The Effects of Balanced Scorecard Implementation on the Intellectual Capital Accumulation of Taiwan-listed IT Companies: Using Corporate Innovation Activities as the Moderator

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ABSTRACT

This study is primarily intended to verify the effects of Balance Scorecard (BSC) implementation on the Intellectual Capital (IC) accumulation of Taiwan-listed IT companies, with corporate innovation activities being the extraneous variable. Interviews were conducted on the managerial staff of financial, human resource and marketing departments at the afore-mentioned companies, selected by way of Simple Random Sampling. This study's author tested the goodness-of-fit effects of the overall model, structural model, and measurement model using Structural Equation Modeling (SEM) and found a significantly positive extraneous/interactive effect of corporate innovation activities on the relationship between BSC implementation and IC accumulation at Taiwan-listed IT companies. In other words, corporate innovation activities noticeably accelerate the effects of BSC implementation on a Taiwan-listed IT company's IC accumulation efforts.

Keywords: Balanced Scorecard, Intellectual capital, corporate innovation activities

INTRODUCTION

For a company, BSC is a measure of forces driving the future performance, a remedy for the insufficient measures for past financial performance, and a strategic management tool combined with corporate strategies/vision. Intellectual Capital (IC), on the other hand, is essential to a company’s survival as it bolsters the Enterprise Value (EV) and competitive advantage (Han-yi Chiang, 2006).

Not only does strategic integration become more and more important in terms of management accounting, it is also shifting from the one-dimensional principle of performance assessment toward a multi-dimensional one that involves an organization’s key success factors at every level (Kaplan, 1984; Johnson, 1990; Hall, 1990). In addition to the financial, or conventional, perspective of corporate performance, the BSC system consists of indicators in three non-financial perspectives, namely the “customer”, “internal-business-process” and “innovation and learning” perspectives. By connecting an organization’s vision/strategies, the BSC presents a new measurement system constructed on the basis of objectives and measures, with the organization’s future competitiveness driven largely by the four perspectives mentioned above. The value of BSC, according to Chow and Haddad (1997), lies in the fact that it is an integration of strategies, frameworks and vision that transforms a corporate organization’s long-term strategies and goals (e.g., the creation of customer value) into tangible actions, internally or externally (Chang-yun Liu, 2002).

IC has emerged as a company’s key factor for future success and long-term profitability in the age of knowledge-based economy, when tangible corporate assets are gradually replaced by intangible ones. For information reliability reasons, the conventional approach to financial accounting requires that corporate value be measured on the basis of transaction costs already incurred and that transaction details be objectively, faithfully represented; however, this approach leaves many important intangible assets overlooked (Yu-hsiu Chen, 2005). The primary motive of the present study is to address the growing percentage of EV not shown in the balance sheet (e.g., patents, customer base, and brand values) and IC’s increasing importance as a crucial determinant of a company’s future success and long-term profitability, as mentioned earlier. The second motive, nevertheless, is the fact that the information and electronics sector has long been an integral part of Taiwan’s industrial development, with the output of electronics companies contributing heavily to the national economy over the past two decades. Among others, the recently intensifying competition in the broader economic context has forced management staffs at Taiwanese information and electronics...
firms to redouble efforts to create new values, to explore the next growth market, to contemplate innovation strategies as well as the requirements for (and practices of) own-brand establishments through corporate transformation/upgrade initiatives, and eventually to demonstrate the active benefits of enhanced values.

Meanwhile, a company’s ongoing innovation and knowledge accumulation efforts that result in EV-enhancing IC have become a key factor of corporate competitiveness. In other words, any corporate innovation activity (i.e., an organization-initiated, IC-based attempt to offer a new technology/product/service, to develop a new market, or to adopt a new management strategy) is the crucial factor behind a company’s continuous competitiveness. Such an activity ensures a company’s sustainable operations by way of nonstop growth and development (Feng-chu Hung, 2008).

