To Verify How Intellectual Capital Affects Organizational Performance in Listed Taiwan IC Design Companies with Considering the moderator of Corporate Governance

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ABSTRACT

The main purpose of the research is to verify the effect of intellectual capital on organizational performance in listed Taiwan IC design companies with corporate governance as the intervening variable, and section chief or above in the financial sectors of listed Taiwan IC design companies were the research targets, the database of Taiwan Economic Journal (TEJ) was used to obtain the earnings per share (EPS) data of certain companies. The research adopted convenience sampling which took samples from the population and applied structural equation modeling (SEM) to verify the overall model of the research and its fitting effect of goodness-of-fit of the structural model and the measurement model. The result shows that intellectual capital and corporate governance have a positive and significant interaction effect on the organizational performance in listed Taiwan IC design companies.

Keywords: Intellectual capital, organizational performance, corporate governance

INTRODUCTION

Taiwan is the only country that has a professional system in vertical division of labor among the major semiconductor producing countries of in the world; by the active fostering by the policies, science parks were established, and they're used as the core to generate an enormous cluster effect and they had since become a successful example of developing semiconductor industry for other countries in the world. Taiwan's semiconductor industry has a complete supply chain structure. Thus, whether it's in terms of efficiency or cost, it has an unmatched competitiveness, these manufacturing advantages provided a strong backing for the IC design industries, and an excellent thriving environment (Tzu-feng Peng, 2009).

In addition, if an enterprise wants to gain a dominant position in a rapidly changing environment, it must go through the accumulation of intellectual capital to improve its organizational performance, and thus enhancing its corporate values, enabling the enterprise to continue to grow, and improving the sustainable development potential of the enterprise.

In recent years, there were outbreaks of financially critical incidents one after another in listed information and electronic companies in Taiwan, there were no shortage of large-scale well-known enterprises in which problems occurred. For example: Procomp Informatics, Royal Information Electronics, Infodisc Technology, etc. One of the main reasons for the enterprise financial crisis occurred during that period was likely caused due to the laws at that time did not have an adequate mechanism to oversee corporate governance. In fact, as early as July 2001, Taiwan's Economic Development Council introduced the project of "Directors and supervisors from other companies", in February of the following year, the Securities & Futures Commission of the Ministry of Finance issued an executive order which stipulates that "the newly listed companies have to hire two seats of outside director, 1 seat of external supervisor", outside directors already became one of the criteria for market review in newly listed companies, but for companies that had already been publicly listed, it was not mandatory. However, the father of Taiwan's semiconductor industry - TSMC chairman Morris Chang believed although there's no mandatory requirement from any executive order for companies already listed publicly, companies should still take active initiatives on corporate governance and outside director system based on sustainable development. Therefore, TSMC first hired Michael Porter, MIT's professor of economics, Sir Peter
Bonfield, professor of Harvard business school, Sir Peter Bonfield, former CEO of British Petroleum, and so on three internationally renowned experts hoping to achieve the effect of providing a catalyst for others to follow. Based on this, corporate governance and outside director system have become a wave of business in Taiwan. Therefore, sound corporate governance mechanism can prevent and reduce agency costs, it establishes the management and oversight mechanisms for a company, while serving the best interests of the company, and it can improve organizational performance. (Tsung-Hsien Chuang, 2004); however, there were also studies holding the opposite point of view, that is, when the equity is more concentrated in managers, they may choose programs unfavorable to shareholders, thus, reducing the company's organizational performance. Based on this, whether sound corporate governance affects the performance or value of a company is indeed a major issue (Jensen and Ruback, 1983).

As can be seen from the above description, if an enterprise is to take advantages of a rapidly changing environment, then it must enhance the accumulation of its intellectual capital, and go through the corporate governance to improve its organizational performance, so that it can ensure the sustainable management and development of the company, whether the accumulation of enterprise intellectual capital and the excellent corporate governance can develop the interaction synergy to improve an enterprise's organizational performance was the main motivation that brought about this research. Therefore, this research treated the listed Taiwan IC design companies as the object of study to establish the research model and verified it according to past literature, and understood its goodness-of-fit. In other words, the specific purposes of this research were described below:

1. To verify and to understand whether the intellectual capital of the listed IC design companies in Taiwan has a positively significant effect on organizational performance.
2. To verify and to understand whether the corporate governance of the listed IC design companies in Taiwan has a positively significant effect on organizational performance.
3. To verify and to understand whether the intellectual capital and corporate governance of the listed IC design companies in Taiwan have a positive and significant interaction effect on organizational performance.

