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Value relevance on intellectual capital valuation methods: the role of corporate governance

Mao-Chang Wang

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Abstract Development of a knowledge economy has changed the main value of a firm from traditional physical assets to intellectual capital or intangible assets. Therefore, the accumulation and management of intellectual capital is the competitive advantage of knowledge-based industries. Intellectual capital valuation is the essential factor in firm valuation. Scholars have presented valuation methods of intellectual capital, such as Tobin's Q, Knowledge Capital Earnings (KCE), and Value Added Intellectual Coefficient (VAIC). Management power of modern firms is separate from ownership, and easily occurs in the agency problem; therefore, firms must implement corporate governance to solve this problem. Researchers have presented that a complete appraisal of the firm value includes the effect of corporate governance. This study is the first to apply multi-regression models to examine value relevance on valuation methods of intellectual capital, and to further analyze the role of corporate governance for the information and electronic industry in Taiwan. The results show that Tobin's Q, KCE, and VAIC have a positive relationship to firm value. The characteristic of director board, including board size, the ratio of outside directors, employed independent directors, and the manager concurrently the director, are correlated with the valuation of intellectual capital.

Keywords Intellectual capital valuation · Corporate governance · Firm valuation

1 Introduction

Enterprises currently facing competitive pressures such as globalization, trade liberalization, short product life cycles, and low-profit period must invest heavily in research and development, human resource development, obtaining new patents, technology, marketing channels, and other activities in pursuit of continuous product innovation and to maintain or enhance competitive advantage. Because the future economic benefits of these expenditures are highly

M.-C. Wang (✉)
Department of Accounting, Chinese Culture University, 55, Hwa Kang Road, 11114 Taipei, Taiwan
e-mail: wmaochang@yahoo.com.tw

uncertain, generally accepted accounting principles (GAAP) based on conservatism principles are difficult to measure and cannot be recorded as an asset on a financial report, resulting in traditional accounting measures that deviate from real economics (Lev and Zarowin 1999). Bradley (1997) indicated that many knowledge and innovation firms have an apparent gap between book value and market value. A survey by Morgan Stanley and other investment institutions found that the average share price in stock markets is twice the book value, and as much as 2–9 times in U.S. companies. This gap shows that existing accounting information ignores the critical intellectual capital value of business. Roos et al. (1998) proposed that firm value is mainly composed of traditional financial capital and intangible intellectual capital. Lev (2001) considered that entity and financial assets only create normal investment returns, and that firms can only develop intangible assets to obtain abnormal returns. Several scholars have recently proposed various valuation methods of intellectual capital such as Tobin's Q, Knowledge Capital Earnings (KCE), and the Value Added Intellectual Coefficient (VAIC). However, evaluating intellectual capital is extremely difficult, resulting in no single credible model as a reference. Currently, there is considerable room for future research development in this area (Robert et al. 2006).

The outbreak of a series of corporate fraud cases in Taiwan since 1998 has promoted a system of independent directors and audit committees, and the development of governance practice rules for listed companies, to guide enterprises to strengthen corporate governance and enhance international competitiveness. The Company Law and Securities and Exchange Law and other regulations were revised in 2006, making corporate governance legal. Scholars have proposed various management mechanisms in corporate governance, such as considering director board characteristics and ownership structure to enhance company operating performance and value. The McKinsey Company found that investors in Asian countries were willing to pay a company share price premium of approximately 20 % for good corporate governance in 2002 (Charles et al. 2002). Roger et al. (2005) suggested considering corporate governance variables when evaluating firm value.

Intellectual capital valuation, firm valuation, and corporate governance relate to the competitive power of entire countries, industries, and individual enterprises in this century and constitutes a highly important subject of government, academic research, and practices operation. Most studies are limited to analyzing the relevance of intellectual capital, firm value, or firm performance. Few researchers investigate the various evaluation methods of intellectual capital in the literature. This study is the first to use a sample of the information electronics industry in Taiwan, and to adopt multiple regression models to explore the relevance of intellectual capital valuation methods, firm valuation, and corporate governance. The results will help industries, government, and academics understand the effect of corporate governance elements on the relevance of intellectual capital related to various evaluation methods and enterprise value.