To ensure sustainable operations and growth in a rapid-changing business context, companies seeking competitiveness must implement the BSC and further accumulate IC through innovation activities. The primary purpose of the present study is to examine whether the attempt to simultaneously implement BSC and innovation activities creates interactions and synergy that benefit a company’s IC accumulation. With a focus on Taiwan-listed IT companies, therefore, this study’s author built a research model out of findings from previous studies, and verified it for goodness-of-fit effects. To be specific, this study was conducted for three purposes:
1. To verify and understand whether BSC implementation affects the IC accumulation of Taiwan-listed IT companies in a significantly positive way;
2. To verify and understand whether corporate innovation activities affect the IC accumulation of Taiwan-listed IT companies in a significantly positive way;
3. To verify and understand whether the interaction between BSC implementation and corporate innovation activities affects the IC accumulation of Taiwan-listed IT companies in a significantly positive way.

LITERATURE REVIEW

In this section, previous research results pertaining to this study’s topics are reviewed to establish hypotheses and a research framework. The relevant theories and studies are stated as follows:

**Balance Scorecard (BSC)**

In their study, Chow and Haddad (1997) noted the value of BSC lies in the fact that it connects organizational strategies, frameworks, and vision to create a set of corporate performance indicators for both traditional and modern companies. Meanwhile, the BSC method transforms a company’s long-term strategies/goals (e.g., the creation of customer value) into actual organizational actions, internally or externally.


Centered on strategies rather than control, BSC is adopted by insightful managers for the clarification, communications and management of strategies, which means it is now a core management system, not just an improvement one (Jung-hsing Kuo, 2002).

An-ne Wu (1999) believed that BSC, in fact, involves all functions of an organization. For example, they said the financial perspective of BSC is relevant to corporate finance and accounting; the customer perspective, marketing; the internal-business-process perspective, the overall value chain; the learning-and-growth perspective for employees, human resources.

From the viewpoint of BSC, Jar-rong Lu (2000) studied the connection between capital structure and operating performance at Taiwan-listed IT & electronics firms from the year 1958 to 1999, with the financial-perspective indicators including the Cash Flow Adequacy Ratio, sales growth, operating profit margin and Return on Equity (ROE); the customer-perspective indicators including market share and product return rate; the internal-business-process perspective, research and development (R&D) benefit, average cash-turnover period, and percentage of maintenance costs; the learning-and-growth perspective, revenue per employee and wage per unit.

Hsiu-chin Yeh (2001) conducted a case study of the connection between organizational learning models and performance at product development departments of Taiwan-base electronics technology firms, with the performance...
evaluated in three non-financial BSC perspectives, namely the customer, internal-business-process and learning-and-growth perspectives.

The literature above shows that all companies, regardless of industry, take into consideration the financial as well as non-financial perspectives when it comes to the implementation of BSC, which in the present study is conceptually defined as a performance measurement indicator consisting of four perspectives; namely, the financial, customer, internal-business-process and learning-and-growth perspectives. As recommended by Kaplan and Norton (1996), this study’s author measured these four perspectives to ascertain how BSC implementation affects the financial performance of Taiwan-based electronics SMEs.

Accumulation of Intellectual Capital

Stewart (1997) published Intellectual Capital: the New Wealth of Organizations, a book loaded with case studies in a bid to explain the three elements of IC: human, structural and customer capitals. Stewart (1997) argued that IC includes these three types of capital and defined human capital as the sum of innovations, employees’ mindsets, seniority, turnover rate, work experiences, and learning ability; structural capital as the existing knowledge efficiently collected, tested, organized and integrated, with irrelevant components sifted out for further diffusion; customer capital as the way a specific organization deals with all relevant parties, which involves the satisfaction, retention rate and loyalty of customers.

