreover, notable differences exist in the institutional backgrounds across countries and markets. We cannot rule out the possibility that our results were driven by other aspects of intellectual capital. Despite these limitations, we believe that these findings provide valuable insights as well as alternative approaches to the measurement of human capital.

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