2 Literature review and hypotheses development

Economist John Kenneth Galbraith (1969) first proposed the concept of intellectual capital, first developed in Sweden and then extended to Finland, Great Britain, Spain, the United States, Canada, and other European countries. Today, Asian and Arab countries have also invested. Intellectual capital can be used to explain the difference between enterprise market value and book value (HuoShu 2006). Edvinsson (1997) proposed the basic characteristic of intellectual capital as non-financial capital, representing the gap between market value and book value. Bukowitz and Petrash (1997) defined intellectual capital as assets without

physical value, derived by processes, systems, and organizational culture such as brands, individual knowledge, intellectual property, and organizational knowledge for firms to create value. Bradley (1997) also indicated the obvious gap existing in knowledge and innovation industries between market value and net book value. Chunghuey and Mao-Chang (2008) posited that adding intellectual capital variables into the firm valuation model increases the explanatory power of firm value; therefore, investors should consider adding intellectual capital and financial capital on financial statements to properly evaluate firm value.

Scholars have recently proposed various valuation methods for measuring intellectual capital. The more important methods are as follows (Robert et al. 2006):

(a) Tobin's Q: Chung and Pruitt (1994) proposed the formula (market value of equity + book value of liability) for book value of total assets. This formula avoids different accounting methods used by different companies for different criteria of intellectual capital. Because the information is easy to obtain, Tobin's Q is widely used in academic research.

(b) Knowledge capital earnings (KCE): Classifies firm assets into three categories, including physical assets, financial assets, and intellectual assets. After calculating the proper earnings of a firm's physical assets and financial assets, the remainder is the earnings created by intellectual capital. The formula is as follows:

$$\begin{aligned}\text{KCE} = {} & \text{operating income} - \text{income tax} - \text{physical assets of firms} * \text{industry five} \\ & \text{year average return of assets} - \text{financial assets of firms} * \text{Taiwan security} \\ & \text{market five year average annual return.}\end{aligned}$$

(c) Value added intellectual coefficient (VAIC): The capital use efficiency of VAIC includes value added capital coefficient (VACA), value added human capital coefficient (VAHC), and the relation between VA and employed structural capital (STVA). The formula is: VAIC = VACA+VAHC+STVA (Pulic 1998). This paper uses the stakeholder view of VAIC, referring to Ahmed (2003), Shiao-Yan et al. (2008), calculated as follows:

$$\begin{aligned}\text{VACA} &= (\text{operating income} + \text{personnel expenses})/(\text{total assets} - \text{intangible assets}) \\ \text{VAHC} &= (\text{operating income} + \text{personnel expenses})/\text{personnel expenses} \\ \text{STVA} &= \text{operating income}/(\text{operating income} + \text{personnel expenses})\end{aligned}$$

Corporate governance refers to the methods companies use to manage and control. Corporate governance emphasizes separate ownership and management for modern companies and focuses on the law to design the balance of management and control, to monitor company activities, and to operate company organization. Agrawal and Knoeber (1996) and Bi-Huei and Chi-Chen (2009) discussed various management systems existing in corporate governance, and that simultaneously considering director board characteristics and ownership structure could improve the operating performance and value of firms.

The mission of the director board is to monitor firm management, and to ensure that stakeholders obtain a reasonable return. Therefore, director board characteristic is an important issue in corporate governance studies. Yermack (1996), Eisenberg et al. (1998), and Abbott et al. (2004) found that the scale of director board and firm value have a negative relationship. Vafeas (2005) found that the more members a company has, the higher the financial information quality is. Ahmed and Duellman (2007) also found that when a company has a higher proportion of external directors, conservativeness in accounting is higher, therefore, corporate governance is better, and has a favorable effect on enterprise value. Research conclusions about the independent director vary. For example, Bedard et al. (2004), and Whidbee (1997)

discovered that the independent director and firm value have a positive relationship. Yermack (1996) and Mehran (1995) suggested no obvious relationship between the independent director and firm value. Brickley et al. (1997) found that the centralized power of a manager as concurrent director has favorable effect on operating performance and firm value. Core et al. (1999) found that when a company manager is concurrent director, corporate governance worsens, which has unfavorable effect on operating performance and enterprise value. Hence, the conclusion of the effect of manager as concurrent director on operating performance and firm value is inconsistent.

Jensen and Meckling (1976) and Crutchley et al. (2002), in their study of the ownership structure of corporate governance found that stable directors could help in system monitoring; therefore, the relationship between the shareholding ratio of directors and firm value is positive. Denis (2001) stated that corporate governance is better if external shareholders do not serve as director, or managers in the firm have a higher shareholding ratio, resulting in favorable effect on operating performance and firm value. La Porta et al. (2002), and Leuz et al. (2003) argued that when the deviation between control rights and cash-flow rights is larger, controlling shareholders might take actions that are harmful to other shareholders, which worsens corporate governance, and has unfavorable effect on firm value.