In their book “Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower” Edvinsson & Malone (1997) explained the IC implementation process and measurement indicators at Scandia Inc. They agreed that IC comprises human, structural and customer capitals, with the human capital being the sum of personal competencies, knowledge, skills and experiences of a company’s entire staff and management, as well as the organization’s capabilities in creativity and innovation. Structural capital, they said, is a supportive framework and organized capacity that gives human capital a tangible form, authority and support, including the palpable system for communicating and storing intellectual materials. The customer capital involves customer satisfaction, durability, price sensitivity, and the long-term customers’ financial conditions, the argued.

IC, according to Sveiby (1998), is made up of individual competencies and the internal/external structure of a company, where “individual competencies” is defined as the employees’ capabilities of taking actions under varied circumstances with explicit knowledge, skills, experiences, value judgments, social networks, among others; the “internal structure” is defined as the sum of patents, concepts, patterns/models, computer and management systems; the “external structure”, the sum of company-customer or company-supplier relationships such as brands, goodwill, and trademarks.

Johnson (1999) addressed intellect in three categories, namely the human, structural and relationship capitals, where “human capital” is defined as the combination of idea capital (or the labor force for knowledge-oriented tasks and employee aptitudes/attitudes) and leadership capital (or the personal qualities of an expert/manager); “structural capital” is defined as the combination of innovation capital (i.e., patents, trademarks, copyright and knowledge archives) and process capital (i.e., work procedures, trade secrets); “relationship capital”, the sum of a company’s relationships with customers, suppliers and online-community members.

While Knight (1999) tackled the issue of IC in four dimensions, namely human, structural and external capitals besides financial performance, he said human capital comprises the employee turnover rate, employee satisfaction, the number of new products/ideas conceived and recommended to be proposed/received; the structural capital comprises the operating-capital turnover rate, ratio of salespersons to general/administrative staff, and the length of time required to launch a new product; the external capital comprises customer persistency/satisfactions, the list of customers for maximum profitability, indicators of suppliers’ product quality/reliability; the financial performance comprises the Economic Value Added (EVA), the 90-day accounts receivable, and the value added per employee.

Dzinkowski (2000) pointed out the complicated nature and implications of IC, which are often synonymous to intellectual properties, intellectual assets, knowledge assets, and may either be accumulated in the form of capital, or equated with a knowledge-based corporate process.
The intangible IC is a major referential indicator of EV, as contended by Mei-chun Chen (2001), who said IC consists of human, structural and relationship capitals while defining it as something that integrates into such capitals all the skills, knowledge, information, experiences, problem-solving abilities and wisdom of a company. She went on to define human capital as the knowledge, skills and experiences of a company’s employees and management; structural capital, a company’s overall system/procedures concerning problem-solving and value creation; relationship capital, the initiation, maintenance and development of an organization’s external relationships with customers, suppliers, business partners, among others.

Edvinsson (2003) gave a simple description of IC: something all businesses will rely on for future growth, as well as an indicator of efficiency in business operations. It is impossible to implement any corporate reform without first investing in intangible assets (Shu-hsiao Tsen and Hsiang-ling Hu, 2010).

To sum up the literature above, this study’s author conceptually defined IC according to the argument of Mei-chun Chen (2001): “the sum of skills, knowledge, information, experiences, problem-solving abilities and wisdom integrated into a company’s human, structural and relationship capitals”. Meanwhile, IC is operationally defined as the sum of:

A. Human capital: the knowledge, skills and experiences possessed by a company’s employees and management;
B. Structural capital: a company’s overall system and procedures concerning problem-solving and value creation;
C. Relationship capital: the initiation, maintenance and development of an organization’s external relationships with customers, suppliers, business partners, among others.

Corporate Innovation Activities

Despite the large quantity of literature concerning innovations, opinions vary over the definition and viewpoint of innovations. Most researchers in this area focused on technical improvements/breakthroughs or product refinements/development (Souder, 1987; Chandy and Tellis, 2000).

