

## 採購人員獎酬制度與採購績效之關聯性

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**摘要：**本文主要探討台灣某零售業者之採購人員獎酬制度的適切性。本研究利用 Tobit 迴歸模型檢驗採購人員績效獎金和其採購績效間之關聯性，同時也評估了目前該個案公司之採購人員績效獎金的評估方式是否恰當。此外，為了改善該公司採購人員的獎酬設計，本研究進一步使用了平衡計分卡(BSC)結合層級分析法(AHP)，提出更適合的採購人員績效評估制度。本研究結果發現，目前個案公司之採購人員績效獎金與其績效之間並無關聯性。此結果顯示出目前僅以財務指標作為採購人員之績效衡量指標，可能無法達到激勵採購人員的效果。本研究主要貢獻除了增加有關誘因效果之實證研究外，同時也提供零售業者，作為其設計適當獎酬機制之參考。

**關鍵詞：**獎酬機制、平衡計分卡、層級分析法、財務衡量指標

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## The Relationship between a Buyer Incentive Scheme and Purchasing Performance

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**Abstract:** In this study, we investigate the appropriateness of an incentive scheme that links buyer compensation to the measurement of performance in a Taiwan retail chain. We use a Tobit regression model to examine the relationship between buyer bonus and purchasing performance, as well as assess the suitability of the current buyer incentive scheme in the case company. To improve scheme design, we have utilized the balanced scorecard (BSC) and analytic hierarchy process (AHP) to establish a more suitable performance measurement system to evaluate buyers. We found that there is no relationship between buyer bonus and purchasing performance. These results suggest that an incentive scheme that links compensation mainly to financial measures may not be suitable for motivating buyers. Our study fills a gap in the literature regarding the effects of incentives, as well as insights into a practical means for establishing appropriate incentive schemes for retail companies.

**Keywords:** incentive scheme, balanced scorecard, analytic hierarchy process, financial measures

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## I. Introduction

In Retailing, the primary objective is to profitably fulfill customer demand for its products at diverse demographic locations, at the same time sourcing the right product at the right price and the lowest delivery cost (Vinod, 2005). However, the one who is accountable for this objective is the retail buyer; since acquiring high-quality products at the lowest cost relative to competitors is critical to retailing success; therefore the retail buyer plays a crucial role in the process. It is because buyers are not only responsible for controlling cost but also responsible for generating revenue (Hansen and Skytte, 1998).

In this paper, we report on the field test of a performance-based incentive scheme for buyers implemented by the largest electronics chain store in Taiwan. To improve procurement competence, the case company, called 3C (computers, communications, and consumer electronics), recently implemented an output-based incentive scheme that links compensation to measures of their buyers' performance. Under the scheme, buyers are paid a bonus in addition to their basic monthly salary if they exceed a specific goal (the sales target and profit target are performance measures).

How to design an effective incentive scheme is an important management task. More specifically, the choice of performance measures and the relative weights used in incentive schemes are key concerns of managers, since poor performance measures may render incentive contracts ineffective (Bouwens and van Lent, 2006). The results of previous studies suggest that output-based incentive schemes have a beneficial effect on employee productivity (Jones and Kato, 1995; Rajagopalan, 1997; Banker, Lee, Potter, and Srinivasan, 1996, 2000); however, very little attention has been paid to examining the appropriateness of incentive schemes designed for frontline employees. The primary objective of this research is to assess the appropriateness of incentive schemes for buyers in the case company. In addition, to improve the design of the incentive scheme used to motivate buyers, we adopt the balanced scorecard (BSC) and analytic hierarchy process (AHP). By investigating these issues, we hope to contribute to the literature on the effectiveness of incentive schemes, and provide insight into practical means of establishing an appropriate procurement incentive scheme for the retail industry.

Effective performance measures provide accurate, informative, and timely indications of individual contributions to a firm's value, at low risk to the employee (Holmstrom, 1979). In 2005, the case company implemented an output-based incentive scheme that links compensation to accounting figures. However, performance measures, especially accounting figures, may not fully reflect an employee's contribution because they do not consider some dimensions of the employee's job adequately (Gibbs,

Merchant, Van der Stede, and Vargus, 2004). To determine the effectiveness of the case company's incentive scheme, we investigate the relationship between buyers' bonuses and their performance.

The BSC is designed for use in results-based pay and reward systems. A major challenge in adopting the BSC is how to identify the key performance indicators (KPI) and the relative weight of each KPI. Proper determination of KPIs and their relative weights is critical to the success of the BSC system. In this study, we develop a BSC system for buyers in the case retail chain and use the AHP to determine the relative weights of the adopted performance measures.

