AN EMPIRICAL INVESTIGATION OF THE RELATION BETWEEN PERFORMANCE MEASURES: EVIDENCE FROM PUBLIC ENTERPRISES IN KOREA

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Abstract

The information age environment requires that firms implement strategic performance measurement systems that focus on intangible assets. These systems are now widely used and implemented in the public sector. However, there have been few studies on the relationship between performance measures. Contingent factors and the management environment of the public sector are fundamentally different from the private sector. Consequently, performance measurement systems should be adapted before they are applied to the public sector. Using the data for 13 Korean public enterprises from 1990 to 2003, this study investigates the relation between performance measures. Our findings suggest that management measures are not significantly associated with goal achievement measures prospectively. Furthermore, specific management measures are not significantly related with goal achievement measures either currently or prospectively. Overall, the results indicate that performance measurement systems in Korean public enterprises have not been implemented effectively and are not fulfilling the system designers' original intention.

Keywords: Korean Public Enterprise, Performance Measurement System, Goal Achievement Measure, Management Measure

Introduction

Strategic performance measurement systems are widely used in many companies. Unlike traditional performance measurement systems, strategic performance measurement systems focus less on financial indicators and more on nonfinancial

indicators. This is because firms that are faced with changing environments are increasingly focusing on intangible assets rather than tangible assets with their management practices. The Mckinsey Company. reported that 75 percent of firm value was created by intangible assets in 2002 compared to 30 percent in 1982. Nonfinancial measures are also better indicators of financial performance than accounting and financial measures (Banker et al., 2000). Nonfinancial measures focus on the value drivers of future financial performance[1] and are aligned to financial measures based on cause-and-effect relations (Hauser et al. 1994).

Strategic performance measurement systems are also increasingly being used and implemented in the public sector. The topic of accountability and performance measurement has become more urgent for non-profit organizations as they encounter increasing competition from a proliferating number of agencies, all competing for scarce donor, foundation, and government funding (Niven 2003). For a private sector company, financial measures provide the accountability measure between it and its owners, the shareholders. For a non-profit, however, the agency's mission represents the accountability between it and society (Kaplan 2001). Therefore, performance measurement systems for the public sector are different from those for the private sector. In the private sector, systems focus on causal relationships between financial measures and non-financial measures. In contrast, systems in the public sector focus on causal relationships between goal achievement measures (lagging measures) which evaluate the effort for achieving current mission and management measures (leading measures) which evaluate current effort for achieving future mission.

However, for all the increasing use of strategic performance measurement systems in both the private and public sectors, there have been very few studies on the relation between performance measures - non-financial measures and financial measures in the private sector (Ittner and Larcker 1998a) and goal achievement measures and management measures in the public sector. Especially, studies in the public sector are less common than those in the private sector. There are several reasons for this. First, non-profit organizations lack the simple elegance of a financial measure used by for profit organizations to assess their performance (Kaplan 2001; Forbes 1998). Second, there cannot be one universal model of organizational effectiveness (Kaplan 2001; Cameron and Whitten 1983) and third, the existence of multiple constituencies requires other kinds of methodological approaches for public enterprises (Kaplan 2001; Kanter and Summers 1987).

The purpose of this study is to investigate the relation between goal achievement measures and management measures in the public sector. The characteristics of this study are twofold. First, this study follows the structure of a performance measurement system which is made by agreement between the rater and the

rate. We adopt the classification for leading measures and lagging measures as the system represents. This methodology reflects the original intention of the performance measurement system and avoid the intervention of subjectivity caused by an investigator's reclassification of measures. Second, this study uses 14 years of public data and objectively investigates the long-term relation between the performance measures. A limitation of prior studies for performance measurement systems in the public sector is that they use short-term data. This study addresses that problem.

Using panel data covering the period 1990 to 2003 from the Korean public enterprises' performance measurement systems, the results indicate that management measures are not significantly associated with goal achievement measures prospectively. The results also indicate that the specific management measures which belong to the following: the organization and human resource management sector (ORG), the payments and employee relation management sector (EMP), the internal performance evaluation management sector (PER), the finance and budgeting management sector (FIN), the research and development sector (R&D), and the planning execution and internal process management sector (PRO), are not significantly associated with goal achievement measures currently or prospectively. In sensitivity analysis, this study reclassifies performance measures into qualitative measures and quantitative measures. There is no statistically significant relation between qualitative measures and quantitative measures. These results are consistent both in service public enterprises and in manufacturing public enterprises. Lastly, the size of the corporations and the structure of the evaluation methods are significantly associated with goal achievement measures and quantitative measures. However, the size of the corporations is not associated with qualitative measures. The number of measures is not related with goal achievement and quantitative measures, but is related to qualitative measures.

The remainder of the paper is organized as follows. In the second section, the research sites are described. In the third section, we discuss the relevant literature and develop the testable hypotheses. In the fourth section, we describe the sample and empirical tests. The results of the empirical tests and sensitivity analysis are contained in the fifth section, and the sixth section includes the summary and conclusion of the study.

The Research Sites

The Outline of the Performance Measurement System of Korean Public Enterprises

The performance measurement system of Korean public enterprises is a series of processes which consist of evaluating the yearly performance of each enterprise

and reflecting the results into incentive schemes and next year's performance target according to "The law for management of Korean Public Enterprises" (Korean Society of Public Enterprise 2003, p. 24). Korean public enterprises for which the performance measurement system is applied to enterprise which financed over 50 percent of their capital from the government. The purpose of this system which was implemented since 1984 is to allow the entities autonomy and flexibility in their management and to establish self-regulating systems. The government presents the principal goals and monitors their performance ex post facto. The specific purpose of this system is as follows. First, this system induces the post-political relationship between government and public enterprises defining each role clearly. Second, it motivates the managers of public enterprises by evaluating performance of each corporation yearly. Finally, it clarifies managements' goals and makes the enterprises balance entity profitability with public purpose effectively (Korean Society of Public Enterprise 2003, p. 29-30).

The Structure and Change of the Performance Measurement System

Since this performance measurement system was implemented in 1984, there has been no fundamental change of the system. The purpose and basic structure of the system have been preserved. On the other hand, a variety of changes have been made with regard to its details, such as the operation of management system, evaluation organization, performance measurement framework and methods, enterprises evaluated, and the application of the evaluation results etc.

Performance measures consist of the following three parts by its purpose and evaluation object: general measures which belong to the general management sector, goal achievement measures which belong to the goal achievement sector, and management measures which are in the management sector (Korean Ministry of Planning and Budget, 2004).

General measures evaluate the comprehensive management achievement and include capital productivity, managerial efforts for improving responsibility in the management and in the public benefit, etc. This study classifies the general measures into lagging measures and leading measures based on each characteristic.

The performance measurement system leads public enterprises to focus on their core mission and enhance consistency in management by defining management direction for each enterprise. Goal achievement measures play a central role in this field. These measures clearly define the purpose of existence of public enterprises and contemporary management target (Korean Society of Public Enterprise 2003 p. 339-340). Therefore, this study considers goal achievement measures as lagging measures like financial measures in the private sector.

Management measures which consist of qualitative measures mostly are subdivided into the organization and human resource management sector, the payments and employee relation management sector, the internal performance evaluation management sector, the finance and budgeting management sector, the research and development sector, and the planning execution and internal process management sector (Korean Ministry of Planning and Budget 2004). The report for performance measurement systems in Korean public enterprises emphasizes that management measures are designed to promote long-term performance improvement rather than short-term achievement (Korean Society of Public Enterprise 2003, p. 49). Therefore, this study classifies them as leading measures like nonfinancial measures in the private sector.

Although each performance measure has been continuously changed, the basic framework has been maintained. This study follows the established framework in the system for classification of the measures. This is, as stated above, to prevent the researcher's subjectivity caused by reclassification[2].

In regard to the evaluation methods, the performance measures are divided into qualitative measures and quantitative measures. Specifically, quantitative measures are divided into four types. Government and public enterprises decide targets of 'Actual to target' measures based on mutual agreement. 'Trend' measures evaluate the rate of improvement based on the past performance. 'Beta analysis' measures use the weighted average of maximum score and minimum score of the past performance for the appropriate periods. 'Targeting' measures use the difference between the maximum target and the minimum target. Qualitative measures are evaluated by a 1-to-5 grading system from 1993 to 1995 and a 1-to-9 grading system from 1996 onward. The evaluation method of the measures can affect the results of the study because each method uses different evaluating standards and formula. Therefore, this study controls how much weight is given to the each measurement method in relation to the total weight of the dependent variables.