LITERATURE REVIEW

This section aimed to understand the the correlation between the research results of past scholars and this research topic. From the literature review, the research hypotheses were derived to establish the research framework, hereby described the theory and research below respectively.

Intellectual capital

Stewart wrote a book in 1997 “Intellectual Capital: The New Wealth of Organizations”, many practical cases were cited, it described the three major elements of intellectual capital: human capital, structural capital, and customer capital. Stewart (1997) believed intellectual capital includes human capital, structural capital, and customer capital. Human capital refers to innovation, employee attitudes, seniority, turnover, experience, and learning; structural capital refers to using highly effective way to collect, test, organize, integrate existing knowledge and to eliminate the impure and to retain the pure then disseminate it; customer capital refers to the relationship between a certain organization and the people it deals with, such as customer satisfaction, customer retention rate, and customer loyalty.

Edvinsson & Malone (1997) wrote the book, “Intellectual Capital: Realizing Your Company's True Values by Finding its Hidden Brainpower”. It explained the implementation process and the measuring indicators of Skandia Company. In addition, Edvinsson & Malone (1997) also believed intellectual capital includes human capital, structural capital, and customer capital. Human capital refers to the individual capability, knowledge, skills, experience, and it also includes an organization's creativity and innovation; structural capital refers to being capable of materializing and giving power to the human capital, and the supporting infrastructure, it's a kind of ability to organize including a tangible system used to transmit and to store smart materials; customer capital refers to customer satisfaction, constancy, price sensitivity, and the financial condition of long-term customers.

Sveiby (1998) believed that intellectual capital included individual competence, internal structure, and external structure. Individual competence refers to employees ability to act in a variety of situations including explicit knowledge,
skills, experience, value judgments, and social network; internal structure refers to patents, concept, modes, computer and management system; external structure refers to the relationship between the customers and suppliers such as brands, reputation, and trademarks.

Johnson (1999) believed intellectual capital included human capital, structural capital and relationship capital. Human capital refers to idea capital (the manpower, employee abilities and attitude of the knowledge base) and leadership capital (the characteristics of experts and managers); structural capital refers to innovation capital (patents, trademarks, copyrights, knowledge database) and procedure capital (working procedures, trade secrets); relationship capital refers to customer relations, supplier relationships, and the relationship of network membership.

Knight (1999) believed intellectual capital includes human capital, structural capital, external capital, and financial performance, human capital refers to employee turnover, employee satisfaction, the number of new product ideas, and the number of proposals submitted/accepted; structural capital refers to working capital turnover ratio, the ratio of salespeople to general and administrative personnel, and time to market of new products; external capital refers to customer continuity, customer satisfaction, a list of most profitable customers, and supplier quality/reliability indicator; financial performance refers to economic value added (EVA), the number of accounts receivable within 90 days, and added value per employee.

Mei-Chun Chen (2001) pointed out invisible intellectual capital is an important reference index to evaluate the value of an enterprise. It's composed of human capital, structural capital, and relationship capital, and it defined the intellectual capital as: “the skills, knowledge, information, experience, problem-solving abilities and wisdom which cover an entire company, and integrated with human capital, structural capital and relationship capital”, and the so-called “human capital is the knowledge, skills and experience of employees and managers of an entire company”; the so-called “structural capital is the overall systems and procedures that solve problems and create values for a company”; the so-called “relationship capital is the external relationships an organization established, maintained and developed including customers, suppliers, and partners”.

Edvinsson (2003) described intellectual capital simply: intellectual capital is the pillars of the future of any enterprise; it’s an indicator of whether an enterprise can operate effectively. Any enterprise that does not invest in invisible capital cannot possibly generate the momentum of innovation (Shu-Hsiao Tsen and Hsiang-Ling Hu, 2010).