The remainder of this paper is structured as follows. Section 2 we review related works. In Section 3, describes the research site and the incentive scheme. The research methods are described in Section 4, and the empirical results are discussed in Section 5. Section 6 considers the contributions, implications, and limitations of the current study.

## II. Literature Review

Increased competition has led many firms in service industries to use outcome-based compensation schemes to motivate employees and improve their productivity (Banker et al., 1996, 2000). From the perspective of agency theory, outcome-based compensation schemes improve an organization's overall productivity by motivating employees to increase or better allocate their efforts (Banker et al., 2000). Ideally, incentive contracts should use all available information to weight the effects that employees' performances have on a firm's value, so that incentives are appropriately balanced across different dimensions of the employee's jobs (Gibbs et al., 2004). Previous studies have shown that, when properly implemented, incentive motivators are effective mechanisms for enhancing an employee's performance (Stajkovic and Luthans, 1997, 2003). Gehrig, Lütje, and Menkhoff (2009) observed that higher bonus payments are strongly related to greater work efforts; while Ang, Chen, and Lin (2005) found that cash bonuses have a positive effect on an organization's performances. Therefore, a positive relationship between employee performance and incentive payments should be observable under an appropriate incentive scheme.

However, we need to be cautious because not all actions induced by incentives are intended. Holmstrom and Milgrom (1991) stated that job functions are complex, and employees will opportunistically expend more effort on those tasks that are related to their incentive schemes. Chu, Cho, and Liu (2011) found that purchasing performance deteriorated after implementing the incentive scheme that was only based on financial

measures. Kepes, Delery, and Gupta (2009) also highlighted the following important aspect of incentive scheme. If the principal only uses one dimension to measure an agent's performance, it will not reflect the worker's real effort appropriately. It will lead to dysfunctional behavior among employees and impact corporate productivity. Meanwhile, Banker, Potter, and Srinivasan (2000) have analyzed time series data on performance measures within a firm before and after the introduction of nonfinancial performance measures in management compensation. They found that after introducing explicit weight on nonfinancial measures in managers' compensation plan, the values of financial and nonfinancial performance have increased substantially. In addition, Sliwka (2002) used two-period Holmstrom Milgrom-type model to prove that compensation for managers based on financial results only leading to a distortion in the incentive system. However, this distortion is mitigated when additional nonfinancial measures can be used in the incentive contract. Therefore, an incentive scheme can have adverse consequences and sometimes harm an employer if it only focuses on financial performance and is not designed properly.

Many organizations have found that the BSC is a valuable tool for performance measurement (Fonville and Carr, 2001; Gumbus and Lyons, 2002). Kumar, Ozdamar, and Peng Ng (2005) found that the BSC provided a good starting point for evaluating the purchasing process in Singapore Hospital. The BSC translates an organization's mission and business strategy into a set of performance measures that provide a framework for implementing the strategy. Instead of focusing solely on achieving financial objectives, it also highlights non-financial goals that an organization must achieve to meet its financial objectives. A BSC system linked to individual bonuses can be used to implement schemes designed to motivate employees. The system allows for the setting of individual goals that can be tied to the company's growth or other metrics. Several studies suggest that the BSC contains measures that can be linked together in a cause-and-effect relationship to align departmental goals with the organization's overall strategy (Hemmer, 1996; Banker et al., 2000; Banker, Potter, and Srinivasan, 2005; HassabElnaby, Said, and Wier, 2005).

A major challenge in adopting the BSC is how to identify the KPI and the relative weight of each KPI, since the system does not weight the relative importance of the performance metrics. Ittner, Larcker, and Meyer (2003) posited that the subjective nature of the BSC allowed supervisors to ignore measures that were predictive of future financial performance and to change evaluation criteria from period to period; hence, the scorecard might cause uncertainty in the performance criteria used to determine rewards. However, this situation only occurs when these measures contain little incremental

information on managerial action. Thus, it is necessary to design a scorecard that can assign appropriate weights and scores to various measures. Proper determination of the KPIs and their relative weights is critical to the success of the BSC system. Recent studies (Fletcher and Smith, 2004; Searcy, 2004) showed that the AHP can be used to help select the metrics for a BSC and determine the relative importance of each metric.

Although a number of works have considered the issues related to measuring buyer performance (Chao, Scheuing, and Ruch, 1993; Easton, Murphy, and Pearson, 2002), little is known about how to design appropriate incentive schemes for buyers in the retailing industry. Chu et al. (2011) investigated whether the implementation of an output-based incentive scheme for buyers could improve the purchasing performance, but they did not develop a BSC-based incentive scheme. The objective of this study is twofold. First, we investigate whether there is a relationship between buyers' performance and the bonuses they receive. Second, we develop a BSC system for buyers in the case company and use the AHP to determine the relative weights of the adopted performance measures.