The Composition of the Performance Evaluating Group and Feedback Procedure

The primary role of the performance-evaluating group is to design performance measures and evaluate the performance of each enterprise. The group is divided into three parts: the general evaluating team, the qualitative measure evaluating team, and the quantitative measure evaluating team. Every year the group consists of 25 to 40 experts - a professor, CPA, a researcher, and related experts carry out the performance evaluation on a yearly basis (Korean Society of Public Enterprise 2003, p. 203). However, there have been discussions and agreements between the raters and rates in designing the performance measures and in evaluating management's performance continuously.

Incentive payments are decided by the results of the performance evaluation (from a minimum of 100 percent to a maximum of 300 percent of monthly salary), and the advice from the results plays an important role as a first guideline for future management practice. Furthermore, the results of performance evaluation can also affect public enterprises' social recognition by officially announcing the results every year (Korean Society of Public Enterprise 2003, p. 44).

Hypotheses Development

In spite of the spread of strategic performance measurement systems in the public sector, there have been very few studies on the efficiency and effectiveness of performance measurement systems in the public sector. Chu (1993) reveals that there is no significant relation between qualitative measures and quantitative measures one or three years later using Korean public enterprises' data from 1988 to 1991. In a recent study, Na and Lee (2001) investigate the difference between qualitative measurement and quantitative measurement, the correlation between weight of the measure and its achievement rate, and the effect of measurement methods and the number of measures on performance score using Seoul City-Invested companies' data. Their results indicate that there is no significant difference between two measurements and measurement methods and the number of measures has no effect on the performance score. Na (2003), applying a structural equation model, tests the causal relationship between performance measures of Korean public enterprises using government invested-companies' data from 1999 to 2000. In that study, each performance measures are reclassified into result, relation, activity, and future sector based on BSC framework as well as into qualitative and quantitative measures. He finds that there is no significant relation between them in both cases.

Prior studies investigating the relation between performance measures in public enterprises fail to verify the long-term relation between performance measures because of the limitations of the data period. However, it can take a long time for leading measures to affect lagging measures (Banker et al. 2000; Said et al. 2003). This study, using 14 years of data set from 1990 to 2003, tests whether a long-term relation between performance measures exists, and if any, how long the effect lasts. Furthermore, the prior studies have focused on the relation between quantitative measures and qualitative measures (Chu 1993; Na 2003). However, in the public sector, the cause-and-effect relation needs to be designed between goal achievement measures which evaluate the effort for achieving current mission and management measures which evaluate current effort for achieving future mission rather than between quantitative measures and qualitative measures (Kaplan 2001, p. 361).[3] The classification of measures in Korean public enterprises' performance measurement system (general measures, goal achievement measures

and management measures) also can be considered to reflect this cause-and-effect relationship (Korean Ministry of Planning and Budget 2004, p. 37). Accordingly, we posit the following hypothesis.

H1: Management measures are positively significantly associated with goal achievement measures currently or prospectively.

The management sector is subdivided into the organization and human resource management sector (ORG), the payments and employee relation management sector (EMP), the internal performance evaluation management sector (PER), the finance and budgeting management sector (FIN), the research and development sector (R&D), the planning execution and internal process management sector (PRO) (Korean Ministry of Planning and Budget 2004, p. 37).

Rationalization of organization and human resource management, as one of the cardinal means to implement the strategy of corporations, require firms to achieve systematic empowerment, simplify and specialize the organizational structure, and promote employee career management based on ability and performance (Korean Society of Public Enterprise 2003, p. 356-359).

Payments and employee relation management is focused on the prevention of moral hazard such as excessive labor costs and welfare costs derived from reckless management and introduction of a payment system based on ability and performance. Moreover, in recent time, they have been improving labor-management relations by increasing the opportunities of conversations between management and unions and enlarging the participation of labors (Korean Society of Public Enterprise 2003, p. 370-372).

The internal performance evaluation management sector promotes organic relations between the performance measurement system of Korean public enterprises and internal ones. They evaluate whether the internal performance measurement system is well established and effectively operated (Korean Society of Public Enterprise 2003, p. 364-368).

Generally, a financial perspective provides a constraint, not an objective for government and not-for-profit organizations. These organizations must limit their spending to budgeted amounts (Kaplan and Norton 1996, p. 180). However, when more autonomy is given, promoting efficiency of budget management and achieving sound finance also become important. The finance and budgeting management sector deals with financial structure improvement and reasonable budgeting (Korean Society of Public Enterprise 2003, p. 360-363).

The research and development are primary factor not only in the private sector but also in the public sector. The performance measurement system of Korean

public enterprises has evaluated efficiency and effectiveness of the research and development activity since its inception in 1984 (Korean Society of Public Enterprise 2003, p. 374).

Lastly, the other measures which are included nowhere among the above sectors are collected in the planning execution and internal process management sectors. These measures (e.g., managerial efforts for improving responsibility in management and public benefit, rightness of management planning, administrative expense and inventory management) can be considered to evaluate efficiency of process and effectiveness of planning execution.

An aggregated score of management measures is not sufficient to identify which sectors among them are significantly associated with goal achievement measures. Therefore, this study posits the following hypothesis.

H2: Specific management measures (ORG, EMP, PER, FIN, R&D and PRO) are positively significantly associated with goal achievement measures currently or prospectively.[4]

Estimation Models and Tests

Data

Yearly performance evaluation score data were obtained for a period from 1990 to 2003 (14 years) for 13 Korean public enterprises from public sources. Korean public enterprises are Korea Electric Power Corporation, Korea Minting and Security Printing Corporation, Korea Coal Corporation, Korea Resources Corporation, Korea National Oil Corporation, Korea Trade-Investment Promotion Agency, Korea Highway Corporation, Korea National Housing Corporation, Korea Water Resources Corporation, Korea Land Corporation, Korea Agricultural and Rural Infrastructure Corporation, Korea Agro-Fisheries Trade Corporation and Korea Tourism Organization.[5]

The performance measurement system has changed as we noted in section II. It includes the introduction and deletion of performance measures, weights and evaluation methods changes. The evaluation method of grading for qualitative measures changed from a five-point scale to a nine-point scale in 1996. The range of ratings of each measure extended from 75-100 to 0-100 in 1998 (Ahn and Kim 2005). Therefore, we transformed the data to reflect the above changes. The rating scores from 1998 to 2003 are transformed to the scale of a minimum 75 maximum 100 using the formula "(original score/4) +0.75".

Models

The Relation between LAG and LEAD

To test the hypothesis I, the following model is specified for estimation using pooled time-series data for 13 enterprises:

$$LAG_{i,t} = \alpha_0 + \beta_1 \cdot LAG_{i,t-1} + \beta_2 \cdot LEAD_{i,t\sim t-3} + \beta_3 \cdot NUM_{i,t} + \beta_4 \cdot ROA_{i,t} + \beta_5 \cdot SIZE_{i,t} + \beta_6 \cdot RGRA_{i,t} + \beta_7 \cdot RTAR1_{i,t} + \beta_8 \cdot RTAR2_{i,t} + \beta_9 \cdot RTRE_{i,t} + \sum_{i=1}^{12} \beta_i \cdot FIRM_i + \sum_{t=1}^{10} \beta_t \cdot YEAR_t + \varepsilon_{i,t} \quad \text{(M1)}$$

where:

i : 1,...,13 represents the individual public enterprises,

t : 1,...11 represents the years in our sample period,

$LAG_{1,t\sim t-1}$: Total scores of performance measures in the goal achievement sector divided by total weights of performance measures in the goal achievement sector of firm i in year t, t-1,

$LEAD_{i,t\sim t-3}$: Total scores of performance measures in the management sector divided by total weights of performance measures in the management sector of firm i in year t, t-1, t-2, t-3,

$NUM_{i,t}$: The number of goal achievement measures of firm i in year t,

$ROA_{i,t}$: Net income divided by total assets of firm i in year t,

$SIZE_{i,t}$: The natural log of total assets of firm i in year t,

$RGRA_{i,t}$: Total weights of grading measures in the goal achievement sector divided by total weights of performance measures in the goal achievement sector of firm i in year t,

$RTAR1_{i,t}$: Total weights of actual to target measures in the goal achievement sector divided by total weights of performance measures in the goal achievement sector of firm i in year t,

$RTAR2_{i,t}$: Total weights of targeting measures in the goal achievement sector divided by total weights of performance measures in the goal achievement sector of firm i in year t,

$RTRE_{i,t}$: Total weights of trend measures in the goal achievement sector divided by total weights of performance measures in the goal achievement sector of firm i in year t,

$FIRM_i$: A dummy variable = 1 if firm i = 0 otherwise,

$YEAR_t$: A dummy variable = 1 if year t = 0 otherwise,

$\varepsilon_{i,t}$: Random error term.