The above descriptions were consolidated, and therefore, the conceptual definition of “intellectual capital” for the research followed the definition of Mei- Chun Chen (2001), “the skills, knowledge, information, experience, problem-solving abilities and wisdom which cover the entire company, and integrated with human capital, structural capital and relationship capital”, and its operational definition is summarized below:

A. Human capital: the knowledge, skills, and experience of all employees and managers of a company.
B. Structural capital: the overall system and process of problem solving and value creation of a company.
C. Relationship capital: the establishment, maintenance and development of external relationships by the organization including customers, suppliers and partners.

Corporate governance

Fu-Li Li’s (2006) study indicated that the variables of corporate governance included board size, ratio of shareholding of directors and supervisors, equity pledge ratio of directors and supervisors, certification content of accountant, replacing the accountant, whether chairman and general manager are the same person, etc.

Ling-Ju Cheng (2008) indicated that corporate governance is defined as “the rights and responsibilities of managers, shareholders, board of directors, and other stakeholders, and a set of systems and procedures stipulated to manage company affairs”. In addition, she pointed out the variables of corporate governance included ratio of shareholding of managers, ratio of shareholding of large shareholders, board size and ratio of shareholding of outside directors, and conducted research.

This research’s “conceptual definition” of corporate governance followed Ling-Ju Cheng’s (2008) definition: “the rights and responsibilities of managers, shareholders, board of directors, and other stakeholders within the company, and a clearly stipulated system and program to manage company affairs”, this research studied the variables of corporate governance including board size, ratio of shareholding of outside directors, ratio of shareholding of directors and
supervisors, equity pledge ratio of directors and supervisors, managers' shareholding ratio, certification content of accountant, whether chairman and general manager are the same person, etc.

Organizational performance

Bonoma & Clark (1988) found what's used more commonly by the enterprise to measure the financial side included the rate of profit, sales growth rate, market share, and cash flow.

Vorhies & Morgan (2005) pointed out when a company is judging whether its organizational marketing capabilities can shape its organization's competitive advantages, it can carry out measurement from three performance indicators, in order to measure effectively whether its marketing capability possesses a competitive advantage, these three measuring indicators must be established on the basis to compared against the company's major competitors. However, the characteristics and the content of these three measuring indicators are:

(1) Customer satisfaction: this indicator includes various actions that can be taken to improve customer satisfaction. For example: customer satisfaction, the delivery capability of customer values, the ability to satisfy customers, retaining valuable customers, etc.

(2) Market performance: this indicator is mainly used to measure the company's ability to achieve various goals related to markets. For example: the growth of market share, the growth of sales revenue, the growing number of new customers, and the growth of sales volume to existing customers, etc.

(3) Expected or existing earning power: this indicator is mainly used to measure the warning situation within the past year and forecast the earning situation in the next year. For example: earning power, rate of return, return on sales, and the ability to achieve the financial goals of a business unit, etc. Clark (2000) discovered in the research, sales growth rate, profitability and market share are the most commonly used measuring indicators in business.

Atkinson et al. (1997) believed that the trends of performance development were to jointly improve existing financial indicators (for example: added economic values, etc.) and the non-financial indicators that can guide the organization to look ahead (for example: customer satisfaction, employee satisfaction, product defect rate, etc.)

Tatikonda's (1998) research indicates that in a changing environment a performance management system that only pays attention to only short-term financial goals will waste the limited resources of the enterprise. Therefore, what the enterprise needs is a dynamic performance measurement system. That is, a vision that surpasses the traditional financial performance.

In the past, there were lots of research that discussed the measuring dimensions of organizational performance because the ultimate benefits will be fed back to the financial dimension; therefore, most scholars used financial performance as one of the measuring indicators. However, in today's convenient information delivery and rapidly changing market environment, an enterprise cannot just reply on the financial performance as the only element of survival and competition. That is, organizational performance can not be measured adequately just by a single financial performance indicators. (Ya-Hui Ling and Ling Hung, 2010).

In addition, Ya-Hui Ling and Ling Hung (2010) believed organizational performance is the results completed within a specified period by the relevant business, departments within an organization, in order to achieve phased or overall goals.

Kaplan & Norton (1996) emphasized that in order to achieve strategic objectives, an enterprise should not be too dependent on the financial aspects, and both the financial and non-financial dimensions should be required. In other words, the measurement of financial performance should start from both the financial and non-financial perspectives, the non-financial perspective refers to:

(1) Customer perspective

(2) Internal procedure perspective and

(3) Learning and growth perspectives, and so on three perspectives.