Previous studies on the relationship between intellectual capital and corporate governance have focused on the intellectual capital disclosure index or score, for example, Li et al. (2008) explored the relationship between the intellectual capital disclosure index and corporate governance in UK listed companies. The findings are as follows: the relationship between the intellectual capital disclosure index and corporate governance, such as the percentage of independent directors, centralized ownership, scale of audit committee, meetings of audit committee, is obvious. This is consistent with Keenan and Aggestam (2001) argument, previously untested, that corporate governance impacts on efficient intellectual capital management. However, the relationship between the manager as concurrent director and the intellectual capital disclosure index is not obvious. Cerbioni and Parbonetti (2007) explored the relationship between intellectual capital disclosure score and corporate governance in European listed companies. The findings are as follows: the relationship between the percentage of independent directors and the internal disclosure score is positive; the relationship between the manager as a concurrent director and the proactive disclosure score is negative. Most studies are limited to analyzing the relationship between intellectual capital and firm value or performance, or the relationship between corporate governance and firm value. Very few refer to the valuation methods of intellectual capital.

3 Methodology

This section explains the hypotheses of this study, the study period, sample selection, the variable definition, and the research model.

3.1 Research hypothesis

Many researches show that director board size, control rights and cash-flow rights deviation level all have a negative relationship to firm value. However, the ratio of outside directors, director shareholding ratio, and the shareholding ratio of external shareholders all have a positive relationship to firm value. No consistent conclusion exists between independent directors, the manager as a concurrent director, and firm value. In this paper, director board characteristics include board size, the ratio of outside directors, employed independent directors,

and the manager as a concurrent director. Ownership structure is the percentage of director shareholding, the percentage of external shareholding, and control rights and cash-flow rights deviation level. Intellectual capital explains the difference between firm value and book value, and is therefore important for firm valuation. This paper develops three research hypotheses, as follows:

Hypothesis 1 Intellectual capital valuation has a positive relationship on firm valuation.

Hypothesis 2 The director board characteristic of corporate governance has positive or negative relationship on intellectual capital valuation.

Hypothesis 3 The ownership structure of corporate governance has positive or negative relationship on intellectual capital valuation.

To verify the hypotheses, this paper uses the multi-regression model for analysis. The intellectual capital valuation related variables include Tobin's Q, KCE, and the VAIC.

3.2 Research periods and samples

The research periods are from 2007 to 2009, and the sample is the information electronics industry in Taiwan and firms listed on the Taiwan Stock Exchange. Total sample consists of 361 firms covering the period 2007–2009, and 1,019 firm-year observations, after deleting incomplete data. Data were derived from the Taiwan Economic Journal (TEJ) database and the Market Observation Post System.

3.3 Variables definition

This paper refers to the research approach of Chaur-Shiuh and Shing-Jen (2009), Bushman et al. (2004), and Larcker et al. (2007), to classify the director board characteristic and ownership structure in corporate governance. The main advantages of this approach include consideration of various corporate governance situations, and avoiding the inconsistent results and biased conclusions of corporate governance research. The definition of corporate governance variables and measures are as follows:

(a) Director board size: the total number of director board seats (DSIZE). The measurement is arranged as DSIZE, from large to small and converts a number 0 to 1.
(b) Ratio of outside directors: the outside director accounts for the ratio of total directors (OUTD), outside director = all directors − controlling shareholders and directors who have relationships with family or related entities. The measurement is arranged as OUTD, from small to large and converts a number 0 to 1.
(c) Independent directors (ID): employed independent directors is 1, otherwise, 0.
(d) Manager as concurrent director (MD): the manager as concurrent director is 1, otherwise, 0.
(e) Percentage of director shareholding (DHOLD): the number of shares held by directors divided by the number of shares outstanding at the end of the year. The measurement is arranged as DHOLD, from small to large, and converts a number 0 to 1.
(f) Percentage of external shareholding (EHOLD): the shareholding of external shareholders is divided by the number of shares outstanding at the end of the year; the definition of external shareholders does not include firm directors, managers of individual shareholders or corporate shareholders, non-affiliated representatives, and directors who have a family relationship. The measurement is arranged as EHOLD, from small to large, and converts a number 0 to 1.

