# The effects of the balanced scorecard implementation on the financial performance in Taiwan-listed electronics companies: Meta analysis

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## Abstract

The primary purpose of this study is to understand the effects of the balanced scorecard implementation on the financial performance in Taiwan-listed Electronics Companies, with data in this study being collected based on previous studies done by domestic and international scholars using the Meta Analysis to analyze the collected data. The conclusion has been made by this study: the "balanced scorecard implementation" in Taiwan-listed Electronics Companies indeed makes a significantly positive effect on the "financial performance".

**Keywords:** Balanced scorecard, financial performance, meta analysis

## Introduction

The semiconductor industry is the key project of national economic development and a high capital- & technology-intensive industry. Among major producing countries of semiconductors, Taiwan is the only country that has a professional vertical disintegration system, establishing science parks under active support by policy-making and strengthening productive forces as a core for producing a huge cluster effect, which solemnly makes a successful model of the semiconductor industry development for the whole world. Moreover, the semiconductor has been a high capital-intensive industry, wanting to master advantages in a rapidly changing era of knowledge economy; it is indicated from domestic and international literature research that the balanced scorecard implementation would make a positively significant effect on the enhance of a company's financial performance and bring it competitive advantages, if the company is able to carry out the balanced scorecard implementation.

Therefore, this study used the "Meta Analysis" as its research method, aims to understand the effects of the balanced scorecard implementation on the financial performance in Taiwan-listed Electronics Companies. It is the main purpose of this study.

## Literature review

To understand the general status of literature and research relevant to the topic, herewith, the literature reviews relevant to the topic are respectively carried out as follows:

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**Relevant literature of "balanced scorecard" and "financial performance"**
Maisel (1992) considered a company could not make correct assessments by traditional performance measurement methods due to their excessive emphasis on financial indexes; therefore, this deficiency could be improved if the Balanced Scorecard were to be used, and the management level would measure everything as a whole, rather than placing merely emphasis on the financial issues. In other words, the balanced scorecard retains traditional financial dimension and three additional dimensions of customer, corporate internal process, learning and growth, using the measurements of future performance to remedy the lack of only considering the financial measurements.

Kaplan & Norton (1996) believed external measurements stressed "financial dimension" and "customer dimension"; and internal ones, the company's "internal process dimension" and "learning and growth dimension".

Wu (2002) held the opinion that the creation source of business value for high-tech industries had been changed from traditional industries' "Fixed Assets" to these assets of "Customer Relationship Management", "Human Resource", "Company Standard Procedure", "Company Culture" and "Innovation Ability", which just comprised a company's intellectual capital. These five types of intellectual capital and three dimensions among the balanced scorecard (learning and growth, internal process, and customer dimensions) are related.

A study from Wu (2006) also pointed out the balanced scorecard made positively significant effects on the financial performance.

Additionally, Wang and Kao (2002) proposed three dimensions other than the financial dimension of Strategic Management System "balanced scorecard": customer dimension, internal process dimension and learning & growth dimension, which can be respectively referred to as customer capital, innovation & process capital and human capital.

Liao (2004) integrated the concepts of corporate governance, intellectual capital and balanced scorecard as ones to build up a management model of business value ranging through four dimensions and each dimension's key performance indexes with a causal relationship. This established management model of business value summarized relative explanatory power of four dimensions versus foundry industry value. It has been found from the research results that corporate governance is indeed influential to the foundry business value, and these four dimensions bring the influence on the foundry business value in this order: first "learning and growth dimension", "corporate internal process dimension", and "corporate governance dimension", and finally "customer dimension".

Huang (2004) discussed the relationship between the balanced scorecard's four dimensions of performance measurement indexes and corporate intellectual capital, trying to find out the key performance measurement indexes that affect the intellectual capital, for a purpose to explore the competition sources between banking industries. Here are the empirical results indicating: the meaning of intellectual capital can structure and verify the value sources of banking industries' intellectual capital, including financial capital and other non-financial factors, by each index of the balanced scorecard. Further, corporate performance is not only the performance of the financial sectors, but also includes the indirect influence generated from other dimensions (such as the customer, internal process, learning and growth), and necessarily places stress on tangible and intangible investments to advocate the core competition power.