Summing up the above, the “conceptual definition” of “organizational performance” of this research adopted the definition by Ya-Hui Ling and Ling Hung (2010). In addition, the view of “financial perspective” and “non-financial perspective” in Kaplan's & Norton's balanced scorecard was adopted to be the measuring dimension of a company.
The effect of corporate governance on organizational performance

Alchian and Demsetz (1972) believed once the equity is too fragmented, it lowers the degree of control on managers by the enterprise, thereby affecting the values of the company. As for the large shareholders, it refers to those shareholders with more than 10% of actual ordinary shares under the Securities Exchange Act. When the sense of shareholding is dispersed due to the spread of ownership, more monitoring is required; it also led to a higher degree of information disclosure.

Zahra and Pearce (1989) believed that the larger a board size, the more it is able to perform supervisory and guidance functions. The board members can be divided into inside directors and outside directors, inside directors refer to the directors who serve in other positions in the company; outside directors refer to the directors that do not serve in any position within the company, they're usually more professional and more independent, they can easily perform the supervisory functions and lower the possibility of conspiracy and abuse by the executives of the company.

Yermack’s (1996) research indicated that smaller board is less effective than larger board, therefore, there is a positive relationship between a board size and Tobin's Q, and the higher the ratio of shareholding by outside directors or the higher the ratio of outside directors, the higher the company values, it indicated outside directors performed the functions of independent supervision and assessment enabling the company's decision making to be more efficient.

Pei-Chun Hung (2006) indicated whether it's a group company or a non-group company, institutional investors holding and excellent corporate governance will all have a significant positive effect on corporate performance, and among them, foreign ownership had the greatest effect.

Yin-Hua Wang’s (2006) research pointed out that equity structure and the board structure have a key effect on company values, and the companies with excellent corporate governance system will attract more investors. The reason being excellent corporate governance can ensure that investors can get a reasonable return on investment. Thus, corporate governance has a significant positive effect on performance (Ling-Ju Cheng, 2008).

The research established the following research hypothesis based on the above deduction:
Hypothesis 1 (H1): corporate governance has a significant, positive effect on organizational performance in listed information and electronics companies in Taiwan.

The effect of intellectual capital on organizational performance

Chao-Hsu Yang (2006) did research on 211 listed enterprises, and found that intellectual capital had a significant contribution to the creation of organizational values and organizational competitive advantages. Its capacity can be brought into play more effectively going through the interaction among human, structure and customer capital. Rudez and Mihalic (2007) also pointed out in their research, the hotel industry must promote the development of its intellectual capital so it can maintain its competitiveness. If they can go through the interaction of human capital and information technology, then the financial performance of the organization can be boosted. No matter it’s information technology, biotechnology, high technology, or emerging industries, etc., intellectual capital affected their organizational performance deeply (Chang, Chen, & Lai, 2008), especially in the international tourist hotels and other service industries, what they provided were tangible products and intangible services, such as employees' knowledge and an organizational management procedures, etc., these are all the intellectual capital of an organization. Shi-Hsiao Tsen et al. (2010) indicated that intellectual capital includes “human capital”, “structural capital”, and “social capital”. Therefore, an organization should develop the “human capital” that cannot be imitated by the competitors easily, converting the wisdom and capabilities it has accumulated into its core competencies: operating the functions of “structural capital” to create distinct characters of an organization. It establishes an irreplaceable external relationship to enhance an organization's “social capital”, and the synergy created from the interaction among “human capital”, “structural capital” and “social capital” is a key for an organization to build competitiveness. Mei-Chun Chen (2001) believed an organization's intellectual capital had a significant positive effect on organizational performance.

According to the above analysis, even though the research targets of these literatures were not in the biotechnology and the technology sectors, this research can still deduce the following hypotheses:

Hypothesis 2 (H2): the accumulation of intellectual capital has a significant, positive effect on organizational
Whether intellectual capital and corporate governance can simultaneously have a multiplying effect on organizational performance is a subject worth investigating. Therefore, this research derived the third hypothesis:

Hypothesis 3 (H3): the intellectual capital and corporate governance of listed IC design companies of Taiwan have a significant interaction effect.