Our study contributes to the literature by presenting empirical evidence about the effectiveness of incentive schemes, and by providing insight into practical means of establishing an appropriate procurement incentive scheme for the retail industry.

### **III. Research Site and the Current Buyer Incentive Scheme**

The research site for this study is a retail chain called 3C. The company, which is listed on the NASDAQ stock exchange, is the largest electronics chain store organization in Taiwan. The main function of the purchasing department is to manage the supply chain activities of the company efficiently through cost-effective means of sourcing, procurement, inventory management and distribution.

Although buyers in the case company do not directly response for selling products, they are accountable for generating revenues and controlling cost. They have to decide the quantity of merchandise meanwhile to maintain the quality of products. In addition, buyers in the case company have to control the cost of goods sold and they are required to negotiate the expense of distribution, advertising and discount fee with supplier. Hence, to improve procurement competence, the company implemented an output-based incentive scheme that links compensation to financial measures of each buyer's performance. Under the incentive scheme, which was introduced in September 2005, a buyer's compensation consists of a base salary plus bonuses, which are linked to his/her sales and profit achievement rates. More specifically, each buyer's bonuses are based on his/her

contribution score. The score is determined by combining 50% of the weight of the buyer's sales achievement rate (measured by the sales revenues generated by the buyer minus a specific target) and 50% of the weight of the buyer's gross profit achievement rate (measured by the gross profit generated by the buyer minus a specific target).

However, the case company didn't satisfy the current incentive plan; it formed a task team to reassess the plan.<sup>1</sup> Therefore, this research is to assess the appropriateness of current incentive schemes for buyers in the case company. Meanwhile, we also adopt the BSC and AHP to give the case company an insight into establishing an appropriate procurement incentive scheme.

## **IV. Research Methods**

### **Data Collection**

At 3C, the buyers are divided into 10 procurement teams based on different product categories. To compile a complete data set, we used procurement team data instead of individual buyer data to measure the purchasing performance. The retailer provided us with monthly financial data, details of cash bonuses, and related information for all procurement teams for the period April 2006 to February 2007. We also interviewed the general manager and several senior managers to gain insight into their retailing operations and learn about the company's incentive schemes.

To assess the appropriateness of current buyer incentive schemes, we use the Tobit model to examine the relationship between buyers' bonuses and their performance. In addition, we employ the BSC and AHP to establish, respectively, the performance measures and relative weights for buyers in the case company.

### **The Relationship between Buyers' Bonuses and Purchasing Performance**

As mentioned earlier, the case company implemented an output-based incentive scheme for buyers. If the scheme is appropriate for motivating buyers, a positive relationship between purchasing performance and incentive pay should be observable. Prior studies suggested several criteria that could be used to measure overall performance. Sales and gross profit are two of the most-widely used measures (Dubelaar, Bhargava, and Ferrarin, 2002; Levy and Weitz, 2004). However, there is growing trend towards using non-financial measures in performance evaluations. The measures include customer satisfaction (Babakus, Bienstock, and Scotter, 2004) and

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<sup>1</sup> One of authors of the study is the team member.

labor productivity (Dubelaar, Chow, and Larson, 2001). Gaur, Fisher, and Raman (2005) pointed out that inventory turnover is the most popular performance index in the retail industry, but this measure alone may not indicate how an organization achieved its profitability (Ozcan and McCue, 1996). For example, in the retail industry, a low profit margin is compensated for by high inventory turnover. These components cannot be analyzed as if they operate independently.

### Using the DEA Model to Measure the Aggregated Performance Index

Typically, purchasing performance is very difficult to measure. Therefore, following Ozcan and McCue (1996) and Easton et al. (2002), we apply Data Envelopment Analysis (DEA) to develop an aggregated performance index (*API*) and use it as a proxy for purchasing performance. The *API* allows us to weight the ratios discussed above to create an optimal purchasing performance measure for buyers.

We model the procurement teams as multi-input/multi-output decision-making units (DMUs) that attempt to maximize outputs for a given level of input and technology.

In the basic DEA model, the efficiency ( $\lambda$ ) can be evaluated for any observation  $j$ . Let  $o$  denote a focal procurement team. Each team, in turn, becomes a focal procurement team when its efficiency score is computed as the solution to the following linear programming problem (Fare, Grosskopf, Norris, and Zang, 1994):

$$\begin{aligned} & \max_{\lambda, z} \lambda, \\ & \text{subject to:} \\ & \lambda y_{om} \leq \sum_{j=1}^J z_j y_{jm} \quad m = 1, 2, \dots, M \\ & \sum_{j=1}^J z_j x_{jn} \leq x_{on} \quad n = 1, 2, \dots, N \\ & \lambda, z_j \geq 0 \quad j = 1, 2, \dots, J \quad \dots \dots \dots (1) \end{aligned}$$

Here,  $\lambda$  is the relative efficiency score,  $z$  is an intensity or activity variable, and  $y_{jm}$ ,  $x_{jn}$  denote, respectively, the output and input of the  $j$ th team. We follow Ozcan and McCue (1996) and set the values of  $x_{jn}$  as a single dummy input of 1. Therefore, the weights used for each procurement team are those that maximize the focal team's *API*. More specifically, the current DEA model is a constant returns-to-scale output maximization model with a single dummy input of 1 for each team.