Table 1 Explanation of variables

Variable name	Code	Definition
Net value per share (dependent variable)	VALUE	Stock price per share at the end of the fiscal year−book value of per share
Tobin's Q	TOBIN	(Equity market value + book value of. liability)/book value of total assets
Knowledge Capital Earnings	KCE	(Operating income-income tax−physical assets of firms * industry five year average return of assets − financial assets of firms * Taiwan security market five year average annual returns)/weighted-average outstanding shares
Value Added Intellectual Coefficient	VAIC	(Operating income + personnel expenses)/(total assets − intangible assets)+(operating income + personnel expenses)/personnel expenses + operating income/(operating income + personnel expenses)
Director board characteristic	CGD	DSIZE+OUTD+ID+MD
Ownership structure	CGS	DHOLD+EHOLD+DEV
Earning per share	EPS	Earning per share this year
Firm age as a listed firm	AGE	The number years as a listed firm
Debt ratio	LEVERAGE	Total liability/total asset
Firm size	SIZE	The opening market value by taking logarithmic value

(g) The deviation level of control rights and cashflow rights (DEV): Stock domination minus earnings distribution. The measurement is arranged as DEV, from large to small, and converts a number 0 to 1.

The director board characteristic (CGD) is DSIZE+OUTD+ID+MD. Ownership structure (CGS) is DHOLD+EHOLD+DEV. Table 1 shows the variables. Intellectual capital explains the main differences between book value and firm market value, therefore, the dependent variable is per share of net value. Referring to Li et al. (2008), the earnings per share is a proxy variable of financial performance and profitability in the regression model. The study variables included Tobin's Q value (TOBIN), KCE, VAIC, director board characteristic (CGD), and ownership structures (CGS).

Referring to Carey and Simnett (2006), Ghosh and Moon (2005), to enhance the regression specification correction, the three control variables are firm age as a listed firm, debt ratio, and firm size. No determined relationship exists between firm age as a listed firm and firm value, so firm age as a listed firm, which is expected to affect firm value, cannot be determined. The higher the debt ratio, the greater the likelihood of management to manipulate positive earnings to avoid debt contract violation. However, it may also reduce the level of earnings to obtain more favorable borrowing conditions, so the debt ratio, which is expected to affect firm value, cannot be determined. Firm size may represent a considerable number of missing variables and must be controlled, so its affect on firm value cannot be determined.

3.4 Research model

Research model (a): the intellectual capital valuation method is Tobin's Q

$$\begin{aligned}\text{VALUE}_{i,t} = {} & \alpha_0 + \alpha_1 TOBIN_{i,t} + \alpha_2 TOBIN_{i,t} * CGD_{i,t} + \alpha_3 TOBIN_{i,t} * CGS_{i,t} \\ & + \alpha_4 EPS_{i,t} + \alpha_5 AGE_{i,t} + \alpha_6 LEVERAGE_{i,t} + \alpha_7 SIZE_{i,t} + \varepsilon_{i,t} \end{aligned} \quad \text{(a)}$$

VALUE: net value per share, TOBIN: TOBIN's Q, TOBIN*CGD: the interaction of TOBIN's Q with the director board characteristic, TOBIN*CGS: the interaction of TOBIN's Q with the ownership structure, EPS: earning per shares, AGE: firm age as a listed firm, LEVERAGE: debt ratio, SIZE: firm size.

Research model (b): the intellectual capital valuation method is Knowledge Capital Earnings (KCE)

$$\begin{aligned}\text{VALUE}_{i,t} = {} & \alpha_0 + \alpha_1 KCE_{i,t} + \alpha_2 KCE_{i,t} * CGD_{i,t} + \alpha_3 KCE_{i,t} * CGS_{i,t} + \alpha_4 EPS_{i,t} \\ & + \alpha_5 AGE_{i,t} + \alpha_6 LEVERAGE_{i,t} + \alpha_7 SIZE_{i,t} + \varepsilon_{i,t} \end{aligned} \quad \text{(b)}$$

where KCE is the knowledge capital earnings, KCE*CGD is the interaction of knowledge capital earnings with the director board characteristic, KCE*CGS is the interaction of knowledge capital earnings with the ownership structure.

Research model (c): the intellectual capital valuation method is the value Added Intellectual Coefficient (VAIC)

$$\begin{aligned}\text{VALUE}_{i,t} = {} & \alpha_0 + \alpha_1 VAIC_{i,t} + \alpha_2 VAIC_{i,t} * CGD_{i,t} + \alpha_3 VAIC_{i,t} * CGS_{i,t} + \alpha_4 EPS_{i,t} \\ & + \alpha_5 AGE_{i,t} + \alpha_6 LEVERAGE_{i,t} + \alpha_7 SIZE_{i,t} + \varepsilon_{i,t} \end{aligned} \quad \text{(c)}$$

where VAIC is the value added intellectual coefficient, VAIC*CGD is the interaction of the value added intellectual coefficient with the director board characteristic, VAIC*CGS is the interaction of the value added intellectual coefficient with the ownership structure.