RESEARCH METHOD

The research hypotheses were derived based on the above research motivation, objective, and literature review, and it established the conceptual research framework of the following research model as shown in Figure 1.

The research framework

![Research Framework Diagram]

Questionnaire design

The questionnaire design of the research follow each observable dimension and the “itemized measurement” method was adopted for implementation. The measurement of questionnaire adopted seven-point Likert scale, a score of 1 to 7 was given according to the extent of agreement and disagreement, a 7-point represents an extreme agreement, a 1-point represents an extreme disagreement, the higher the extent of agreement, the higher the score; conversely, lower scores. Then, a “centralization” was carried out on all of the sample data collected, that is, the sum of subtracting the mean from the score of each questionnaire’s topic is zero, to eliminate the linear overlap between the independent variables and the intervening variable, to test the interaction between the independent variables and the intervening variable, the math formula of “centralization” is shown below:

$$\sum (X_i - \bar{X}) = \sum Y_i = 0$$

With regard to the questionnaire design of "intellectual capital" the point of view of Mei-Chun Chen(2001), Shu-Hsiao Tsen and Hsiang-Ling Hu (2010) about intellectual capital was referred to, and three dimensional scales of “human capital”, “structural capital” and “relationship capital” were used to design 12 questions.

With regard to the questionnaire design of “corporate governance”, the scale of corporate governance by Fu-Li Li (2006) and Ling-Ju Cheng (2008) was used as a reference and a total of 24 questions were designed.

As to the measuring indicator of “organization performance”, the measuring indicators of financial performance referred to the earnings per share (EPS) between 2001 and 2011 of the target companies and were used as the measuring indicators, and these indicators were obtained from the database of Taiwan Economic Journal (TEJ). As to the non-financial performance aspect, the non-financial performance dimension of Kaplan & Norton (1996) was followed, that is: (1) Customer perspective; (2) Internal procedure perspective and (3) Learning and growth perspective, and so on three perspectives, and Ya-Hui Ling and Ling Hung (2010) was used as a reference to design a total of 16 questions.
The sampling method

This study uses convenience sampling to conduct a questionnaire survey targeting the personnel of finance section chief and above in the listed IC design companies of Taiwan. In this research, 30 expert questionnaires were issued as a pre-test, revisions were made according to the recommendations from the experts, the post-test was then conducted, 300 questionnaires were formally distributed with 238 effective samples, and the sample recovery rate was 79.3%.

Questionnaire data and measurement system

In order to verify the research framework proposed by the research, structure equation modeling (SEM) was adopted to conduct the confirmatory factor analysis (CFA) for the research model framework. The research divided the questionnaire into three implicit variables of intellectual capital, corporate governance, and organization performance. Each implicit variable can be divided into the following observable/explicit variables, and each observable/explicit variable has several questions in the survey. The data obtained from the survey was then processed, and the original questionnaire data file was established; as to the construction of the measurement system of the research model, although the questionnaire design followed the method of “itemized measurement”, however, the duel measurement (Shun-Yu Chen, 2010) was used to carry out the measurement when making the software processing by computers more smoothly was considered. The number of questions in the survey related to the research’s implicit variables and explicit variables and their reference sources were shown in Table 1.

<table>
<thead>
<tr>
<th>Implicit Variables</th>
<th>Explicit Variables</th>
<th>Number of questions</th>
<th>Questionnaire references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual capital (X)</td>
<td>Human capital</td>
<td>4</td>
<td>Mei-Chun Chen (2001),</td>
</tr>
<tr>
<td></td>
<td>Structural capital</td>
<td>4</td>
<td>Shu-Hsiao Tsen and Hsiang-Ling Hu(2010)</td>
</tr>
<tr>
<td></td>
<td>Relationship capital</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Corporate governance (MO)</td>
<td>Board size and the ratio of outside directors' shareholding</td>
<td>4</td>
<td>Ling-Ju Cheng (2008)</td>
</tr>
<tr>
<td></td>
<td>Shareholding ratio directors and supervisors</td>
<td>4</td>
<td>Fu-Li Li (2006)</td>
</tr>
<tr>
<td></td>
<td>Equity pledge ratio directors and supervisors</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Managers’ shareholding ratio</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Certification content of accountant</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chairman and general manager</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Organizational performance (Y)</td>
<td>Financial dimensions (measured by EPS)</td>
<td>4</td>
<td>Database of Taiwan Economic Journal</td>
</tr>
<tr>
<td></td>
<td>Non-financial dimensions</td>
<td>12</td>
<td>Ya-Hui Ling and Ling Hung (2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kaplan &amp; Norton (1996)</td>
</tr>
</tbody>
</table>