Generally, in regard to the balanced scorecard dimension effects on organizational performance, Kaplan & Norton (1996) classification is quoted in this study. Relevant measurement tools of the balanced scorecard are: (1) financial dimension, using shareholders' Return On Equity (ROE) as a measurement criterion; (2) customer dimension, using market share as a measurement criterion; (3) internal process dimension, using corporate innovation process and after-sales service process standards as measurement criteria; and (4) learning and growth dimension using employee retention rate and employee productivity as measurement criteria.

Additionally, it will finally maximize the effect of corporate value when the company achieves good financial performance; and currently, there is much domestic and international literature about measurement indexes for financial performance to be referred to, hereby the literature more related to this study is briefly introduced as follows:

Huang (2008) applied the three indexes of ROE, ROA and EVA to measure financial performance; Wang and Kao (2002) proposed three dimensions other than the financial dimension of Strategic Management System "balanced scorecard": customer dimension, internal process dimension and learning & growth dimension, which can be respectively referred to as customer capital, innovation & process capital and human capital. In overview of previous discussion, this study applied ROE or ROA as a measurement index for the financial performance.

Lee *et al.* (2011) had shareholders' Return on Equity (ROE), Price-Book Ratio (P/B, PBR) and Tobin Q value, integrated to produce a Comprehensive Index of Financial Performance (PERF), hereby indicating the financial performance of the organization.

Anyway, in regard of the "Financial Performance" measurement tools, measurement criteria in this study are based on shareholders' Return on Equity (ROE) and Return on Assets (ROA).

## 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
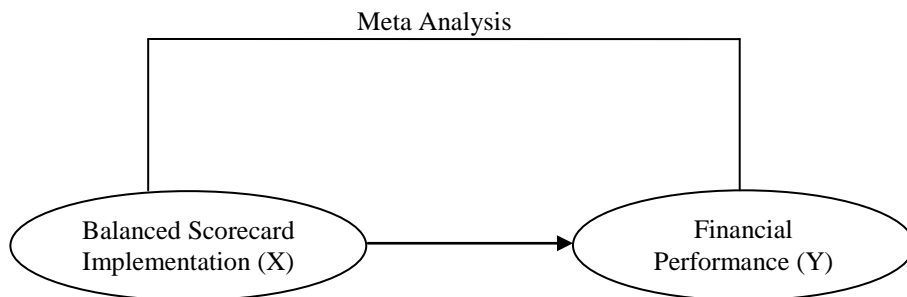


**Figure 1: Conceptual framework of the research**

### Data collection and methods

The data collection of the organizational performance in this study is sourced from the database of Taiwan Economic Journal (TEJ), and questionnaires. The software Stata is applied due to the research model of Meta Analysis. Based on the literature reviews mentioned above, it is found that

intellectual capital accumulation makes a positively significant effect on financial performance; therefore, this study has hypothesized that the estimated parameter has only one fixed value with less heterogeneity (standard error); and therefore, that it is better to use Fixed Effects rather than Random Effects (Du, 2014). Thence, this study adopted Fixed Effects to compare various effects.

**Fixed effect Meta analysis theory basis**
1. Fixed effect meta-analysis assumes that the true effect size each study is trying to estimate is the same (i. e. fixed) across all the studies.
2. Peto's odds ratio method (mainly a fixed effect method) which the highlights are as follows: (1) For binary data only; (2) Effect size $\theta_i$ for study i can only be OR; and (3) Calculates odds ratios in a non-standard way before pooling.
3. The advantages of Peto's OR method (only for OR): (1) Performs well with low event rates and does not need correction for zero cell counts; and (2) Extrapolates well to time-to-event data.
4. For the Mantel-Haenszel method, whatever the measure of effect size 〔odds ratios (OR), relative risks(RR) or risk differences(RD)〕, the test for heterogeneity (between-study variability) is based upon the weights from the inverse-variance method, not the Mantel-Haenszel weights:

$$Q = \Sigma w_i (\theta_i - \theta_{MH}) \quad i$$

Ensures the test statistic Q has nice distributional properties, so that p-values can be derived from standard tables.