Phillips (1997) divided innovations into technological and non-technological ones. As a technological innovation involves either a product or a manufacturing process, a creative company is one that has introduced within the past three years at least one product or manufacturing process that is new or an improvement. A non-technological innovation, he said, occurs in such areas as marketing strategy, management techniques, or organizational structures. A business that initiated a reform in any of the afore-mentioned areas is considered a non-technological innovation company (Yei-yi Chen, 2008).

Shyh-bao Lai, Bing-jyun Wang and Yu-an Huang (1997) incorporated the notions of management capabilities and learning organization into their study of technical performance measures, and expanded it to include an organization’s creativity. Chi-tung Tsai, Kuo-long Huang and Chuan-feng Kao (2001) defined creativity from a multi-indicator viewpoint. These studies took the discussions of innovation from the technical level to a managerial one. Clark and Guy (1998) contended that innovation is a process where knowledge is transformed into a useful product, with emphasis placed on how the persons, resources and company departments involved in that process interact with one another, and how information is fed back. Since innovation is the primary source of newly created and/or diffused knowledge, it provides an important means to bolstering competitiveness for a country or a business.

In “The influences on innovative activity, intellectual capital towards corporate development: evidence and insights from Taiwan-publicly listed IT corporations” Feng-chu Hung (2008) addressed corporate innovation activities into three sub-perspectives: (1) managerial innovations; (2) research and development; (3) knowledge innovation.

As defined by Feng-chu Hung (2008), corporate innovation activities in the present study are discussed in three sub-perspectives: Firstly, a managerial innovation is resulted from an organization’s creative process, where a new idea is identified and carried out for the construction of, and assistance for, the planning/execution of corporate innovation activities, so the organization could make plans with bolstered competencies in a wider range of operations, and also with the management ability of identifying strategic goals. Secondly, the research and development is achieved by applying innovative ways of thinking or methods to capacity upgrades and R&D-oriented transformation efforts, with continuously added elements of knowledge. Thirdly, knowledge innovation is an attempt of individuals/groups in the organization (or the organization as a whole) to improve on, or enhance, the existing knowledge using various methods, or to develop brand-new knowledge valuable to the organization, in addition to acquiring the needed knowledge from external sources.
The Effects of BSC Implementation on IC Accumulation

In a comparative analysis, Allee (1999) considered both IC and BSC a company’s building blocks, although the latter was deduced from a balanced value-creation model while the former adding to the accumulated knowledge capital through a dynamic flow model. IC and BSC, according to Allee, share two things in common: (1) the potential of enhancing public perception of value creation and organizational performance indicators; (2) the potential of furnishing information about a company’s latest development and measures for financial or non-financial performance.

In her paper about the links between BSC and IC, An-ne Wu (2002) said BSC leads to IC formation while reinforcing the management of IC, citing the distinctive BSC framework. Wu (2002) also considered the strategic topics/objectives in BSC’s learning-and-growth perspective preceding IC’s innovation and human capitals; the strategic topics/objectives in BSC’s internal-business-process perspective, IC’s process capital; the strategic topics/objectives in BSC’s customer perspective, IC’s customer capital, referred to as “relationship capital” in the present study.

Bukh, Johansen and Mouristen (2002) mentioned the complimentary effects of IC integrated with BSC, citing the former’s contribution to KM-related communications at a company and the latter’s role as a monitor of project progress/results.


The afore-mentioned literature reflects similar viewpoints to a certain extent, even though it does discuss the same industry or companies of the same size, this study’s author therefore boldly proposed a hypothesis as follows:

$H_1$: BSC implementation affects a company’s IC accumulation in a significantly positive way.

The Effects of Corporate Innovation Activities on IC Accumulation

Feng-chu Hung (2008) concluded there was a significantly positive connection between corporate innovation activities and IC at Taiwan-listed information and electronics firms in her study entitled “The influences on innovative activity, intellectual capital towards corporate development: evidence and insights from Taiwan-publicly listed IT corporations.”