RESEARCH RESULTS AND ANALYSIS

The linear structure model

Confirmatory factor analysis (CFA) is an analysis method relative to exploratory factor analysis (EFA), this research carried out a confirmatory factor analysis among three implicit variables (latent variables): “intellectual capital”, “corporate governance”, and “organizational performance”. And structural equation modeling (SEM) included the structural model and the measurement model, it can effectively solve the cause and effect relationship between implicit variables and latent variables. In addition, the model this research verified included three parts, they were:

1. The goodness-of-fit of the measurement model;
2. The goodness-of-fit of the structural model and;
3. Verification of whether the goodness-of-fit and so on of the overall model were in compliance with the goodness-of-fit
indices to judge the fitting effect of the overall SEM model (Diamantopoulos & Siguaw, 2000).

**Analyzing the fit of the measurement model**

The factor loading of each latent/implicit variable and manifest/explicit variable was mainly used to measure the strength of linear correlation of explicit and implicit variables; the closer the factor loading is to 1, the more it means the manifest variable could measure the latent variable. The factor loading of each manifest variable was between 0.7 and 0.9 indicating the excellent reliability; therefore, the “manifest variable” (explicit variable) within the model's “measurement system” could all measure the “latent variable” (implicit variable) appropriately. In addition, average variance extracted (AVE) was used to calculate latent (implicit) variable's ability to explain variation, the higher the VE value, the higher the reliability and the convergent validity of implicit variable (latent variable). In general, the VE value must be greater than 0.5, that is: the explained variation of the manifest variable(s) is greater than the measurement error (Fornell and Larcker, 1981). The AVE of the research were all greater than 0.5, this indicated that the explicit variables had a very high reliability and convergent validity (Table 2 and Figure 1).

<table>
<thead>
<tr>
<th>Latent variable (implicit variable)</th>
<th>Manifest variables – centralized duel measurement</th>
<th>Factor loading</th>
<th>Variance Extracted, VE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual capital (X)</td>
<td>X1C</td>
<td>0.86</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>X2C</td>
<td>0.85</td>
<td>0.66</td>
</tr>
<tr>
<td>Corporate governance (Mo)</td>
<td>M1C</td>
<td>0.83</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>M2C</td>
<td>0.84</td>
<td>0.65</td>
</tr>
<tr>
<td>X*Mo</td>
<td>X1M1C</td>
<td>0.82</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>X2M2C</td>
<td>0.83</td>
<td>0.64</td>
</tr>
<tr>
<td>Organizational performance (Y)</td>
<td>Z1C</td>
<td>0.86</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>Z2C</td>
<td>0.87</td>
<td>0.68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Path coefficients among implicit variables</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual Capital (X) → Organizational performance (Y)</td>
<td>.393</td>
<td>.081</td>
<td>4.852</td>
<td>*** a</td>
<td></td>
</tr>
<tr>
<td>Corporate Governance (Mo) → Organizational performance (Y)</td>
<td>.463</td>
<td>.033</td>
<td>14.030</td>
<td>*** b</td>
<td></td>
</tr>
<tr>
<td>X*Mo → Organization performance(Y)</td>
<td>.691</td>
<td>.022</td>
<td>31.410</td>
<td>*** c</td>
<td></td>
</tr>
<tr>
<td>X → X1C</td>
<td>.862</td>
<td>.161</td>
<td>5.354</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>X → X2C</td>
<td>.873</td>
<td>.162</td>
<td>5.389</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Mo → M1C</td>
<td>.831</td>
<td>.234</td>
<td>3.551</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Mo → M2C</td>
<td>.848</td>
<td>.222</td>
<td>3.820</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>X*Mo → X1M1C</td>
<td>.931</td>
<td>.183</td>
<td>5.087</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>X*Mo → X2M2C</td>
<td>.951</td>
<td>.181</td>
<td>5.254</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Y → Z1C</td>
<td>.823</td>
<td>.144</td>
<td>5.712</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Y → Z2C</td>
<td>.829</td>
<td>.146</td>
<td>5.678</td>
<td>***</td>
<td></td>
</tr>
</tbody>
</table>