Based on previous studies (Dubelaar et al., 2002; Babakus et al., 2004; Levy and Weitz, 2004; Gaur et al., 2005) and the above discussion, four output variables (gross profit, the number of customer complaints, inventory turnover, and labor productivity)



were incorporated into the DEA model.<sup>2</sup> Using DEA to develop an *API* allows us to weight the four outputs and create an optimal purchasing performance measure for buyers.

We estimate the basic DEA model by pooling data from eleven consecutive sample months (Chirikos and Sear, 2000; Chu, Liu, and Romeis, 2002, 2004; Chu and Liu, 2008). The approach assumes that the purchasing functions were performed under the same technological regime over the entire eleven month period.

### **Tobit Regression**

Since the aggregated performance index computed by DEA model ranges between 0 and 1, an original least squares (OLS) estimate would produce biased and inconsistent parameter estimates (Greene, 2011). Tobit analysis assumes that a number of dependent variable values will be clustered at a limiting value. For this reason, we use Tobit model to investigate the correlation between buyers' bonuses and purchasing performance.

A number of studies (Ittner and Larcker, 1998; Banker et al., 2000) have found that there is a short lag between employees' actions and future financial performance. Hence, to capture the economic impact of the buyers' incentive scheme, we use the lead-lag relation to examine the effect of buyers' bonuses on the *API*.

We consider several control variables in addition to the incentive effect because other factors may influence the *API*. Cachon (2004) posited that sharing the inventory risk between the retailer and the supplier would achieve 100% supply chain efficiency. The retail performance declines as the risk increases. The type of contract between the two parties represents the degree of risk borne by the retailer. The case company uses the every day purchase contract to order all of its merchandise and it bears all the inventory risk. We use the every day ratio (*ED*) to measure the degree of risk, which increases as the every day ratio increases. Fiorito (1990) found that an employee's seniority (*SEN*) affects the bargaining results. Hence, we posit that procurement teams whose buyers have higher average seniority may be more efficient in negotiating contracts. In addition, a number of studies have found that number of buyers (*NUM*) and the purchasing budget (*BUD*) also influence the purchasing performance (Murphy, 1992; Johnson, Reiley, and Muñoz, 2006; Sellers-Rubio and Mas-Ruiz, 2006).

The above discussion can be summarized by the following model:

$$API_{t,i} = \alpha + \beta_1 BON_{t-1,i} + \beta_2 ED_{t,i} + \beta_3 SEN_{t,i} + \beta_4 NUM_{t,i} + \beta_5 BUD_{t,i} + \varepsilon \dots\dots\dots (2)$$

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<sup>2</sup> labor productivity = sales/the number of buyers.

where

*API* = the relative efficiency score computed by Equation (1) under the assumption that the returns to scale are appropriate.

*BON* = the cash bonuses paid to the buyers in each procurement team.

*ED* = the ratio of the ED contract budget to the total budget.

*SEN* = the seniority of the members of the procurement team. Specifically, an employee's seniority is defined as number months from the date he/she joined the company up to the first day of the month under study.

*NUM* = the number of buyers in each procurement team.

*BUD* = the ratio of the purchasing budget of each procurement team to the total purchasing budget.

### **Applying BSC and AHP to Establish the Performance Measures and Relative Weights**

In this section, we explain how we use the BSC framework to establish a performance index for buyers, and how we apply the AHP to determine the relative weights of the components of the performance index. Although our primary objective is to establish a more suitable performance measurement system to evaluate buyers, such a system would lead to improvements in the design of the company's incentive scheme.

#### **The Balanced Scorecard (BSC)**

The BSC system is an invaluable tool for determining compensation and reward parameters, since it translates an organization's mission and business strategy into a set of performance measures that provide a framework for implementing the strategy. Instead of focusing solely on achieving financial objectives, the BSC highlights the non-financial objectives an organization must achieve to meet its financial objectives. It views organizational performance from four perspectives: financial, customer focus, internal business processes, and learning and growth (Horngren, Datar, and Rajan, 2012). A good BSC system should enable an organization to focus on its business strategy, the true driver of performance. A lack of focus may negate the effectiveness of the BSC.