In “Exploring the Relationships among Corporate Innovations, Intellectual Capital, and Corporate Development and Performance Assessment: A Case Study of Taiwan-Listed Electronics Companies” Yu-che Li (2008) noted a significantly positive influence of innovation activities on IC accumulation.

From the literature above was derived a hypothesis as follows:

$H_2$: Corporate innovation activities affect a company’s IC accumulation in a significantly positive way.

The Effects of BSC implementation and Corporate Innovation Activities on IC Accumulation

Literature cited in Sections 2.4 and 2.5 shows that whether BSC implementation and corporate innovations have a multiplying effect, or synergy, on a company’s IC accumulation efforts is a topic worth exploring, hence the boldly derived $H_3$:

$H_3$: The interaction between BSC implementation and corporate innovation activities affects a company’s IC accumulation in a significantly positive way.
RESEARCH METHOD

Figure 1 illustrates how motivations, research objectives and literature review cited in the previous passages led to this study’s hypotheses and conceptual research framework:

Research Framework

![Research Framework Diagram]

Designing the Questionnaire

The questionnaire in this study was compiled based on Multi-Dimension Measurement and the afore-mentioned observable perspectives. On a 7-point Likert Scale, the answers were measured with 7 denoting Strongly Agree and 1 denoting Strongly Disagree: the score grows along with the degree of agreement. The sample data collected was then “centralized” so the sum of scores given to all questionnaire items was zero after deducting the average. Centralization erases multicollinearity between the independent and extraneous variables, in order that their interactions are tested more accurately, as shown in the mathematical equation below:

\[ \Sigma (Y_i - \bar{y}) = \Sigma X_i \times 0 \]

The 16-item BSC questionnaire was compiled in accordance with the argument of Kaplan and Norton (1996) that BSC should be discussed in four perspectives: the financial, customer, internal-business-process, and learning-and-growth perspectives.

The 12-item IC questionnaire was inspired by statements put forth by Mei-chun Chen (2001), Shu-hsiao Tsen and Hsiang-ling Hu (2010) about the three perspectives of IC, namely the human, structural and relationship capitals.

The 12-item questionnaire for corporate innovation activities was patterned after the three perspectives proposed by Feng-chu Hung (2008), namely the managerial, intellectual and R&D innovations.

Sampling Method

While the respondents of questionnaire survey (i.e., the managerial staff of financial, human resource and marketing departments at Taiwan-listed IT companies) were selected by simple random sampling, 30 copies of questionnaire were given out to experts in a pilot-test. After revising or removing unsuitable items as per the exerts’ advice, the study’s author sent out 350 copies of questionnaire in an official post-test and received 151 validly completed copies for a 43.1% response rate.
The Data Obtained from Questionnaire and Measurement Model

This study’s author adopted Linear SEM in a Confirmatory Factor Analysis (CFA) of the research framework, and based the questionnaire design on three latent variables (i.e., BSC, IC and corporate innovation activities), each of which was divided into observable/explicit sub-variables containing several questions, as shown in the table below. After processing the collected data, the author created a primary file that preceded the design of questionnaire, using Multi-Dimension Measurement for the construction of this study’s measurement system. However, Duel Measurement was adopted to ensure the computer software efficiently handled and/or measured all data (Shun-yu Chen, 2010). Table 1 shows the number of questions under each implicit or explicit variable, as well as the referential sources.

<table>
<thead>
<tr>
<th>Implicit Variables</th>
<th>Explicit Variables</th>
<th>Total Number of Questionnaire Items</th>
<th>Referential Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSC (X)</td>
<td>Financial perspective</td>
<td>4</td>
<td>Kaplan and Norton (1996)</td>
</tr>
<tr>
<td></td>
<td>Customer perspective</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal-business-process perspective</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning-and-growth perspective</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Corporate innovation activities (Mo)</td>
<td>Managerial innovations</td>
<td>4</td>
<td>Feng-chu Hung (2008)</td>
</tr>
<tr>
<td></td>
<td>Intellectual innovations</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R&amp;D innovations</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>IC (Y)</td>
<td>Human capital</td>
<td>4</td>
<td>Mei-chun Chen (2001); Sha-Hsiao Tsien and Hsiang-ling Hu (2010)</td>
</tr>
<tr>
<td></td>
<td>Structural capital</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Relationship capital</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