The above model I specifies the relation between LAG (performance of goal achievement sector) at t and LEAD (performance of management sector) at t, t-1, t-2 t-3 controlling for other variables that can affect LAG at t. While earlier studies recognize that nonfinancial measures may have a long-term impact, there is no formal theory to identify the specific number of lags for nonfinancial measures (Banker et al. 2000). Therefore, this study adds the LEAD variable from t to t-3 subsequently to the model for checking whether there exists additional effects of LEAD variables to LAG controlling future LEAD.[6]

In testing the relation, this study introduces controls for a number of factors. For controlling past goal achievement performance, this study includes lagged values of LAG (Banker et al. 2000; Said et al. 2003). We also include variables to control for profitability, size, the number of measures and the structure of the evaluation methods (Grading, Actual to target, Targeting, Trend and Beta analysis).

Profitability is measured using the ROA. Compared to the private sector, the public sector doesn't consider profitability as a fundamental target. So we cannot evaluate the performance of the public sector by just using a profitability index (Park and Lee 2000). Nevertheless, in our data, a few performance measures in goal achievement sector reflect profitability (e.g., Capital productivity, Labor productivity) and profitability of each enterprise serves a guide to the evaluation of other performance measures (Jang and Lee 1997). Therefore, this paper controls profitability by using ROA which is defined as net income divided by total assets.

The results of the questionnaire on the attitude of ratees to the performance measurement system show that even though they think a performance measurement system is necessary, they are not satisfied with the results. The primary reason of this phenomenon is that many ratees and even raters are not sure of the fairness of the performance measurement system (Kwon and Yoon 1999). In this study, we apply the fixed effects model. So the individual facts of each enterprise are controlled. However, there still can be a relation between size and performance of each enterprise. Therefore, we include the natural log value of total assets as control variable.

The use of multiple measures leads to questions about the value of including a broad set of metrics in performance measurement systems. A diverse set of performance measures may cause ratees to spread their efforts over too many objectives, reducing the effectiveness of the performance measurement system (Ittner and Larcker 1998b). In addition, a broad set of performance measures can affect raters by inducing a leniency tendency, so we also control the number of measures in dependent variable.

Because the distribution of the score is different depending on the evaluation method, the structure of the evaluation methods can also affect the score of the dependent variables. The average score of actual to target measures are very close to the full score while the grading measures show the lowest score among the evaluation methods (Jang and Lee 1997). In addition, the standard deviation of the scores of the qualitative measures is lower than that of the quantitative measures due to central tendency (Saal et al. 1980; Ahn and Kim 2005).[7] To controlling this effect, we calculated the value that the weights of each method's measures in the goal achievement sector divided by total weights of performance measures in goal achievement sector and put them to the model (RGRA, RTAR1, RTAR2 and RTRE).[8]

As we explain in section II, the basic framework of a performance measurement system have been preserved. However, the concrete factors have changed continuously. For controlling the change of the raters, the policy of government, etc. we include year specific dummies in the model.

Finally, 13 enterprises of this study belong to the different industries. In addition, the characteristics of each firm are unique and very difficult to compare.[9] For controlling this effect, we include firm specific dummies in the model (Banker et al. 2000; Said et al. 2003).

The Relation between LAG and ORG, EMP, PER, FIN, R&D and PRO

To test the hypothesis II, the following model is specified for estimation using pooled time-series data for 13 enterprises:

$$\begin{aligned} LAG_{i,t} = {} & \alpha_0 + \beta_1 \cdot LAG_{i,t-1} + \beta_2 \cdot ORG_{i,t\sim t-3} + \beta_3 \cdot EMP_{i,t\sim t-3} + \beta_4 \cdot PER_{i,t\sim t-3} + \beta_5 \cdot FIN_{i,t\sim t-3} \\ & + \beta_6 \cdot R\&D_{i,t\sim t-3} + \beta_7 \cdot PRO_{i,t\sim t-3} + \beta_8 \cdot NUM_{i,t} + \beta_9 \cdot ROA_{i,t} + \beta_{10} \cdot SIZE_{i,t} \\ & + \beta_{11} \cdot RGRA_{i,t} + \beta_{12} \cdot RTAR1_{i,t} + \beta_{13} \cdot RTAR2_{i,t} + \beta_{14} \cdot RTRE_{i,t} \\ & + \sum_{i=1}^{12} \beta_i \cdot FIRM_i + \sum_{t=1}^{10} \beta_t \cdot YEAR_t + \varepsilon_{i,t} \end{aligned} \quad \text{(M2)}$$

where:

i : 1,...,13 represents the individual public enterprises,

t : 1,...11 represents the years in our sample period,

$LAG_{1,t\sim t-1}$: Total scores of performance measures in the goal achievement sector divided by total weights of performance measures in the goal achievement sector of firm i in year t, t-1,

$ORG_{1,t\sim t-3}$: Total scores of performance measures in the organization and human resource management sector (ORG) divided by total weights of performance measures in the ORG sector of firm i in year t, t-1, t-2, t-3,

$EMP_{1,t\sim t-3}$: Total scores of performance measures in the payments and employee relation management sector (EMP) divided by total weights of performance measures in the EMP sector of firm i in year t, t-1, t-2, t-3,

$PER_{1,t\sim t-3}$: Total scores of performance measures in the internal performance evaluation management sector(PER) divided by total weights of performance measures in the PER sector of firm i in year t, t-1, t-2, t-3,

$FIN_{1,t\sim t-3}$: Total scores of performance measures in the finance and budgeting management sector (FIN) divided by total weights of performance measures in the FIN sector of firm i in year t, t-1, t-2, t-3,

$R\&D_{1,t\sim t-3}$: Total scores of performance measures in the research and development sector (R&D) divided by total weights of performance measures in the R&D sector of firm i in year t, t-1, t-2, t-3,

$PRO_{1,t\sim t-3}$: Total scores of performance measures in the planning execution and internal process management sector (PRO) divided by total weights of performance measures in the PRO sector of firm i in year t, t-1, t-2, t-3,

*See model I for definition of other variables

The above model II specifies the relation between LAG (performance of goal achievement sector)at t and ORG, EMP, PRO, FIN, R&D and PRO (performance of specific management sector) at t, t-1, t-2 t-3 controlling for other variables that can affect LAG at t. As we distinguish management sectors to specific sectors, we investigate the detailed relation between goal achievement measures and specific management measures.[10] We controlled other variables following model I.

The Results

Descriptive Statistics

Table 1 presents descriptive statistics for the 13 public enterprises. The average value of LAG is a little higher than that of LEAD (0.94, 0.91 respectively). The average values of ORG, EMP, PER, FIN, R&D and PRO are from 0.90 to 0.91. There exists little difference among them because these measures mainly consist of the qualitative measures. As we said above, raters of qualitative measures belong to the qualitative measures evaluating team together. The average number of performance measures in the goal achievement sector is 14.7 units. The weights of goal achievement sector consists of grading measures by 32.4 percent, actual to target measures 18.8 percent, targeting measures by 6.2 percent, trend measures by 38 percent and beta analysis measures by 4.6 percent. Trend measures are mostly used, because the purpose of the performance measurement system is

Table 1: Descriptive Statistics of Sample Public Enterprises

Variable	Mean	Standard Deviation	First Quartile	Median	Third Quartile
LAG	0.936	0.024	0.920	0.940	0.953
LEAD	0.910	0.032	0.891	0.914	0.935
ORG	0.914	0.038	0.894	0.919	0.938
EMP	0.904	0.049	0.870	0.914	0.944
PER	0.914	0.039	0.887	0.913	0.938
FIN	0.905	0.043	0.877	0.913	0.939
R&D	0.902	0.039	0.875	0.906	0.938
PRO	0.911	0.045	0.885	0.920	0.944
NUM	14.720	2.769	13.000	15.000	17.000
GRADE	0.907	0.029	0.891	0.911	0.928
TAR1	0.989	0.027	0.995	1.000	1.000
TAR2	0.954	0.065	0.932	0.979	1.000
TREND	0.929	0.042	0.903	0.936	0.960
BETA	0.952	0.067	0.939	0.984	1.000
RGRA	0.324	0.090	0.250	0.333	0.389
RTAR1	0.188	0.068	0.175	0.189	0.204
RTAR2	0.062	0.102	0.000	0.000	0.073
RTRE	0.380	0.151	0.298	0.400	0.500
RBET	0.046	0.080	0.000	0.000	0.064
ROA	0.004	0.075	0.001	0.006	0.018

GRADE : Total scores of grading measures divided by total weights from 1993 to 2003,
TAR1 : Total scores of actual to target measures divided by total weights from 1993 to 2003,
TAR2 : Total scores of targeting measures divided by total weights from 1993 to 2003,
TREND : Total scores of trend measures divided by total weights from 1993 to 2003,
BETA : Total scores of beta analysis measures divided by total weights from 1993 to 2003,
*See model I and II for definitions of other variables.

not to evaluate the achievement of each enterprise relatively, but to evaluate the improvement of them absolutely based on past achievements (Korean Society of Public Enterprise 2003, p. 43). Table 1 also indicates that there exists a large difference between TAR1 and GRADE (0.99, 0.91 respectively). Especially, the fact that TAR1 is close to the full score implies the target is determined by the level which is easily achievable. The average value of ROA is 0.4 percent. The standard deviation of ROA is high because the profitability of public enterprises is largely affected by external contingent factors.