Based on Kaplan and Norton (1996), face-to-face interviews with senior managers in the case company, and a pre-test completed by two academics and five retailing specialists, we developed a balance scorecard for buyers (see Table 1).

**Table 1 The Balanced Scorecard for Buyers**

Perspectives	Strategic Objectives	Performance Measures
Financial	Increase profit	Sales revenue
		Gross profit
Customer Focus	Extend credit periods	Credit periods
	Increase customer satisfaction	Repeat customer sales
		Market share
		Product return rate
		Customer complaint rate
Internal processes	Supplier management	Percentage of sales from new products
		Main product out-of-stock
		Liquidated damages
		Gross profit guarantee
	Effective inventory management	Inventory turnover
		Carry over
		Returned purchase completion rate
Learning and growth	Improve processes and reduce risk	Percentage of cases meeting the contract deadline
		Evaluation and maintenance of price system
		Training hours
		Evaluation of internal operating system
	Improve buyers' skills	Improve employees' performance
Labor productivity		

**Analytic Hierarchy Process (AHP)**

The AHP is a multi-criteria decision-making tool developed by Saaty and Vargas (2001). We use it to determine the relative weights of the performance categories in Table 1. A number of studies suggest that the AHP is a better multi-criteria assessment tool than subjective judgments because of its stronger mathematical foundation and its ability to gauge the consistency of judgments (Saaty, 1999; Saaty and Vargas, 2001; Ngai, 2003; Liedtka, 2005). Therefore, we use it to compute the relative weight of each key performance measure for the BSC from data obtained via a questionnaire.

The AHP is a basic approach to decision-making that can be used to develop ratio scales or a set of weights from pair-wise comparisons. It has been used as a decision-making tool in various fields. In the following, we explain how the process derives the relative weights of the performance categories in our study.

There are infinite ways to derive the vector of priorities from the matrix  $(a_{ij})$ . The emphasis on consistency yields the eigenvalue formulation  $AW=nW$ :

$$A = (a_{ij}) = \begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ a_{31} & a_{32} & a_{33} & \cdots & a_{3n} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & a_{n3} & \cdots & a_{nn} \end{bmatrix} = \begin{bmatrix} W_1/W_1 & W_1/W_2 & W_1/W_3 & \cdots & W_1/W_n \\ W_2/W_1 & W_2/W_2 & W_2/W_3 & \cdots & W_2/W_n \\ W_3/W_1 & W_3/W_2 & W_3/W_3 & \cdots & W_3/W_n \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ W_n/W_1 & W_n/W_2 & W_n/W_3 & \cdots & W_n/W_n \end{bmatrix}$$

$$a_{ij} = \frac{W_i}{W_j}, \quad a_{ji} = \frac{1}{a_{ij}}, \quad W = \begin{bmatrix} W_1 \\ W_2 \\ W_3 \\ \vdots \\ W_n \end{bmatrix}, \quad i, j = 1, 2, 3, \dots, n$$

$$\text{Then } AW = \begin{bmatrix} W_1/W_1 & W_1/W_2 & W_1/W_3 & \cdots & W_1/W_n \\ W_2/W_1 & W_2/W_2 & W_2/W_3 & \cdots & W_2/W_n \\ W_3/W_1 & W_3/W_2 & W_3/W_3 & \cdots & W_3/W_n \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ W_n/W_1 & W_n/W_2 & W_n/W_3 & \cdots & W_n/W_n \end{bmatrix} \begin{bmatrix} W_1 \\ W_2 \\ W_3 \\ \vdots \\ W_n \end{bmatrix} = \begin{bmatrix} nW_1 \\ nW_2 \\ nW_3 \\ \vdots \\ nW_n \end{bmatrix} = n \begin{bmatrix} W_1 \\ W_2 \\ W_3 \\ \vdots \\ W_n \end{bmatrix} = nW$$

Saaty and Vargas (2001) suggested that an approximation of the eigenvectors  $(W_1', W_2', W_3', \dots, W_n')$  can be obtained by normalizing the elements in each column of the judgment matrix and calculating the average of each row as follows:

$$W_i' = \frac{\prod_{j=1}^n a_{ij}^{\frac{1}{n}}}{\sum_{i=1}^n \left( \prod_{j=1}^n a_{ij}^{\frac{1}{n}} \right)}, \quad i, j = 1, 2, \dots, n$$

To simplify the notation,  $AW = \lambda'_{\max} W$ , where  $\lambda'_{\max}$  is the largest eigenvalue of  $A' = (a'_{ij})$ , and the perturbed value of  $A = (a_{ij})$  with the reciprocal  $a'_{ij} = 1/a_{ij}$  is forced.  $\lambda'_{\max}$  can be derived as follows:

$$\text{Let } AW' = \begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ \vdots \\ X_n \end{bmatrix} \quad \text{then } \lambda'_{\max} = \frac{1}{n} \left[ \frac{X_1}{W_1'} + \frac{X_2}{W_2'} + \frac{X_3}{W_3'} + \cdots + \frac{X_n}{W_n'} \right]$$