RESULTS AND ANALYSIS

Linear Structure Model Analysis

This study includes a CFA, an analytical method contrary to the Exploratory Factor Analysis (EFA), on the three unobservable/latent variables of BSC, IC and corporate innovation activities. SEM is made up of structural and measurement models to efficiently tackle the cause-effect relations among implicit/latent variables. The three parts of model-testing in this study are: (1) goodness-of-fit of the measurement model; (2) goodness-of-fit of the structural model; and (3) the overall model’s conformity with goodness-of-fit indicators. In other words, goodness-of-fit indicators were applied to a test of the overall goodness-of-fit effect of SEM (Diamantopoulos & Siguaw, 2000; Lee^4, 2012).

Analyzing Fit of the Measurement Model

Largely, factor loading is intended to measure the intensity of linear correlation between each latent/implicit variable and a manifest/explicit one. The closer the factor loading is to 1, the better an observable variable is in measuring latent variables. Since this study’s reliability is supported by the fact that factor loadings for all observable variables ranged between 0.8 and 0.9, all observable/explicit variables in the measurement model appropriately gauged the latent/implicit ones. The Average Variance Extracted (AVE), on the other hand, gauges an unobservable/implicit variable’s explanatory power of variance with regard to an observable one, with the VE value growing in proportion to the reliability and convergent validity of that particular implicit/latent variable. As a rule, VE must be larger than 0.5 for an observable variable’s explainable variance to exceed the measurement error (Fornell and Larcker, 1981). As Table 2 and Figure 2 show that all AVEs in this study exceeded 0.5, the explicit variables have excellent reliability and convergent validity.

<table>
<thead>
<tr>
<th>Latent variables</th>
<th>Observable Variables: Centralized Dual Measurement</th>
<th>Factor loading</th>
<th>Variance Extracted (VE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSC (X)</td>
<td>X1C</td>
<td>0.84</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>X2C</td>
<td>0.82</td>
<td>0.65</td>
</tr>
<tr>
<td>Corporate innovation activities (Mo)</td>
<td>M1C</td>
<td>0.81</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>M2C</td>
<td>0.80</td>
<td>0.63</td>
</tr>
<tr>
<td>X*Mo</td>
<td>X1M1C</td>
<td>0.85</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>X2M2C</td>
<td>0.83</td>
<td>0.67</td>
</tr>
<tr>
<td>IC (Y)</td>
<td>Y1C</td>
<td>0.82</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>Y2C</td>
<td>0.83</td>
<td>0.65</td>
</tr>
</tbody>
</table>
ANALYZING FIT OF STRUCTURE MODEL

Path Analysis Results of Structure Model

This study’s author made sure that the overall model passed the goodness-of-fit test before calculating the parameter estimates; Standard Errors (S.E.) and Critical Ratio (C.R.) among latent variables (see Table 3). According to the results, the interaction between BSC implementation and corporate innovation activities (X*Mo) affects IC accumulation (Y) significantly (c=0.784). That is, a company that factors innovation activities into the effects of BSC implementation on its IC accumulation tends to accomplish multiplying synergy.