Table 2 provides the matrix of correlations between LAG and explanatory variables. LAG, LEAD at t are highly correlated with LAG, LEAD at t-1 (ρ = 0.66 and ρ = 0.69, p = 0.0001). ORG, EMP, PER, FIN, R&D and PRO are highly positively correlated with LEAD at t (ρ = 0.60, ρ = 0.70, ρ = 0.54, ρ = 60, ρ = 0.52, ρ = 0.88[11], p = 0.0001). The specific management measures are highly correlated each other (ORG-EMP: ρ = 0.39, ORG-PER: ρ = 0.44, ORG-R&D:

Table 2: Correlation Coefficient Matrix Focusing on Explanatory Variables in Model I and II

	$LAG_{i,t}$	$LAG_{i,t-1}$	$LEAD_{i,t}$	$LEAD_{i,t-1}$	$ORG_{i,t}$	$EMP_{i,t}$	$PER_{i,t}$	$FIN_{i,t}$	$R\&D_{i,t}$	$PRO_{i,t}$
$LAG_{i,t}$	1	0.6730 (<.0001)***	0.5290 (<.0001)***	0.4497 (<.0001)***	0.3166 (0..0001)***	0.2104 (0.0116)***	0.2364 (0.0045)***	0.3329 (<.0001)***	0.2554 (0.0021)***	0.5068 (<.0001)***
$LAG_{i,t-1}$	0.6637 (<.0001)***	1	0.4383 (<.0001)***	0.5054 (<.0001)***	0.2448 (0.0032)***	0.1892 (0.0236)**	0.0836 (0.3206)	0.2499 (0.0026)***	0.2586 (0.0018)***	0.4478 (<.0001)***
$LEAD_{i,t}$	0.5121 (<.0001)***	0.4371 (<.0001)***	1	0.7052 (<.0001)***	0.5211 (<.0001)***	0.6459 (<.0001)***	0.4290 (<.0001)***	0.6179 (<.0001)***	0.4189 (<.0001)***	0.8803 (<.0001)***
$LEAD_{i,t-1}$	0.4800 (<.0001)***	0.4839 (<.0001)***	0.6928 (<.0001)***	1	0.4082 (<.0001)***	0.4596 (<.0001)***	0.3581 (<.0001)***	0.3236 (<.0001)***	0.4467 (<.0001)***	0.6415 (<.0001)***
$ORG_{i,t}$	0.3746 (<.0001)***	0.2705 (0.0011)***	0.5970 (<.0001)***	0.4479 (<.0001)***	1	0.3288 (<.0001)***	0.4012 (<.0001)***	0.1776 (0.0338)**	0.2513 (0.0025)***	0.4330 (<.0001)***
$EMP_{i,t}$	0.2243 (0.0071)***	0.2222 (0.0076)***	0.6992 (<.0001)***	0.4661 (<.0001)***	0.3901 (<.0001)***	1	0.2199 (0.0083)***	0.3523 (<.0001)***	0.1042 (0.2155)	0.3965 (<.0001)***
$PER_{i,t}$	0.2833 (0.0006)***	0.1672 (0.0459)***	0.5377 (<.0001)***	0.4527 (<.0001)***	0.4443 (<.0001)***	0.3081 (0.0002)***	1	0.1644 (0.0497)***	0.3839 (<.0001)***	0.3328 (<.0001)***
$FIN_{i,t}$	0.3334 (<.0001)***	0.3138 (0.0001)***	0.6049 (<.0001)***	0.3205 (<.0001)***	0.1939 (0.0203)**	0.3852 (<.0001)***	0.1789 (0.0325)**	1	0.1154 (0.1698)	0.3449 (<.0001)***
$R\&D_{i,t}$	0.2374 (0.0043)***	0.2216 (0.0078)***	0.5163 (<.0001)***	0.5013 (<.0001)***	0.3239 (<.0001)***	0.1605 (0.0554)*	0.4207 (<.0001)***	0.1117 (0.184)	1	0.4864 (<.0001)***
$PRO_{i,t}$	0.5035 (<.0001)***	0.4240 (<.0001)***	0.8786 (<.0001)***	0.6302 (<.0001)***	0.4958 (<.0001)***	0.4278 (<.0001)***	0.4156 (<.0001)***	0.3077 (0.0002)***	0.5685 (<.0001)***	1

1. See model I and II for definitions of variables.
2. Spearman coefficients in the upper triangle; Pearson coefficients in the lower triangle.
3. p-value in parentheses.
4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).

ρ = 0.32, ORG-PRO: ρ = 0.5, EMP-FIN: ρ = 0.39, EMP-PRO: ρ = 0.43, PER-R&D: ρ = 0.42, PER-PRO: ρ = 0.42, R&D-PRO: ρ = 0.57, p = 0.0001). Interestingly, LEAD at t is correlated with LEAD at t-3 higher than LEAD at t-2.(ρ = 0.64, ρ = 0.61, p = 0.0001). This is contrary to the general fact that correlations are attenuated as time goes by. Table 3 presents the matrix of correlations between LAG and control variables. LAG at t is positively correlated with RGRA (ρ = 0.28, p = 0.0006) but highly negatively correlated with RTAR1 (ρ = -0.43, p = 0.0001). Considering that TAR1 (0.99) is 0.08 point higher than GRA (0.91), this result is contrary to expectations. NUM is negatively correlated with LAG and LEAD (ρ = -0.21, p = 0.014). ROA is not significantly correlated with LAG, but correlated with LEAD (ρ = 0.11, ρ = 0.27 respectively). The magnitude is not so high. Finally, SIZE is not correlated with LAG, but correlated with LEAD (ρ = 0.34, p = 0.0001).

The Relation between Goal Achievement Measures and Management Measures

Table 4 presents OLS estimates of the relation between goal achievement measures and management measures by extending time period from t to t-3. The overall regressions are significant (F = 8.28, p = 0.0001, F = 8.08, p = 0.0001, F = 7.79, p = 0.0001, F = 7.50, p = 0.0001) with adjusted R^2 from 0.609 to 0.615. Panel A of table 4 indicates that LEAD at t are positively associated with LAG at t. However, this must be interpreted with caution because LAG is also associated with LEAD currently when we put it in as an independent variable.[12] Panels B, C, and D of table 4 suggest that LEAD from t-1 to t-3 are not significantly associated with LAG at t. In addition, the coefficients of these variables are negative. Even though these coefficients are not significant, a negative sign is contrary to our expectation. The insignificant relationship between the LEAD from t-1 to t-3 and LAG at t indicates that acquiring high previous LEAD does not guarantees the high LAG prospectively.

Regarding the control variables in the model I, the coefficients of SIZE are positive and significant. This indicates that the LAG is higher as the size of enterprises is larger controlling other variables. Interestingly, RTAR1, RTAR2 and RTRE are significantly and negatively associated with LAG at t. Specially, Table 4 indicates that the absolute magnitude of RTAR1 (-0.16) is about 0.1 point larger than RGRA, RTAR2 and RTRE. This result is contrary to the expectation that the more RTAR1 leads the higher LAG because the TAR1 is very high (0.989). Considering the correlation coefficient of RTAR1 and LAG at t (-0.43, table 3), result implies that the less LAG leads the higher RTAR1. NUM are positively associated with LAG at t. However, the magnitude is small and not significant in Panels B, C, and D. This indicates that the number of goal achievement measures does not affect LAG at t.