The variable of intellectual capital valuation in research model (a),(b), and (c) are Tobin's Q, knowledge capital earnings, and value added intellectual coefficient, and test hypothesis 1: intellectual capital valuation has a positive relationship on firm valuation. Add the interaction of intellectual capital valuation with the director board characteristic (CGD), ownership structure (CGS), then test hypothesis 2 and 3: whether corporate capital will affect intellectual capital valuation.

4 Empirical results and analysis

This section consists of two sub-sections that describe the empirical results, including descriptive statistical analysis and a discussion of the regression analysis.

4.1 Descriptive statistical analysis

The sample descriptive statistics are shown in Table 2. The average sample of Tobin's Q, KCE, and VAIC are positive, showing intellectual capital valuation as positive. Tobin's Q ranged from 0.18 to 23.22, with a mean of 1.36. Knowledge capital earnings ranged from −16.32 to 332.29, with a mean of 32.10. Value added intellectual coefficient ranged from −52.88 to 637.44, with a mean of 3.02. They show that individual sample measures of intellectual capital differ. The director board characteristic ranged from 0.42 to 3.08, with a mean

Table 2 Descriptive statistics

Variable	Smallest	Largest	Average	Standard deviation
VALUE	−19.20	425.23	17.78	42.99
TOBIN	0.18	23.22	1.36	1.09
KCE	−16.32	332.29	32.10	41.43
VAIC	−52.88	637.44	3.02	20.61
CGD	0.42	3.08	2.20	0.57
CGS	0.77	2.73	1.33	0.22
EPS	−10.72	50.48	2.37	4.28
AGE	1	59	20.66	9.58
LEVERAGE	2.26	98.59	39.64	16.67
SIZE	12.29	20.74	15.87	1.37

VALUE: net value per share, TOBIN: TOBIN's Q, KCE: knowledge capital earnings, VAIC: value added intellectual coefficient, CGD: director board characteristic, CGS: ownership structure, EPS: earning per share, AGE: firm age as a listed firm, LEVERAGE: debt ratio, SIZE: firm size

of 2.20, and ownership structure ranged from 0.77 to 2.73, with a mean of 1.33, which shows differences in corporate governance.

4.2 Regression analysis

The variance inflation factors (VIF) of each independent variable estimated in each research model were smaller than 10, and thus according to Greene (2008), the collinearity problems among independent variables were insignificant. Table 3 summarizes the regression analysis.

From the empirical results of the research model (a) in Table 3, the model (a) has a 1 % statistically significant level. The Tobin's Q value (TOBIN) positively relates to firm net value per share (VALUE) and has a statistically significant 1 % level. The interaction of TOBIN's Q to the director board characteristic (TOBIN*CGD) positively relates to firm net value and has a 5 % statistically significant level. However, the interaction of TOBIN's Q to the ownership structure (TOBIN*CGS) negatively relates to firm net value and does not have a statistically significant level.

From the empirical results of the research model (b) in Table 3, the model (a) has a 1 % statistically significant level. Knowledge capital earnings (KCE) positively relates to firm net value per share (VALUE) and has a statistically significant 5 % level. The interaction of knowledge capital earnings to the director board characteristic (KCE*CGD) negatively relates to firm net value and has a 10 % statistically significant level. However, the interaction of knowledge capital earnings to the ownership structure (KCE*CGS) negatively relates to firm net value and does not have a statistically significant level.

From the empirical results of the research model (c) in Table 3, the model (a) has a 1 % statistically significant level. The VAIC positively relates to firm net value per share (VALUE) and has a statistically significant 5 % level. The interaction of the value added intellectual coefficient to the director board characteristic (VAIC*CGD) negatively relates to firm net value and has a 5 % statistically significant level. However, the interaction of the value added intellectual coefficient to the ownership structure (VAIC*CGS) negatively relates to firm net value and does not have a statistically significant level.