Table 3: Path Analysis Results of the Structural Model

<table>
<thead>
<tr>
<th>Path Coefficients between 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>BSC (X) → IC (Y)</td>
<td>.482</td>
<td>.062</td>
<td>7.774</td>
<td>***</td>
<td>a</td>
</tr>
<tr>
<td>Corporate innovation activities (Mo) → IC (Y)</td>
<td>.295</td>
<td>.039</td>
<td>7.564</td>
<td>***</td>
<td>b</td>
</tr>
<tr>
<td>X*Mo → IC (Y)</td>
<td>.784</td>
<td>.042</td>
<td>18.667</td>
<td>***</td>
<td>c</td>
</tr>
<tr>
<td>X → X1C</td>
<td>.863</td>
<td>.142</td>
<td>6.775</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>X → X2C</td>
<td>.872</td>
<td>.131</td>
<td>6.655</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Mo → M1C</td>
<td>.843</td>
<td>.304</td>
<td>2.773</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Mo → M2C</td>
<td>.822</td>
<td>.312</td>
<td>2.635</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>X*Mo → X1M1C</td>
<td>.744</td>
<td>.273</td>
<td>2.725</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>X*Mo → X2M2C</td>
<td>.793</td>
<td>.271</td>
<td>2.926</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Y → Y1C</td>
<td>.832</td>
<td>.138</td>
<td>6.029</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Y → Y2C</td>
<td>.841</td>
<td>.137</td>
<td>6.139</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, also known as Squared Multiple Correlation (SMC), indicates the explanatory power of an implicit independent variable with regard to an implicit dependent one. That is, the R2 values shown in Table 4 indicate that the implicit independent variables have adequate explaining power on the implicit dependent variables respectively.

Table 4 Path Coefficient of Determination

<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>.877</td>
<td>.769</td>
<td>.773</td>
<td>.317</td>
<td>.004</td>
<td>14.218</td>
<td>2</td>
<td>97</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>.885</td>
<td>.783</td>
<td>.785</td>
<td>.512</td>
<td>.002</td>
<td>7.024</td>
<td>1</td>
<td>96</td>
<td>0.003</td>
</tr>
</tbody>
</table>

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

Table 4.3.2 was derived from Table 4.3.1:

<table>
<thead>
<tr>
<th>Coefficients of Determination</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSC (X), Corporate innovation activities (Mo) versus IC (Y)</td>
<td>0.769</td>
</tr>
<tr>
<td>BSC (X), Corporate innovation activities (Mo) and X*Mo versus IC (Y)</td>
<td>0.783</td>
</tr>
</tbody>
</table>

Indices of Fit of the Overall Model

This study’s author adopted SEM for modeling in order to explore how unobservable variables connect to one another in the Structural Model, whether the measurement model has measurement reliability, and how the overall model’s goodness-of-fit effect is. While χ², d.f., GFI, AGFI, NFI, CFI, RMR and RMSEA are the goodness-of-fit indicators for the overall model, it is usually required that χ²/d.f. <5, 1>GFI>0.9, 1>NFI>0.9, 1>CFI>0.9, RMR<0.05 and RMSEA<0.05 (Bagozzi & Yi, 1988). In this study, the overall model has a satisfactory goodness-of-fit effect because χ²/d.f. <5 and the values of GFI, AGFI and NFI all exceed 0.90, with a below-0.05 RMR, as shown as in Table 5.
Table 5: Assessment of Fit of the Overall Model

<table>
<thead>
<tr>
<th>Determination index</th>
<th>χ²</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>0.921</td>
<td>0.913</td>
<td>0.911</td>
<td>0.910</td>
<td>0.031</td>
<td>0.027</td>
</tr>
</tbody>
</table>

Standardized Results of SEM Analysis
The model’s overall framework resulted from computer-aided standardization, as shown in Fig. 2 (Lee, 2011).

Analytical Testing of Path Effects for the Structural Model
To test the extraneous variable, this study’s author performed a hierarchical regression analysis (see Table 4.3.1), followed by centralized regression analyses and t-tests of Y versus X, Mo and X*Mo in order to examine whether the hypothesis about a significant regression coefficient c is substantiated (i.e. whether c is zero or not). The test results are shown in Table 6.