Table 3: Correlation Coefficient Matrix Focusing on Control Variables in Model I and II

	$LAG_{i,t}$	$LEAD_{i,t}$	$NUM_{i,t}$	$ROA_{i,t}$	$SIZE_{i,t}$	$RGRA_{i,t}$	$RTAR1_{i,t}$	$RTAR2_{i,t}$	$RTRE_{i,t}$	$RBET$
$LAG_{i,t}$	1	0.5290 (<.0001)***	-0.2298 (0.0058)***	0.0878 (0.297)	0.1321 (0.1156)	0.2950 (0.0003)***	-0.2726 (<.0001)***	0.1818 (0.0297)**	-0.2437 (0.0034)***	0.0868 (0.3024)
$LEAD_{i,t}$	0.5121 (<.0001)***	1	-0.2559 (0.002)***	0.2490 (0.0027)***	0.4000 (<.0001)***	0.2040 (0.0145)**	-0.2257 (0.0067)***	0.2640 (0.0014)***	-0.2342 (0.0049)***	0.0231 (0.7834)
$NUM_{i,t}$	-0.2058 (0.0136)**	-0.2050 (0.014)**	1	0.0399 (0.6361)	-0.0401 (0.6344)	-0.0808 (0.3371)	-0.0022 (0.9791)	-0.1035 (0.2185)	0.0305 (0.7175)	0.0849 (0.3129)
$ROA_{i,t}$	0.1101 (0.1904)	0.2653 (0.0014)***	0.1329 (0.1134)	1	0.1202 (0.1527)	0.1366 (0.1036)	-0.1326 (0.1143)	0.1718 (0.0401)**	0.2037 (0.0147)**	0.0918 (0.2755)
$SIZE_{i,t}$	0.0545 (0.5177)	0.3385 (<.0001)***	0.0729 (0.3865)	-0.0044 (0.9577)	1	-0.1481 (0.0775)*	-0.0801 (0.3416)	0.2192 (0.0085)***	-0.0544 (0.518)	0.0795 (0.3451)
$RGRA_{i,t}$	0.2826 (0.0006)***	0.1838 (0.0279)**	-0.0513 (0.5423)	0.1582 (0.0591)*	-0.1375 (0.1015)	1	-0.4818 (<.0001)***	0.1207 (0.1507)	-0.6639 (<.0001)***	0.2433 (0.0034)***
$RTAR1_{i,t}$	-0.4271 (<.0001)***	-0.2238 (0.0072)***	0.0813 (0.3340)	-0.0526 (0.5327)	-0.0241 (0.7748)	-0.3787 (<.0001)***	1	-0.3737 (<.0001)***	0.3602 (<.0001)***	-0.2973 (0.0003)***
$RTAR2_{i,t}$	0.1955 (0.0192)**	0.2565 (0.002)***	-0.0742 (0.3782)	-0.0216 (0.7978)	0.2137 (0.0104)***	0.1174 (0.1624)	-0.2973 (0.0003)***	1	-0.5260 (<.0001)***	0.1115 (0.1849)
$RTRE_{i,t}$	-0.1711 (0.0409)**	-0.2009 (0.0161)**	-0.0007 (0.9934)	-0.1127 (0.18)	-0.0473 (0.5743)	-0.5999 (<.0001)***	0.0813 (0.3343)	-0.5962 (<.0001)***	1	-0.4801 (<.0001)***
$RBET_{i,t}$	0.1209 (0.1502)	0.0363 (0.6661)	0.0848 (0.3139)	0.1087 (0.1959)	-0.0094 (0.9104)	0.1876 (0.0248)**	-0.2008 (0.0162)**	-0.0302 (0.7202)	-0.52761 (<.0001)***	1

1. See model I and II for definitions of variables.
2. Spearman coefficients in the upper triangle; Pearson coefficients in the lower triangle.
3. p-value in parentheses.
4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).

Table 4: Regression Results for the Relation between Goal Achievement Measures and Management Measures

Variable	Expected Sign	Panel A	Panel B	Panel C	Panel D
$LAG_{i,t-1}$	(+)	0.3319 (4.31)***	0.3425 (4.42)***	0.3410 (4.38)***	0.3444 (4.36)**
$LEAD_{i,t}$	(+)	0.1993 (2.24)*	0.2237 (2.44)**	0.2232 (2.43)**	0.2249 (2.43)**
$LEAD_{i,t-1}$	(+)	-	-0.0961 (-1.12)	-0.0858 (-0.97)	-0.0885 (-0.99)
$LEAD_{i,t-2}$	(+)	-	-	-0.0429 (-0.51)	-0.0390 (-0.45)
$LEAD_{i,t-3}$	(+)	-	-	-	-0.0260 (-0.32)
$NUM_{i,t}$	(?)	0.0011 (1.70)*	0.0011 (1.60)	0.0011 (1.61)	0.0011 (1.62)
$ROA_{i,t}$	(+)	0.0059 (0.26)	0.0060 (0.26)	0.0055 (0.24)	0.0046 (0.20)
$SIZE_{i,t}$	(+)	0.0117 (2.95)***	0.0117 (2.95)***	0.0118 (2.96)***	0.0117 (2.94)***
$RGRA_{i,t}$	(-)	-0.0410 (-1.31)	-0.0424 (-1.35)	-0.0411 (-1.30)	-0.0402 (-1.26)
$RTAR1_{i,t}$	(+)	-0.1548 (-5.00)***	-0.1574 (-5.08)***	-0.1605 (-5.06)***	-0.1583 (-4.86)***
$RTAR2_{i,t}$	(?)	-0.0567 (-2.04)**	-0.0576 (-2.07)**	-0.0567 (-2.03)**	-0.0551 (-1.93)*
$RTRE_{i,t}$	(?)	-0.0459 (-2.05)**	-0.0470 (-2.10)**	-0.0459 (-2.04)**	-0.0452 (-1.99)**
F-Value		8.28	8.08	7.79	7.50
Adj R-Sq		0.6138	0.6146	0.612	0.6088

$$LAG_{i,t} = \alpha_0 + \beta_1 \cdot LAG_{i,t-1} + \beta_2 \cdot LEAD_{i,t\sim t-3} + \beta_3 \cdot NUM_{i,t} + \beta_4 \cdot ROA_{i,t} + \beta_5 \cdot SIZE_{i,t} + \beta_6 \cdot RGRA_{i,t} + \beta_7 \cdot RTAR1_{i,t} + \beta_8 \cdot RTAR2_{i,t} + \beta_9 \cdot RTRE_{i,t} + \sum_{i=1}^{12} \beta_i \cdot FIRM_i + \sum_{t=1}^{10} \beta_t \cdot YEAR_t + \varepsilon_{i,t}$$

1. See model I for definitions of variables.
2. t-statistics in parentheses.
3. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).
4. Parameter estimates of firm and year specific dummy variables are not reported.

In summary, the overall results suggest that management measures are not associated with goal achievement measures prospectively. The results also suggest the size of enterprises and RTAR1 is significantly associated with LAG at t. This finding leads us to another question about the performance measurement system. So we extend the analysis of the effect of the size of enterprises, the number of measures, the structure of the evaluation methods to other dependent variables (quantitative measures and qualitative measures) in sensitivity analysis.

The Relation between Goal Achievement Measures and Specific Management Measures

Table 5 presents the result of the model II. Model II investigates the relation between goal achievement measures and specific management measures by extending time period from t-t-3. The overall regressions are still significant with adjusted R^2 from 0.612 to 0.630.

Panel A of Table 5 presents that ORG, EMP, PER, FIN, R&D and PRO at t are not associated with LAG at t. This is contrary to the fact that LEAD at t is significantly correlated with LAG at t. This is because categorizing the LEAD variables into the specific variables diminishes the variance of each variable. Panel B of table 5 indicates some interesting results. The coefficients of EMP, R&D at t-1 are negative and significant. These results are consistent with the negative sign of LEAD variable at t-1. Another interpretation can be given for these intriguing coefficients.[13] There are no significant variables in Panels C and D in Table 5. The insignificant relationship between the ORG, EMP, PER, FIN, R&D, PRO scores from t to t-3 and LAG scores at t indicates consistent results with the previous analysis in model I.

The coefficients of control variables in the regression of model II is similar to those of model I. NUM is not significantly associated with dependent variable at any panel of model II. In summary, consistent with the results of model I, the specific management measures are not significantly associated with the goal achievement measures currently or prospectively.

The Interpretation of Results

Considering the results of model I and model II, we can infer that the high performance of management sector is not linked to the high performance of the goal achievement sector currently or prospectively. These results fail to come up to the expectations of system designers. However, the reason for the results of the analysis can be interpreted in various ways.