Note: * indicates P <0.05; ** indicates P <0.01; *** indicates P <0.001

**Coefficient of determination**

The coefficient of determination is also called squared multiple correlations (SMC), that is, the extent of explanation of the implicit “independent variable” on the implicit “dependent variable”. In other words, the R² value shown in Table 4 indicates that the implicit independent variable has an adequate explaining ability on the implicit
dependent variable respectively.

Table 4: Coefficients\(^a\)【Hierarchical Regression】

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.887(^a)</td>
<td>.783</td>
<td>.773</td>
<td>.317</td>
<td>.787</td>
<td>179.218</td>
<td>2</td>
<td>97</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>.895(^b)</td>
<td>.811</td>
<td>.785</td>
<td>.512</td>
<td>.015</td>
<td>7.024</td>
<td>1</td>
<td>96</td>
<td>0.009</td>
</tr>
</tbody>
</table>

\(^a\) Predictors: (Constant), Mo and X  
\(^b\) Predictors: (Constant), Mo, X and Mo*X

Data was extracted from Table 4 to obtain Table 5 as shown below.

Table 5: Coefficients\(^a\)

<table>
<thead>
<tr>
<th>Coefficients of Determination</th>
<th>R(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual capital(X), corporate governance (Mo) on organizational performance(Y)</td>
<td>0.783</td>
</tr>
<tr>
<td>Intellectual capital(X), corporate governance(Mo) and X*Mo on organizational performance(Y)</td>
<td>0.811</td>
</tr>
</tbody>
</table>

The goodness-of-fit analysis of the overall model

Structural equation modeling (SEM) was used as the objective of the research modeling to investigate the relationship of implicit variables within the structural model, and whether the reliability of measurement existed in the measurement model, and the fitting effect of the overall goodness-of-fit of the research was measured, and the indices of overall goodness-of-fit to measure the research included \(\chi^2\), d.f., GFI, AGFI, NFI, CFI, RMR, RMSEA, etc., generally, \(\chi^2/d.f. <5\); 1>GFI>0.9; 1>NFI>0.9; 1>CFI>0.9; RMR<0.05; RMSEA<0.05 (Bagozzi & Yi, 1988), overall, the goodness-of-fit of the overall model of the research was \(\chi^2/d.f. <5\); GFI, AGFI and NFI all greater than 0.90, and RMR value is less than 0.05 indicating that the overall goodness-of-fit effect of the research model was good as shown in Table 6.

Table 6: The evaluation table of goodness-of-fit of the overall model

<table>
<thead>
<tr>
<th>Determination index</th>
<th>(\chi^2)</th>
<th>DF</th>
<th>GFI</th>
<th>AGFI</th>
<th>NFI</th>
<th>CFI</th>
<th>RMR</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fit value</td>
<td>12.705</td>
<td>14</td>
<td>0.917</td>
<td>0.902</td>
<td>0.913</td>
<td>0.911</td>
<td>0.013</td>
<td>0.021</td>
</tr>
</tbody>
</table>
STANDARDIZED RESULTS OF SEM ANALYSIS

Figure 2 shows the overall framework with the standardized results implemented by a computer.

Figure 2: Standardized results of SEM analysis

The analysis and verification of the path effect of the structural model

The test of the intervening variables of this research was first to conduct the hierarchical regression analysis (as in Table 4), then the regression analysis of centralized Y against X, Mo, X*Mo was carried out and the t-test was conducted to examine whether the significance of partial regression coefficient c can be established (that is, if c is not equal to 0), as shown in Table 7 (Lee, 2011).