Table 6: Coefficients*

<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>3.816</td>
<td>4.171</td>
<td>.461</td>
<td>4.924</td>
</tr>
<tr>
<td>X</td>
<td>9.753</td>
<td>.912</td>
<td>.472</td>
<td>10.941</td>
</tr>
<tr>
<td>Mo</td>
<td>6.884</td>
<td>.412</td>
<td>.310</td>
<td>13.344</td>
</tr>
<tr>
<td>2 (Constant)</td>
<td>5.041</td>
<td>5.551</td>
<td>.452</td>
<td>4.914</td>
</tr>
<tr>
<td>X</td>
<td>9.186</td>
<td>.634</td>
<td>.476</td>
<td>10.941</td>
</tr>
<tr>
<td>Mo</td>
<td>6.374</td>
<td>.121</td>
<td>.282</td>
<td>13.344</td>
</tr>
<tr>
<td>X*Mo</td>
<td>15.411</td>
<td>.528</td>
<td>.683</td>
<td>27.971</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Organizational Effectiveness (Y)
As shown in Table 4, the 0.784 Path Coefficient of Mo*X versus Y suggests an extraneous effect of Mo*X on Y.

From the afore-mentioned analyses were derived some research results:
1. BSC implementation affects a company’s IC accumulation in a significantly positive way, with an estimated 0.482 standardized path coefficient (H₁ substantiated);
2. Corporate innovation activities affects a company’s IC accumulation in a significantly positive way, with an estimated 0.295 standardized path coefficient (H₂ substantiated);
3. The interaction between BSC implementation and corporate innovation activities affects a company’s IC accumulation in a significantly positive way, with an estimated 0.784 standardized path coefficient (H₃ substantiated).

CONCLUSION AND SUGGESTIONS

Conclusions
From the afore-mentioned data analyses and results were derived this study’s conclusions, as detailed in the following passages:
1. Regarding the verification of SEM, this study has a good model fit as its author constructed a SEM with satisfactory goodness-of-fit in the measurement, structural and overall models.
2. Conclusions regarding the verification of business practices at Taiwan-listed IT companies:
   The interaction between BSC implementation and corporate innovation activities affects the IC accumulation of Taiwan-listed IT companies in a significantly positive way. In other words, the “corporate innovation activities” variable in this study displays a positive extraneous effect. According to Shun-yu Chen (2010), if an extraneous and an independent variable both exert a significant interactive effect on a dependent variable, neither the independent nor the extraneous variable will have a significant effect on the dependent one. Moreover, when the variable of “corporate innovation activities” exerts an extraneous effect, the BSC implementation (i.e., independent variable) and corporate innovation activities (i.e., extraneous variable) will be irrelevant/independent variables (as shown in Figure 2).

Contributions of the Present study
1. Innovative Applications of Research Method
   Exploratory research enabled by the multi-regression analysis accounts for a majority of the literature, leaving the implicit variables’ extraneous effect in a CFA-based research framework rarely considered. Since the present study’s main perspectives are implicit variables, CFA and linear SEM appear to be suitable measurement tool and model framework, respectively. That explains why this study is relatively innovative in terms of research method.

2. A Topic that Meets the Actual Needs of Taiwan-listed IT Firms
   Unlike the previous studies, which were largely based on EFA, this study’s author performed modeling in accordance with the summarized literature review and then verified the model for goodness-of-fit effects. The present study, consequently, is a CFA-based one addressing topics that are both important and innovative in terms of business practices, with the research results serving as a reference for further studies in relevant fields, and also for decision-makers at Taiwan-listed IT companies seeking management insights.

Limitations and Suggestions
1. This study is focused solely on the CFA of Taiwan-listed IT companies, and future researchers are advised to compare the goodness-of-fit effects of the same model applied to companies in different industries.
2. Regarding modeling for a CFA-based study like the present one, it is advisable that a simple verification model be built to avoid excessive complexity, and the subsequently poor goodness-of-fit (Shun-yu Chen, 2010). This study’s author, therefore, decided to focus solely on how BSC implementation affects IC accumulation, with corporate innovation activities being the extraneous variable.
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