$A$  is consistent if and only if  $\lambda'_{\max} = n$  and we always have  $\lambda'_{\max} \geq n$ ; and  $(\lambda'_{\max} - n)/(n - 1)$  is the variance of the error incurred in estimating  $a_{ij}$ . The measure of inconsistency can be used to improve the consistency of judgments. The consistency index of a matrix of comparisons is given by  $C.I. = (\lambda'_{\max} - n)/(n - 1)$ ; and the consistency ratio ( $CR$ ) is found by  $C.R. = (C.I./R.I.)$ , where  $R.I.$  is a random index with the same order as the matrix in Table 2.

The greater the inconsistency, the larger will be the deviation of  $\lambda'_{\max}$  from  $n$ . Saaty and Vargas (2001) suggested that any  $CR < 0.10$  represents good consistency. Expert Choice software can be used to check the consistency ratio.

**Table 2 Random Consistency Index (R.I.)**

N	1	2	3	4	5	6	7	8	9	10
R.I.	0.00	0.00	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49

Saaty, T. L., and L. G. Vargas. 2001.

To determine the relative importance of the performance categories in Table 1, we compiled a questionnaire (details of which are available on request) for use in the case company. Our objective was to identify which category in a pair (e.g., the financial perspective or the customer perspective) was more important for measuring buyer performance, and to assess the degree of its importance compared to the other item in the pair. We follow Saaty and Vargas (2001) and use a one-to-nine ratio scale to assess the degree of importance.<sup>3</sup> Prior to distributing the questionnaire, a pre-test questionnaire was completed by two academics and five retailing specialists. Only a small number of people in the company had sufficient understanding of the buyers' performance measurements, so we asked them to complete the questionnaire. In total, twenty questionnaires were sent to managers and executives who had at least 10 years experience in the industry.

## V. Empirical Results

### The Relationship between Buyers' Bonuses and Purchasing Performance

The descriptive statistics of variables in the Tobit regression model are presented in Table 3. As the variations in buyer's bonuses and employee seniority are large, we need to control these variables in our analysis.

Table 4 shows the relationship between buyers' bonuses and the aggregated purchasing performance index. We find that there is no relationship between buyers' bonuses and aggregated purchasing performance index. This result suggests that the incentive scheme might not be suitable because it is based primarily on accounting

<sup>3</sup> The response scale for the degree of importance of a performance measures is as follows: 1 = the performance measures are of equal importance; 3 = the performance measure is slightly more important than the other measure; 5 = the performance measure is much more important than the other measure; 7 = the performance measure is demonstrably more important than the other measure; 9 = the performance measure is absolutely more important than the other measure.

**Table 3 Descriptive Statistics of Variables**

Variable	Mean	Std. Dev.	Min	Max
<i>API</i>	0.58	0.24	0.17	1.00
<i>BON</i>	4,827.99	6,411.40	0.00	22,000.00
<i>ED</i>	0.72	0.14	0.32	0.95
<i>SEN</i>	57.18	39.50	6.50	164.33
<i>NUM</i>	5.00	1.00	3.00	10.00
<i>BUD</i>	0.10	0.07	0.01	0.28

measures. Gibbs et al. (2004) contended that accounting figures can distort incentives because they do not consider some dimensions of the employee's job. Moreover, some studies (e.g., Ittner, Larcker, and Rajan, 1997; Banker et al., 2000) suggest that non-financial measures are better indicators of future financial performance than accounting measures. They are also valuable for motivating employees to improve their performance (Banker et al., 2000). These insights help explain why it is essential to link compensation to both financial and non-financial measures when implementing an output-based incentive scheme. The BSC and AHP allow us to consider both types of measures and thereby establish a more suitable performance measurement system to motivate buyers.

**Table 4 The Relationship between Buyers' Bonuses and Purchasing Performance (N=97)**

Variables	Coefficient	t-value
<i>Constant</i>	0.38	2.23**
<i>BD</i>	-0.00	-0.38
<i>ED</i>	0.14	0.60
<i>SEN</i>	0.00	0.24
<i>NUM</i>	0.01	0.64
<i>BUD</i>	0.62	1.30*
<i>Chi-square</i>	4.85	( $p < 0.01$ )

1. The Chi-square test is based on a likelihood ratio test, which assesses the joint significance of the independent variables (Chilingerian, 1995). This statistic is calculated by  $-2\log LR$ , where  $\log LR$  is the difference between the maximized value of the likelihood function for the full model and the maximized value if all coefficients except the intercept are zero. The result indicates the significance of the Tobit model and is similar to an F-score test in standard regression.