Table 3 Empirical results of research models

Variable\model	Model (a) Regression coefficient	Model (b) Regression coefficient	Model (c) Regression coefficient
INTERCEPT	−27.28 (−2.45)**	3.03 (0.25)	8.03 (0.70)
TOBIN	8.63 (2.59) ***		
TOBIN*CGD	2.37 (2.32)**		
TOBIN*CGS	−2.56 (−1.23)		
KCE		0.27 (1.64)**	
KCE*CGD		−0.06 (−1.75)*	
KCE*CGS		−0.15 (−1.44)	
VAIC			2.73 (2.05) **
VAIC*CGD			−0.76 (−2.15)**
VAIC*CGS			−0.95 (−1.11)
EPS	6.13 (26.67)***	6.99 (28.32)***	6.91 (29.08)***
AGE	−0.20 (−2.08)**	−0.42 (−4.10)***	−0.41 (−4.01)***
LEVERAGE	−0.05 (−0.79)	−0.04 (−0.61)	−0.12 (−1.88)*
SIZE	1.41 (1.97) **	0.64 (0.83)	0.44 (0.59)
R^2	0.568	0.514	0.512
Adjusted R^2	0.565	0.510	0.508
F test of model	190***	152.56***	151.27***

* Significant level at 10 %, ** significant level at 5 %, *** significant level at 1 %. The figure is *t* value in the bracket

TOBIN, KCE and VAIC are one-way test, otherwise are two-way test

VALUE: net value per share, TOBIN: TOBIN's Q, TOBIN*CGD: the interaction of TOBIN's Q with the director board characteristic, TOBIN*CGS: the interaction of TOBIN's Q with the ownership structure, KCE: knowledge capital earnings, KCE*CGD: the interaction of knowledge capital earnings with the director board characteristic, KCE*CGS: the interaction of knowledge capital earnings with the ownership structure. VAIC: value added intellectual coefficient, VAIC*CGD: the interaction of value added intellectual coefficient with the director board characteristic, VAIC*CGS: the interaction of value added intellectual coefficient with the ownership structure, EPS: earning per shares, AGE: firm age as a listed firm, LEVERAGE: debt ratio, SIZE: firm size

In summary, the results of this paper support research hypothesis 1: intellectual capital valuation has a positive relationship on firm valuation; that is Tobin's Q, knowledge capital earnings, and the value added intellectual coefficient positively relate to firm net value per share. The results also support hypothesis 2: the director board characteristic of corporate governance has a positive or negative relationship on intellectual capital valuation; that is, the interaction of TOBIN's Q to the director board characteristic positively relates to firm net value; the interaction of knowledge capital earnings or the value added intellectual coefficient to the director board characteristic negatively relates to firm net value.

The results do not support research hypothesis 3: the ownership structure of corporate governance has a positive or negative relationship on intellectual capital valuation. The results show that Tobin's Q, knowledge capital earnings, and the value added intellectual coefficient have a positive relationship to firm value for information and electronic industries in Taiwan. The relationships between director board characteristics include board size, the ratio of outside directors, employed independent directors, the manager as a concurrent director;

and valuation of intellectual capital includes Tobin's Q, knowledge capital earnings, and the value added intellectual coefficient.

5 Conclusion

The main value of a firm is intellectual capital or intangible assets, therefore, the accumulation and management of intellectual capital is the competitive advantage for the information and electronic industry. Intellectual capital valuation is the essential factor in firm valuation. The management power of modern firms is separate from ownership, and easily occurs as an agency problem, so the firm needs to implement corporate governance, such as considering director board characteristics and ownership structure, to solve this problem. Scholars have presented that a complete appraisal of firm value includes the effect of corporate governance. Intellectual capital valuation, firm valuation, and corporate governance relate to the competitive power of an entire country, industry, and individual enterprise and are very important subjects for government, academic research, and operation practices. This is the first study to use a sample of the information and electronics industries in Taiwan, and adopts multiple regression models to explore the relevance of intellectual capital valuation methods, firm valuation, and corporate governance, making this an interesting, important, and innovative research issue.

The results show that Tobin's Q, knowledge capital earnings, and the value added intellectual coefficient have a positive relationship on firm value for the information and electronic industry in Taiwan. In matters of corporate governance, the characteristic of director board, including board size, the ratio of outside directors, employed independent directors, and the manager concurrently the director, are correlated with the valuation of intellectual capital, including Tobin's Q, knowledge capital earnings, and the value added intellectual coefficient. Therefore, the management of a firm should be committed to the accumulation and management of intellectual capital to enhance firm value. The firm should focus on implementing corporate governance to increase the effect of intellectual capital that can enhance firm value.

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