Table 5: Regression Results for the Relation between Goal Achievement Measures and Specific Management Measures

Variable	Expected Sign	Panel A	Panel B	Panel C	Panel D
$LAG_{i,t-1}$	(+)	0.3269 (4.17)***	0.3256 (4.18)***	0.3176 (3.97)***	0.3371 (3.89)***
$ORG_{i,t}$	(+)	0.0587 (1.16)	0.0583 (1.11)	0.0862 (1.55)	0.0952 (1.64)
$ORG_{i,t-1}$	(+)	-	0.0662 (1.43)	0.0749 (1.53)	0.0852 (1.65)*
$ORG_{i,t-2}$	(+)	-	-	0.0632 (1.39)	0.0608 (1.29)
$ORG_{i,t-3}$	(+)	-	-	-	0.0222 (0.51)
$EMP_{i,t}$	(+)	-0.0041 (-0.10)	0.0062 (0.15)	0.0017 (0.04)	0.0207 (0.44)
$EMP_{i,t-1}$	(+)	-	-0.0825 (-2.20)**	-0.0664 (-1.67)*	-0.0634 (-1.55)
$EMP_{i,t-2}$	(+)	-	-	-0.0110 (-0.29)	-0.0121 (-0.31)
$EMP_{i,t-3}$	(+)	-	-	-	0.0398 (1.04)
$PER_{i,t}$	(+)	0.0659 (1.30)	0.0924 (1.74)*	0.0760 (1.38)	0.0764 (1.33)
$PER_{i,t-1}$	(+)	-	0.0023 (0.05)	0.0027 (0.05)	-0.0001 (0.00)
$PER_{i,t-2}$	(+)	-	-	-0.0384 (-0.83)	-0.0389 (-0.79)
$PER_{i,t-3}$	(+)	-	-	-	0.0003 (0.01)
$FIN_{i,t}$	(+)	0.0603 (1.56)	0.0824 (2.02)**	0.0799 (1.90)*	0.0760 (1.71)*
$FIN_{i,t-1}$	(+)	-	-0.0425 (-1.09)	-0.0303 (-0.73)	-0.0219 (-0.49)
$FIN_{i,t-2}$	(+)	-	-	-0.0253 (-0.64)	-0.0236 (-0.58)
$FIN_{i,t-3}$	(+)	-	-	-	-0.0462 (-1.33)
$R\&D_{i,t}$	(+)	-0.0378 (-0.63)	-0.0257 (-0.41)	-0.0329 (-0.52)	-0.0276 (-0.42)
$R\&D_{i,t-1}$	(+)	-	-0.1109 (-1.82)*	-0.1057 (-1.59)	-0.1027 (-1.49)

(*Cont'd*)

Table 5 (Cont'd)

$R\&D_{i,t-2}$	(+)	-	-	0.0760 (-1.28)	0.0909 (-1.37)
$R\&D_{i,t-3}$	(+)	-	-	-	-0.0091 (-0.15)
$PRO_{i,t}$	(+)	0.0910 (1.35)	0.0643 (0.95)	0.0568 (0.82)	0.0572 (0.81)
$PRO_{i,t-1}$	(+)	-	0.0053 (0.08)	0.0050 (0.07)	0.0026 (0.04)
$PRO_{i,t-2}$	(+)	-	-	-0.0844 (-1.31)	-0.0921 (-1.39)
$PRO_{i,t-3}$	(+)	-	-	-	-0.0081 (-0.13)
$NUM_{i,t}$	(?)	0.0008 (1.13)	0.0005 (0.69)	0.0007 (0.92)	0.0007 (0.88)
$ROA_{i,t}$	(+)	0.0046 (0.20)	-0.0088 (-0.38)	-0.0079 (-0.33)	-0.0129 (-0.52)
$SIZE_{i,t}$	(+)	0.0114 (2.83)***	0.0106 (2.60)***	0.0102 (2.39)**	0.0096 (2.20)**
$RGRA_{i,t}$	(-)	-0.0345 (-1.05)	-0.0591 (-1.78)*	-0.0600 (-1.71)*	-0.0547 (-1.49)
$RTAR1_{i,t}$	(+)	-0.1551 (-4.76)***	-0.1690 (-5.18)***	-0.1645 (-4.68)***	-0.1603 (-4.25)***
$RTAR2_{i,t}$	(?)	-0.0471 (-1.63)	-0.0513 (-1.80)*	-0.0589 (-2.01)**	-0.0600 (-1.96)**
$RTRE_{i,t}$	(?)	-0.0447 (-1.90)*	-0.0566 (-2.41)**	-0.0606 (-2.51)**	-0.0594 (-2.37)**
F-Value		7.23	6.76	5.92	5.20
Adj R-Sq		0.6124	0.6301	0.6247	0.6148

$$LAG_{i,t} = \alpha_0 + \beta_1 \cdot LAG_{i,t-1} + \beta_2 \cdot ORG_{i,t\sim t-3} + \beta_3 \cdot EMP_{i,t\sim t-3} + \beta_4 \cdot PER_{i,t\sim t-3} + \beta_5 \cdot FIN_{i,t\sim t-3} + \beta_6 \cdot R\&D_{i,t\sim t-3} + \beta_7 \cdot PRO_{i,t\sim t-3} + \beta_8 \cdot NUM_{i,t} + \beta_9 \cdot ROA_{i,t} + \beta_{10} \cdot SIZE_{i,t} + \beta_{11} \cdot RGRA_{i,t} + \beta_{12} \cdot RTAR1_{i,t} + \beta_{13} \cdot RTAR2_{i,t} + \beta_{14} \cdot RTRE_{i,t} + \sum_{i=1}^{12} \beta_i \cdot FIRM_i + \sum_{t=1}^{10} \beta_t \cdot YEAR_t + \varepsilon_{i,t}$$

1. See model I for definitions of variables.
2. t-statistics in parentheses.
3. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).
4. Parameter estimates of firm and year specific dummy variables are not reported.

The Lack of the Alliance between Strategy and Performance Measures

Kaplan and Norton stated,

> "The objectives and the measures for the Balanced Scorecard are more than just a somewhat ad hoc collection of financial and nonfinancial performance measures. They are derived from a top-down process driven by the mission and strategy of the business unit. The Balanced Scorecard should translate a business unit's mission and strategy into tangible objectives and measures." (Kaplan and Norton 1996, p. 9-10).

The linkage of the strategy and performance measures must be considered most importantly when applying strategic performance measurement system to public sector. Based on this strategic alliance, firm's strategy can be described by cause-and-effect chains. However, generally nonprofits have considerable difficulty in clearly defining their strategy. Nonprofits are built around their mission, which is hardly measurable, and they serve a multitude of constituencies whose goals and needs may be quite heterogeneous (Speckbacher 2003). In Kwon and Kim (1998), Korean public enterprises fail to position the mission and competitive strategy effectively. Actually, the system has not been implemented as strategic performance measurement system. Raters and ratees have focused on just the target of each year not on the long-term strategy of each enterprise. They have used the system as a short-term planning and monitoring tool by just considering each year's circumstance and not the long-term strategy.

In addition, it needs to be remembered that the performance measures in management sector are applied to all the enterprises identically. Despite the fact that the strategy and the contingent factors of each enterprise are different (Kwon and Kim 1998), applying an identical system to all the enterprises can deter strategic resource allocation. Attempting to be everything for everyone virtually guarantees organizational ineffectiveness (Kaplan 2001).

Finally, when categorizing the evaluation measures into BSC perspectives, the measures of customer and learning and growth perspectives are relatively rare than those of internal process measures (Kwon and Kim 1997; Na 2003).[14] The imbalance of measures is due to the attempts to focus on the enhancement of the efficiency of the public enterprises. However, the management environment of public entities has changed rapidly and they need to pursue not only public benefit but also profitability. So a new prospect from the customer and learning and growth perspectives is required. The excessive emphasis on the internal process perspective can lead to the enterprises not focusing on output or outcome but program execution or initiatives (Kaplan 2001).

Measurement Errors

There needs to be a focus on the expansion of qualitative evaluation as the performance measurement system settles down.[15] There are good reasons why qualitative measures have been and will continue to be employed. One is that they are cost effective because such performance data can be collected through questionnaire or interview surveys that simultaneously elicit information on practices. The more fundamental reason, however, is that for certain types of organization and levels of analysis there may be no viable alternative (Wall et al. 2004). In the case of the public company, the latter one is the primary reason. From the data of this study, we also find that qualitative measures have tended to focus on overall performance of each sector (ORG, EMP, PER, FIN, R&D and PRO), whereas quantitative measures have consisted of more specific indicators.

However, as subjective measures are used widely, the issue of measurement error is also proposed continuously (Bommer et al. 1995; Wall et al. 2004). Generally, there are two types of error concerning qualitative measures. First, if qualitative performance measures contain random error, as a result of remembering figures incorrectly, guessing, or confusing the accounting period of interest with an earlier or later one, then the effect will be to attenuate any real underlying relationship with associated variables of interest [Type II error]. More troublesome is the possibility of systematic bias creating relationships between practices and performance that do not really exist [Type I error] (Wall et al. 2004). The possibility of these kinds of measurement error also remains in the data of this study. Especially, the fact that the information which is used when raters evaluate performance is obtained from the ratees enhances the possibility of a type II error.

Quantitative measures also cannot be free from the measurement error issue. Many prior studies already pointed out the problems of traditional financial measures (ex. ROI). Problems with managing for short-term financial objectives arise because operating managers learn that there is a variety of ways to meet profit and ROI goals. Profits and ROI targets could still be achieved by working a little harder in the finance office: exploiting accounting conventions, engaging in financial entrepreneurship, and reducing discretionary expenditures (Johnson and Kaplan 1987, p. 196-197). However, this study focuses not on the private sector but on the public sector, so financial measures like ROI need not to be considered seriously. Nevertheless, there still exists the possibility of intentional intervention of raters and ratees to quantitative measures. For example, the fact that the average score of actual to target measures are very close to the full score implies the target is set by the level which is easily achievable. In addition, the fact that as RTAR1 is negatively related with LAG means the contingent factors affect the choice of evaluation method.[16] Trend measures can motivate the ratees to manage the

ideal number. In other words, if the performance of the specific year is bad, the ratees can make the performance even worse for the purpose of acquiring the Big Bath effect (Chu 1993; Jang and Lee 1997). The point that there exists no clear criterion of weights allocation also can be the reason of occurrence of measurement error.