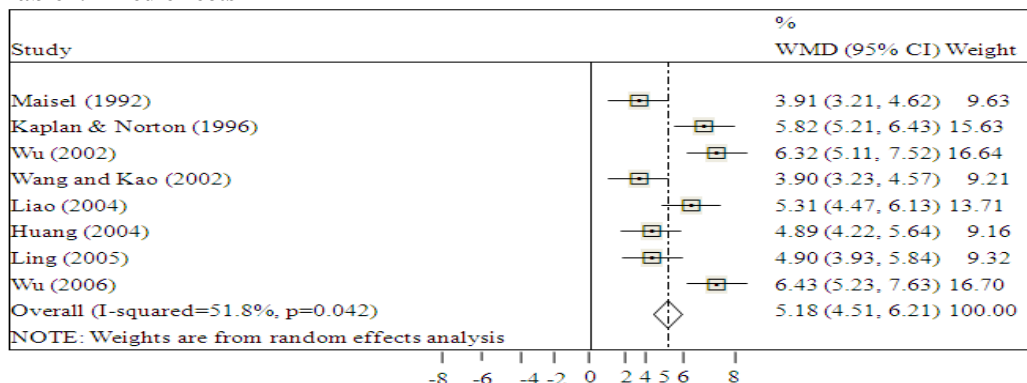Here $\theta$ is the log (OR), log (RR) or RD.
Again, bigger studies tend to have bigger weighting, so where zero cells cause problems with computing standard errors, add 0.5 to all cells (Stata can this do automatically).

5. The advantages of these are as follows:
   The Mantel-Haenszel method: More robust than the inverse-variance method when data are sparse, e.g. low event rates or small studies.
6. Look up Q in tables of the chi-squared distribution on k-1 degrees of freedom. The null hypothesis is that the true effect size is the same for all studies. Besides, a statistically significant result means that there is strong evidence against there being one common effect size, so we take it that there is heterogeneity.
7. Getting Data into Stata: (1) Easier to enter into Excel then cut & paste into Stata's data editor; (2) Ensure each numeric column contains only numbers; (3) Leave cells empty if data missing; and (4) One row per study (Michael *et al.,* 2009**;** Chen *et al.,* 2014).

## Results and analysis

The Fixed Effects have been processed through the Meta Analysis to gain the results as shown in Table 1:

**Table1: Fixed effects**

| Study | | WMD (95% CI) | % Weight |
|-------|---|--------------|----------|
| Maisel (1992) | | 3.91 (3.21, 4.62) | 9.63 |
| Kaplan & Norton (1996) | | 5.82 (5.21, 6.43) | 15.63 |
| Wu (2002) | | 6.32 (5.11, 7.52) | 16.64 |
| Wang and Kao (2002) | | 3.90 (3.23, 4.57) | 9.21 |
| Liao (2004) | | 5.31 (4.47, 6.13) | 13.71 |
| Huang (2004) | | 4.89 (4.22, 5.64) | 9.16 |
| Ling (2005) | | 4.90 (3.93, 5.84) | 9.32 |
| Wu (2006) | | 6.43 (5.23, 7.63) | 16.70 |
| Overall (I-squared=51.8%, p=0.042) | | 5.18 (4.51, 6.21) | 100.00 |
| NOTE: Weights are from random effects analysis | | | |

Based on the I-squared = 51.8 and p-value = 0.042 overall from the report above, it has been known that the independent variables have a made positively significant effect on dependent variables in this research model (Chen *et al.,* 2014).

## Conclusions and suggestions

### Conclusions
Based on the discussion described as above, the balanced scorecard implementation in Taiwan-listed Electronics Companies (1) makes a significantly positive effect on financial performance. It has derived the same results as the ones from Maisel (1992), Kaplan & Norton (1996), Wu (2002), Wang and Kao (2002), Liao (2004), Huang (2004) and Wu (2006), except for their weights.

### Contributions of the present study
According to past literature reviews, most multi-regression analyses were applied in exploratory research with less consideration given to the Meta Analysis for a research method; therefore, the Meta Analysis research method used in this study is relatively innovative.

Additionally, the results from this study can also be delivered to Taiwan-listed Semiconductor Companies for the reference of sustainable development; therefore, this study's results have extremely practical reference value.

### Limitations and recommendations
Based on the discussion previously, this study focused on the primary research objective of Taiwan-listed *E*lectronics Companies, analyzing old domestic and international literature reviews by Meta Analysis to understand the effects of intellectual capital accumulation on the financial performance. Here is a suggestion for subsequent researchers where they can try to consider researching other industries or different sizes of the same industry (for example, Taiwan's small and medium businesses), or use other research methods such as Confirmatory Factor Analysis (CFA) to verify different industries, or compare whether there is any difference of Goodness of Fit between various industries in the same model.

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