2. \* and \*\* indicate significance at  $p < 0.1$  and  $p < 0.05$ , respectively.

### Using BSC and AHP to Establish Performance Measures and Determining Their Relative Weights

Eighteen completed questionnaires were returned (a response rate of 90 percent). The majority of respondents were male, and more than half of them were senior managers with over 15 years experience in the company.

An appropriate performance measurement system is shown in Table 5. The weights of the performance categories were determined by applying the AHP. As shown in the table, the customer perspective is the most important factor in evaluating a buyer's performance, followed by the financial perspective. Analysis of the ranking of the four perspectives reveals two interesting points. First, a strong customer focus is crucial for evaluating purchasing performance. The results suggest that customer-related performance measures should be used in buyer incentive schemes. The second point is that the internal process perspective is ranked last. This is somewhat surprising because internal processes, such as supply chain management and inventory management, are critical to retailing success (Dubelaar et al., 2001; Chu and Liu, 2008). Therefore, the case company should focus more on inventory management-related performance measures.

**Table 5 The Relative Weights of the Performance Categories**

Perspectives	Strategic Objectives	Performance Measures
Financial (29.2%)	Increase profit (24.5%)	Sales revenue (16.4%)
		Gross profit (8.2%)
Customer Focus (33%)	Extend credit periods (4.7%)	Credit periods (4.7%)
		Repeat customer sales (10.5%)
	Increase customer satisfaction (33%)	Market share (7.8%)
		Product return rate (3.8%)
		Customer complaint rate (10.9%)
Internal process (15.6%)	Supplier management (6.7%)	Percentage of sales from new products (0.9%)
		Main product out-of-stock (1.6%)
	Effective inventory management (6.3%)	Liquidated damages
		Gross profit guarantee (2.6%)
		Inventory turnover (3.8%)
	Improve process and reduce risk (2.6%)	Carry over (2.4%)
		Returned purchase completion rate (0.7%)
		Percentage of cases meeting the contract deadline (0.7%)
Learning and growth (22.2%)	Improve buyers' skills (16.4%)	Evaluation and maintenance of price system (1.2%)
		Training hours (3.5%)
		Evaluation of internal operating systems (6.9%)
	Improve employees' performance (5.7%)	Evaluation of procurement teams (6.1%)
		Labor productivity (5.7%)

With respect to strategic objectives, it is not surprising that “increasing customer satisfaction” and “increasing profit” top the list, but it is baffling to find “effective inventory management” and “improve process and decrease risk” near the bottom of the list. This might indicate that managers in the case company do not fully understand the importance of internal processes like inventory management, even though constant improvement of the processes represents the key to survival and growth in a highly competitive retailing environment.

### Additional Sensitivity Test

To assess the robustness of our result, we also conduct the following sensitivity test.

#### *The Impact of Buyers' Bonuses on Buyers' Productivity*

Concerning the proxy of purchasing performance, in Equation (2) we use buyer productivity instead of *API* to test the robustness of our result. Specifically, we use sales revenues per buyer and profits per buyer to represent buyer productivity.

From the Table 6, we can observe that bonuses are negatively but not significantly related to buyer productivity. In addition, bonuses are positively but not significantly related to buyer productivity in Table 7. The finding is consistent with our earlier assertion that the bonuses are not associated with buyers' performance.

**Table 6 The Relationship between Buyers' Bonuses and Buyers' Productivity-Sales Revenues per Buyer (N=97)**

Variables	Coefficient	t-value
<i>Constant</i>	56,800,000.00	3.56***
<i>BON</i>	-127.00	-0.33
<i>ED</i>	14,100,000.00	0.66
<i>SEN</i>	-112,000.00	-1.74*
<i>NUM</i>	-7,630,000.00	-5.52***
<i>BUD</i>	294,000,000.00	6.63***
Adj. $R^2$		0.53
F-value		22.51

\* and \*\*\* indicate significance at  $p < 0.1$  and  $p < 0.01$ , respectively.

#### *Examining the Impact of Buyers' Bonuses on Purchasing Performance by Using Multi-Regression Model*

Instead of using Tobit model to test the relationship between buyers' bonuses and purchasing performance, we use multi-regression model to examine the association



between buyers' bonuses and purchasing performance. The results indicate that bonuses are negative but not significantly related to purchasing performance. The finding echoes our earlier assertion that the bonuses are not associated with buyers' performance.

**Table 7 The Relationship between Buyers' Bonuses and Buyers' Productivity-Profits per Buyer (N=97)**

Variables	Coefficient	t-value
<i>Constant</i>	11,500,000.00	3.50***
<i>BON</i>	81.31	1.02
<i>ED</i>	250198.10	0.06
<i>SEN</i>	-5211.98	-0.39
<i>NUM</i>	-941883.80	-3.31***
<i>BUD</i>	11,300,000.00	1.24
Adj. $R^2$		0.14
F-value		2.94

\*\*\* indicates significance at  $p < 0.01$ .