As a result, when measurement errors come into being, performance measures are may not reflect the original performance. Therefore, the relationship between performance measures can be attenuated or even worse.

The Endogeneity Issue

Endogeneity is the major econometric issue in the areas of empirical accounting research (Ittner and Larcker 2001). Endogeneity is caused whenever a predictor is also a choice variable that is correlated with the random error in the structural model. In this study, we control the number of measures in the dependent variable (the structure of evaluation methods using RGRA, RTAR1, RTAR2, RTRE, the size of the enterprises, ROA, firm and year specific factors), the endogeneity issue still remains. Specially, because the management of public enterprises is strongly affected by government policy and many of them are in monopoly industries, there have been few studies to investigate the contingent factor which can affect their performance.[17] Further research studying the factors which affect the decision of performance measures and the result are required in the public sector.

Sensitivity Analysis

The Relation between Qualitative Measures and Quantitative Measures

Prior research that has studied the relation between performance measures in public enterprises categorized the measures into quantitative and qualitative measures and tested whether the high performance of qualitative measures is related to the high performance of quantitative measures currently or prospectively (Chu 1993; Na 2001). This categorization is based on that lagging measures mostly consist of the quantitative measures compared to that leading measures mostly consist of the qualitative measures.

However, Table 1 indicates that 36 percent of goal achievement measures are qualitative measures. What is more, in management measures, the finance and budgeting management sector and the internal process management sector mainly consist of quantitative measures. Therefore, this type of categorization (qualitative vs. quantitative) can deter reflecting the intention of performance measurement system's designers.[18] Nevertheless, we present the result of the relation between quantitative measures and qualitative measures. The model used in sensitivity analysis is as follows.

$$QUAN_{i,t} = \alpha_0 + \beta_1 \cdot QUAN_{i,t-1} + \beta_2 \cdot QUAL_{i,t\sim t-3} + \beta_3 \cdot QUANNUM_{i,t} + \beta_4 \cdot ROA_{i,t} + \beta_5 \cdot SIZE_{i,t} + \beta_6 \cdot QRTAR1_{i,t} + \beta_7 \cdot QRTAR2_{i,t} + \beta_8 \cdot QRTRE_{i,t} + \sum_{i=1}^{12} \beta_i \cdot FIRM_i + \sum_{t=1}^{10} \beta_t \cdot YEAR_t + \varepsilon_{i,t} \quad \text{(M3)}$$

where:

i	:	1,...,13 represents the individual public enterprises,
t	:	1,...11 represents the years in our sample period,
$QUAN_{1,t\sim t-1}$	:	Total scores of quantitative measures divided by total weights of quantitative measures of firm i in year t, t-1,
$QUAL_{i,t\sim t-3}$	:	Total scores of qualitative measures divided by total weights of qualitative measures of firm i in year t, t-1, t-2, t-3,
$QUANNUM_{i,t}$	:	The number of quantitative measures of firm i in year t,
$QRTAR1_{i,t}$	:	Total weights of actual to target measures divided by total weights of quantitative measures of firm i in year t,
$QRTAR2_{i,t}$	:	Total weights of targeting measures divided by total weights of quantitative measures of firm i in year t,
$QTRE_{i,t}$	:	Total weights of trend measures divided by total weights of quantitative measures of firm i in year t,

*See model I for definition of other variables.

Table 6 provides OLS estimates of the relation between qualitative measures and quantitative measures by extending time period from t to t-3. The Panel A of table 6 suggests that QUAL at t is not associated with QUAN at t. SIZE and QRTAR1 are still significantly associated with dependent variable (positively and negatively). But the magnitude of QRTAR1 is relatively small compared to RTAR1. QRTAR2 and QRTRE are not significantly associated with QUAN. This implies the less LAG leads the higher QRTAR1. QUANNUM, ROA are not related with QUAN at t. The Panels B, C and D of table 6 indicate that QUAL from t-1 to t-3 are not significantly associated with QUAN at t.

In summary, the overall results suggest that qualitative measures are not significantly associated with the quantitative measures currently or prospectively. These results are consistent with prior studies (Chu 1993; Na 2003).

Further Investigation of the Control Variables

Table 4 and 5 indicates that SIZE is significantly associated with dependent variable (LAG). Table 6 also shows that SIZE is significantly associated with QUAN. To investigate the effect of these variables to QUAL, the following model is additionally tested.[19]

$$QUAL_{i,t} = \alpha_0 + \beta_1 \cdot QUAL_{i,t-1} + \beta_2 \cdot QUAN_{i,t} + \beta_3 \cdot QUALNUM_{i,t} + \beta_4 \cdot ROA_{i,t} + \beta_5 \cdot SIZE_{i,t} + \sum_{i=1}^{12} \beta_i \cdot FIRM_i + \sum_{t=1}^{10} \beta_t \cdot YEAR_t + \varepsilon_{i,t} \quad \text{(M4)}$$

where:

$QUALNUM_{i,t}$: The number of qualitative measures of firm i in year t,
*See model I for definition of other variables.

Table 6: Regression Results for the Relation between Qualitative Measures and Quantitative Measures

Variable	Expected Sign	Panel A	Panel B	Panel C	Panel D
$QUAN_{i,t-1}$	(+)	0.2720 (3.05)***	0.2742 (3.04)***	0.2752 (3.04)***	0.2690 (2.94)***
$QUAL_{i,t}$	(+)	0.1398 (1.03)	0.1539 (1.01)	0.1628 (1.05)	0.1547 (0.99)
$QUAL_{i,t-1}$	(+)	-	-0.0302 (-0.21)	-0.0545 (-0.34)	-0.0330 (-0.20)
$QUAL_{i,t-2}$	(+)	-	-	0.0459 (0.32)	0.0020 (0.01)
$QUAL_{i,t-3}$	(+)	-	-	-	0.0849 (0.64)
$QUANNUM_{i,t,}$	(?)	0.0013 (1.54)	0.0013 (1.52)	0.0013 (1.48)	0.0012 (1.42)
$ROA_{i,t}$	(+)	0.0405 (1.36)	0.0405 (1.35)	0.0420 (1.38)	0.0415 (1.36)
$SIZE_{i,t}$	(+)	0.0107 (2.08)**	0.0107 (2.07)**	0.0107 (2.07)**	0.0106 (2.04)**
$QRTAR1_{i,t}$	(+)	-0.0564 (-1.84)*	-0.0565 (-1.84)*	-0.0538 (-1.68)*	-0.0570 (-1.76)*
$QRTAR2_{i,t}$	(?)	-0.0285 (-1.03)	-0.0285 (-1.02)	-0.0288 (-1.03)	-0.0317 (-1.11)
$QRTRE_{i,t}$	(?)	-0.0228 (-0.96)	-0.0229 (-0.96)	-0.0233 (-0.97)	-0.0242 (-1.00)
F-Value		9.63	9.24	8.88	8.58
Adj R-Sq		0.6457	0.6426	0.6397	0.6378

$$QUAN_{i,t} = \alpha_0 + \beta_1 \cdot QUAN_{i,t-1} + \beta_2 \cdot QUAL_{i,t\sim t-3} + \beta_3 \cdot QUANNUM_{i,t} + \beta_4 \cdot ROA_{i,t} + \beta_5 \cdot SIZE_{i,t} + \beta_6 \cdot QRTAR1_{i,t} + \beta_7 \cdot QRTAR2_{i,t} + \beta_8 \cdot QRTRE_{i,t} + \sum_{i=1}^{12} \beta_i \cdot FIRM_i + \sum_{t=1}^{10} \beta_t \cdot YEAR_t + \varepsilon_{i,t}$$

1. See model III for definitions of variables.
2. t-statistics in parentheses.
3. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).
4. Parameter estimates of firm and year specific dummy variables are not reported.

SIZE variable is consistently associated with dependent variable in model I, model II and model III. Table 7 shows that SIZE is not significantly related with QUAL after controlling other variables. This indicates that the size of enterprises does not affect the score of qualitative measures. Considering that the score of qualitative measures is more affected by rater's subjectivity than quantitative measures, we can infer that performance evaluation is robust to the size of enterprises.