Table: 7 Coefficientsa

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>3.817</td>
<td>4.181</td>
<td>.456</td>
<td>4.923</td>
</tr>
<tr>
<td>X</td>
<td>9.354</td>
<td>.902</td>
<td>.381</td>
<td>10.933</td>
</tr>
<tr>
<td>Mo</td>
<td>6.885</td>
<td>.422</td>
<td>.363</td>
<td>13.341</td>
</tr>
<tr>
<td>2 (Constant)</td>
<td>4.033</td>
<td>4.562</td>
<td>.423</td>
<td>4.363</td>
</tr>
<tr>
<td>X</td>
<td>9.597</td>
<td>.924</td>
<td>.392</td>
<td>9.932</td>
</tr>
<tr>
<td>Mo</td>
<td>6.873</td>
<td>.616</td>
<td>.383</td>
<td>13.331</td>
</tr>
<tr>
<td>X*Mo</td>
<td>15.413</td>
<td>.631</td>
<td>.693</td>
<td>22.951</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Organizational Performance (Y)
It can be known from Table 7 that the path coefficient of Mo*X to Y is 0.691 (c=0.691), thus, it was known that Mo*X has an intervening effect on Y.

According to the above analysis, the following verified results can be obtained by the research:

1. Intellectual capital had a significant positive effect on organizational performance; the standardized path coefficient was 0.39. Thus, hypothesis H1 obtained support. (The hypothesis was validated.)
2. Corporate governance had a significant positive effect on organization performance; the standardized path coefficient was 0.46. Thus, hypothesis H2 obtained support. (The hypothesis was validated.)
3. Verified and understood intellectual capital and corporate governance had a significant positive effect on organization performance; the standardized path coefficient was 0.86. Thus, hypothesis H3 obtained support. (The hypothesis was validated.)

CONCLUSION AND SUGGESTIONS

Research conclusion

The following specific conclusion can be obtained through the above results and data analysis.

In terms of the model verification of SEM:

The structural equation model (SEM) built by the research and its measurement model, structural model and overall structure had an excellent goodness-of-fit, it indicated the model fitting was good.

In terms of practical validation:

The accumulation of intellectual capital and excellent corporate governance had a significant positive interaction effect in the listed IC design companies of Taiwan. In other words, the “corporate governance” variable of the research had a positive intervening effect. According to Shun-Yu Chen (2010), when the intervening variable and the independent variable have a simultaneous significant interaction effect on the dependent variable, then the effect of independent variable on the dependent variable or the intervening variable's effect on the dependent variable became less meaningful.

The contribution of the research

1. On the practical level

The research subjects of the past scholars tended to focus on exploratory factor analysis (EFA). However, this research modeled after the integrated, relevant research results of the past scholars, and the goodness-of-fit of the model was verified to understand whether the model had a goodness-of-fit effect. Thus, the research subject was classified as a confirmatory factor analysis (CFA) of practical subject of importance, other than being useful as a reference for follow-up researchers to continue the research in related areas, the results from this research can also be used as a strategic reference by the decision makers when implementing corporate governance for listed IC design companies of Taiwan; therefore, this research is a very valuable reference.

2. The innovative research method

Having reviewed the past literature, most of the researches applied multi-regression analysis to conduct exploratory research, very rarely was there a research framework that adopted confirmatory factor analysis to consider the intervening effect of an implicit variable, and the major dimensions of the research subject were implicit variables, thus, CFA and SEM were more appropriate to be applied as the measurement tool and model framework; therefore, the research method in this research was relatively innovative.

Research constraints and recommendation

1. Due to the resource constraints limited by this research, convenience sampling which was a kind of non-probability sampling was adopted, that is, convenience was used as the basis in the selection of samples which only considered the convenience of proximity or ease of measurement, however, the sampling bias was large, and the reliability of the results will be relatively poor. It's suggested that the follow-up researchers adopt simple random sampling method or
stratified random sampling method, and so on to acquire the samples.

2. This research was a confirmatory factor analysis, while building the model; the validation model should be designed as concisely as possible to avoid building any model that is too complex that may generate a poor goodness-of-fit (Shun-Yu Chen, 2010). Thus, this research only considered the effect of capital structure on organizational performance and with corporate governance as the intervening variable.

3. This research was only limited to confirmatory factor analysis (CFA) of listed IC design companies of Taiwan. Follow-up researchers may consider expanding the scope of the research or verify it in different industries, so the goodness-of-fit of different industries of the same model can be compared.

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