**Table 8 The Relationship between Buyers' Bonuses and Purchasing Performance (N=97)**

Variables	Coefficient	t-value
<i>Constant</i>	0.35	2.28**
<i>BON</i>	-0.00	-0.38
<i>ED</i>	0.11	0.51
<i>SEN</i>	0.00	0.24
<i>NUM</i>	0.01	1.00
<i>BUD</i>	0.74	1.72**
Adj. $R^2$		0.08
F-value		1.52

\*\* indicates significance at  $p < 0.05$ .

## VI. Conclusions and Limitations

Outcome-based compensation schemes are being used increasingly by firms in service industries. Ideally, such schemes should use all available information to weight the effects that employees' performances have on a firm's value, so that incentives are appropriately balanced across different dimensions of the employees' jobs. How to design an effective incentive scheme has thus become an important management issue. Existing studies suggest that output-based incentive schemes have a beneficial effect on employee

productivity (Jones and Kato, 1995; Rajagopalan, 1997; Banker et al., 1996, 2000); however, little or no attention has been paid to examining the appropriateness of incentive schemes for buyers who play a critical role in the success of retail operations. In the case company, we found that there was no relationship between incentive bonuses and employee performance. In other words, the buyers' incentive scheme, which links compensation mainly to financial measures, is not appropriate for motivating employees. To resolve the problem, we utilized the BSC and AHP to construct an appropriate model of purchasing performance indicators for evaluating the company's buyers. In the model, the "internal process perspective" was deemed the least important factor in evaluating buyer performance. This might indicate that managers do not fully understand the importance of internal processes, such as inventory management, which represent the key to retailing success. However, in the case company, the purchasing managers have strong bargaining power and clearly have a huge influence on the choice of performance measures. Although we suggested that the buyer incentive scheme should include inventory turnover because it is one of the most important performance drivers in the company, buyers refused to include inventory turnover as one of their performance measures. Therefore, the company's top management should modify the incentive scheme so that it incorporates inventory turnover as a performance metric.

Finally, we should mention the limitations of our study. First, we only examined data from one chain store organization in Taiwan. More research is required to verify to what extent our results can be generalized to other industries that face different operating environments. Second, because of limited data availability, we only used data for procurement teams instead of for individual buyers to measure the purchasing performance. In addition, from the face-to-face interviews, we found that only a small number of personnel had sufficient understanding of buyers' performance measurements. This might also explain why the incentive scheme did not improve the purchasing performance. In the future, more research is required to verify if the effective communication can improve the effectiveness of incentive scheme.

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2.策略目標：有效的存貨管理運用

下列因素（存貨周轉率及不動銷比率）是平衡計分卡「內部流程構面」下之有效存貨管理運用，衡量指標之兩兩比較，您認為其相對重要比例應為何？

左邊因素	9:1	7:1	5:1	3:1	1:1	1:3	1:5	1:7	1:9	右邊因素
存貨周轉率										不動銷比率

3.策略目標：減少風險

下列因素（商品退貨完成率、規定日期內簽訂合約及商品變價系統維護評量）是平衡計分卡「內部流程構面」下之減少風險，衡量指標之兩兩比較，您認為其相對重要比例應為何？

左邊因素	9:1	7:1	5:1	3:1	1:1	1:3	1:5	1:7	1:9	右邊因素
商品退貨完成率										規定日期內簽訂合約
商品退貨完成率										商品變價系統維護評量
規定日期內簽訂合約										商品變價系統維護評量

(四)學習成長構面

1.策略目標：提升採購人員能力

下列因素（教育訓練時數、內部系統操作之考核評量及部會內容之考核評量）是平衡計分卡「學習與成長構面」下之提升採購人員能力，衡量指標之兩兩比較，您認為其相對重要比例應為何？

左邊因素	9:1	7:1	5:1	3:1	1:1	1:3	1:5	1:7	1:9	右邊因素
教育訓練時數										內部系統操作之考核評量
教育訓練時數										部會內容之考核評量
內部系統操作之考核評量										部會內容之考核評量

四、除目前各構面之衡量指標外，您認為是否還需要考量其他的衡量指標？

否；

是，應再考量以下指標：

1.財務構面：\_\_\_\_\_

2.顧客構面：\_\_\_\_\_

3.學習成長構面：\_\_\_\_\_

4.內部程序構面：\_\_\_\_\_

五、基本資料

您的職稱：\_\_\_\_\_

服務年資：16年以上 11-15年 6-10年 5年以下