NUM and QUANNUM are not significantly correlated with each dependent variable. In contrary, Table 7 shows that QUALNUM is positively significantly related with QUAL. This indicates that performance of qualitative measures is affected by the number of measures. Both raters and ratees can be affected by the number of measures. However, the fact that QUANNUM is not significant but QUALNUM suggests the possibility that raters rather than ratees are more affected by the number of measures.

Table 7: Regression Results for the Qualitative Measures as Dependent Variable

Variables	Expected Sign	Estimate
$QUAL_{i,t-1}$	(+)	0.4339 (5.43)***
$QUAN_{i,t}$	(+)	0.0774 (1.38)
$QUALNUM_{i,t}$	(?)	0.0016 (1.82)*
$ROA_{i,t}$	(+)	0.0203 (1.08)
$SIZE_{i,t}$	(+)	-0.0033 (-1.01)
F-Value		23.24
Adj R-Sq		0.8087

$$QUAL_{i,t} = \alpha_0 + \beta_1 \cdot QUAL_{i,t-1} + \beta_2 \cdot QUAN_{i,t} + \beta_3 \cdot QUALNUM_{i,t} + \beta_4 \cdot ROA_{i,t} + \beta_5 \cdot SIZE_{i,t} + \sum_{i=1}^{12} \beta_i \cdot FIRM_i + \sum_{t=1}^{10} \beta_t \cdot YEAR_t + \varepsilon_{i,t}$$

1. See model IV for definitions of variables.
2. t-statistics in parentheses.
3. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed test).
4. Parameter estimates of firm and year specific dummy variables are not reported.

One of the continuing questions about performance measurement systems is why they do not fully reflect the different characteristics of each enterprise. To analyze this criticism, prior studies tested whether difference in firm characteristics affects evaluation results or not (Kwon and Yoon 1999). This study investigated whether the characteristics of industry affect the relation between the performance measures by dividing industry into service and manufacturing area.[20] Each result is consistent with the main test and there is no significant difference between them (Not reported).

In the early times of the performance evaluation (Y1984), the weights of quantitative measures were 60 to 70, those of qualitative measures were 30 to 40. In contrast, in the present (Y2002), the weights of quantitative measures are 37 to 39, those of qualitative measures are 61 to 63 (Korean Society of Public Enterprise 2003, p. 123-131). In addition, they have emphasized the importance of the linkage between strategy and performance measures recently. Therefore, we divided the sample into two periods (Y1990-Y1997 and Y1998-Y2003) and applied the same models. Each result is consistent with the main test and there is no significant difference between them (Not reported).

Conclusion

The purpose of this study is to investigate the relation between performance measures, by analyzing data from 13 Korean public enterprises. The empirical results indicate that management measures are not significantly associated with goal achievement measures prospectively. Furthermore, specific management measures are not significantly associated with goal achievement measures currently or prospectively. The research also finds that qualitative measures are not significantly related with quantitative measures currently or prospectively. This is consistent with the results of prior studies (Chu 1993; Na 2003).

The structure of the evaluation methods, the number of measures, ROA and the size of enterprise are controlled in this study. Among them, RTAR1, SIZE are significantly associated with LAG (negatively, positively in each). Similarly, QRTAR1, SIZE are related with QUAN (negatively, positively in each). But SIZE is not correlated with QUAL. As to the number of measures, NUM, QUANNUM are not associated with dependent variables while QUALNUM is related with QUAL. Overall results acquired using the fixed effect models, which control firm and year specific dummies, suggest that performance measurement systems have not been implemented effectively and have not fulfilled the system designers' original intention.

There are several limitations to this study. First, the possibility of measurement error remains in the data. Especially, the fact that the information which is used when raters evaluate the performance is obtained from the ratees enhance the possibility of type II errors. In addition, because raters do not belong to the enterprise, it is difficult to expect an in-depth evaluation. Second, even though we control various variables which can affect the dependent variables, the endogeneity issue still remains. Specially, the fact that the management of public enterprises is strongly affected by government policy and many of them are in monopoly industries might impair the robustness of this study.

This study provides fruitful results for testing the effectiveness and the characteristics of performance measurement systems using long-term data. It also suggests a new approach following the structure of an existing performance measurement system. The results of this paper were achieved by applying various models to data from public sector will be useful information set for future research.

Notes

1 The drivers, encompassing customer, internal-business-process and learning and growth perspective, are derived from a translation of the organization's strategy into tangible objectives and measures (Kaplan and Norton 1996, p.18).

2 Management efficiency sector (ex. inventory management) belongs to goal achievement sector in some years and in the management sector for other years. Because the performance measures of this sector reflect the efficiency of finance or internal process, this study classifies those into FIN or PRO.

3 This study includes additional analysis about the relation between quantitative measures and qualitative measures in sensitivity analysis. There is no statistically significant relation between them.

4 Many studies apply the structural equation model and the simultaneous equation model to investigate the relation between independent variables and dependent variables simultaneously (Bryant et al. 2004; Huh and Park., 2004). However, because the endogeneity issue has not been properly studied, this paper prefers not to apply this method. Model specification issue is a realively young area of managerial accounting (Ittner and Larker. 2001).

5 These corporations affect the economy of the private sector directly or indirectly because they are part of the national infrastructure. (Korean Society of Public Enterprise 2003, p. 520).

6 Banker et al. (2000) use Akaike's Information Criterion (AIC) to determine the lag length for nonfinancial measures. However, in order to mitigate the severe multicollinearity problem, they use the moving average of the past six lags of the nonfinancial measures as independent variables. The results of this study suggest that there exists no significant relation between LAG and LEAD. So we report the results of the test from t-3 to t instead of applying AIC. The multicollinearity problem is not a factor as the variance inflation factors are less than 10.

7 Table 1 shows that TAR1(total scores of actual to target measures divided by total weights from 1993 to 2003) is 0.99, while GRADE(total scores of grading measures divided by total weights from 1993 to 2003) is 0.91. TAR1 is very close to the full score. In contrast, GRA shows the lowest score among the evaluation methods.

[8] If we additionally control the RBET (Total weights of beta analysis measures divided by total weights of performance measures in goal achievement sector of firm i in year t), there arise an extreme mullticollinearity problem. So we exclude this variable in the model. Table 1 indicates that RBET is the lowest (0.046) among the evaluation methods.

[9] The scores of some enterprises are higher than other enterprises annually.

[10] When we distinguish management measures into specific sectors, we guess the scores of each sector tend to be highly correlated. However, the results of the regression analyses show no evidence of multicollinearity as the variance inflation factors are less than 10.

[11] PRO is very highly correlated with LEAD (r = 0.88). This is because this sector consists of various measures which do not belong to other sectors.

[12] This result is due to the fact that the grading measures consisting of LAG variable is highly correlated with management measures. When we apply transformed LAG variable which is calculated without the grading measures in the Model, that is not significantly associated with LEAD at t.

[13] This study doesn't focus on the change of the coefficient sign. So if this phenomenon is meaningful, another study is required. One possible interpretation is the smoothing effect induced by raters.

[14] In Na (2003)'s study, he reclassified the performance measures of Seoul City-invested corporations based on BSC perspectives. Result shows the number of internal process perspective measures is 80 percent of all. In contrary, those of customer, learning and growth perspective measures are just 5 percent respectively.

[15] In the early years of performance evaluation (1984), the weights of quantitative measures were 60 to 70, those of qualitative measures are 30 to 40. In contrast, at the present time, the weights of quantitative measures are 37 to 39, those of qualitative measures are 61 to 63 (Korean Society of Public Enterprise 2003, p. 123-131).

[16] Performance evaluation measures have to be applied differently depending on the characteristics of each corporation.

[17] In the private sector, many studies have investigated a variety of information and control system attributes. This set of studies generally supports the theories that the choice of performance measures is a function of the organization's competitive environment, strategy, and organizational design, but the performance effects of these choices remains uncertain (Ittner and Larcker 2001; Said et al. 2003)

[18] In Na (2003)'s research, he reclassified the performance measures based on BSC perspectives. In this study, as we said section II, we follow the structure of the performance measurement system as it is to reflect the intention of designers and implementers.

[19] This analysis also can be performed when the dependent variable is LEAD. However, because management measures are mostly evaluated by using grading method (78.8%), similar results are obtained with the case when the dependent variable is QUAL.

[20] Service enterprises: Korea Electric Power Corporation, Korea Minting and Security Printing Corporation, Korea Coal Corporation, Korea Highway Corporation, Korea National Housing Corporation, Korea Water Resources Corporation, Korea Land Corporation, and Korea Agricultural and Rural Infrastructure Corporation. Manufacturing enterprises: Korea Resources Corporation, Korea National Oil Corporation, Korea Trade-Investment Promotion Agency, and Korea Agro-Fisheries Trade Corporation and Korea Tourism Organization (Korean Ministry of Planning and Budget, 2004).

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