

The Influence of the Government-funded Research Institutes (GRIs) Evaluation System on the Acceptability of Evaluation Results and Performance of the GRIs

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Abstract

This study is a part of the discussion on the development directions of the institutional evaluation system for the performance enhancement of the Government-funded Research Institutes (GRIs) under the National Research Councils(NRCS). It discusses how the GRIs evaluation system influences the degree of acceptability of the evaluation results among the members of the GRIs, and the impact of the evaluation results on the performance of the GRIs.

The results of the analysis in this study showed that the GRIs evaluation system of the NRCS had a significantly positive influence on the acceptability of the evaluation results and the performance of the GRIs. The acceptability of the evaluation results was related to the performance of the GRIs. In specific, the indirect impact via the acceptability was more eminent than the direct impact of the GRIs evaluation system on the performance of GRIs. However, it also showed that the degree of acceptability of the evaluation result was not high due to the overall weakness of the evaluation system and the limitations in the active utilization of the results in government and research council level.

Based on the results of this study, it discusses ways to improve the evaluation system.

Keywords: government-funded research institutes evaluation, acceptability, performance, structural equation model

1. Introduction

Discussions on the validity of evaluations on Government-funded Research Institutes (GRIs) have been conducted since the Korean government established them in 1991. The focus has been on the validity of the evaluations as a political means to maximize the performance of GRIs. Recently, an effort has been made by the government to establish an efficient evaluation system. It is important to increase the level of reliability on the evaluation system and to lead the GRIs to a positive direction by accepting and accommodating the

results (Hwan-Bin Song, 2004). But, every year since 2000, GRIs have been broaching discontent rather than acceptability of the results of institutional evaluations (Min-Hyung Lee, 2001; Byung-Tae Kim, 2004; Jun-Yong Um & Heung-Soon Cho, 2007).

As indicated, the system of research councils in Korea has over 10 years of history and it has renewed the concept of administrating government-funded research institutes through amendment of related laws and transfer of the supervisory office. In particular, the existing National Research Council for Economic and

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Social Sciences, and the National Research Council for Humanities were combined in July 2005 as the National Research Council for Economics, Humanities and Social Sciences (NRCS).

The GRIs evaluation of these research councils is subjected to 23 affiliated research institutes which require substantial financial and human resources. Actually it usually takes more than six months for the preparation of this valuation.

In spite of this effort, the affiliated research institutes' level of satisfaction on the evaluation results is rated as low (Byung-Yong Hwang, 2006). Considering the fact that this low satisfaction prevailed in the institutes with lower evaluation scores than those with higher scores, the low satisfaction is caused either by the imperfect system or the fact that the evaluation result does not assist in the enhancement of the performance of the GRIs. Therefore, there is a need to make progressive improvement on the GRIs evaluation system operated by the council.

On the basis of these critical aspects, the purpose of this study is to propose measures on how to improve the GRIs evaluation system, through the empirical analysis of the influence of the GRIs evaluation system on the acceptability of the members of the institute and the influence of the acceptability on the performance of the research institute

Additionally, the subject of this study was limited to the NRCS. This is due to the abolition of Korea Research Council of Public Science and Technology among three research councils in science and technology and the reorganization of affiliated research institutes. The period of the research was set for three and half years from July 2005 to the present.

2. Theoretical Background

2.1. Status of the GRIs evaluation

Annual GRIs evaluation by NCRC is conducted based on the following policies: a) "Law on the establishment, management and development of GRI" (enacted on Jan. 29, 1999 and amended on May 31, 2005); b) "Enforcement ordinance on the establishment, management and development of GRI"

(enacted on Jan. 29, 1999 and amended on Jun. 30, 2005); and c) "Articles of National Research Council for Economics, Humanities and Social Sciences" (enacted on Jul. 29, 2005). The status of GRIs evaluation centering on the structure and operational procedure is examined as follows.

2.1.1. Objective of evaluation and utilization of the results

In 2006, the NRCS suggested the following four objectives of GRIs evaluation: a) insurance of publicity, accountability and innovation of GRIs; b) promotion of autonomy of GRIs; c) reinforcement of international competitiveness through the promotion of research productivity and management efficiency; and d) promotion of the role as an effective think tank (NRCS, 2006). The objective of these evaluations comprises macroscopic, microscopic, long-term and short-term scopes. For this reason, it is difficult to closely associate the evaluation objective to the guideline for the GRIs because it hinders the achievement of the initial objective through evaluation (Jun-Yong Um & Heung-Soon Cho, 2007).

In GRIs, the evaluation results are utilized as a basis in looking for ways to develop the direction of the institute; however, in the councils, they are utilized as the data from which to base the approval of project plans and budgets, to coordinate the functions of research institutes and to provide long-term development directions. In the Office of the Prime Minister, evaluation results are utilized as the policy data for support, promotion and systematic management of GRIs; and in the Ministry of Planning and Finances, they are utilized for the budgeting of the next fiscal year. However, the problem in the system which results in the failure to achieve initial expected political effect is the way the evaluation plans are established and how the objectives and contents of the evaluation are announced after the completion of the evaluation target period.

2.1.2. Evaluation item and indicator

As shown in Table 1, the evaluation item and indicator are composed of research area and

management area, and it covers broad range of GRIs management in general. It is notable that, against the GRIs evaluation results in 2006, the Evaluation Committee recommended to curb excessive diversification into the specific evaluation indicators, and to promote strategic management of goals with priorities based on the selection and concentration principle (NRCS, 2007b).

Moreover, the evaluation items and indicators with different traits – macroscopic and microscopic, long-term and short-term are all mixed together. Additionally, they are also designed to evaluate and report current states of GRIs without considering any improvement from the previous year. Therefore, the assertion of the Evaluation Committee is persuasive that there might be a chance that the institutes with one-time investment can receive good evaluation result rather than those who have made greater endeavors than the previous year (NSRC, 2007b). Lastly, the evaluation items and indicators are devised by the evaluating entity through collecting opinions to have differentiated sub-items or evaluation weights in consideration of the characteristics of GRIs. However, the differentiation is insufficient to reflect characteristics and types of GRIs. There are also few causal relationships among evaluation indicators, and imbalances between institutional capacity and performance indicators. Moreover, they are determined during or after the evaluation target period, thus causing misunderstanding on the intentions of government's GRIs policies.

Table 1 GRIs Evaluation Item and Indicator

Year	Evaluation Item and Indicator
2005	<ul style="list-style-type: none"> ◎ 13 items, 29 indicators in 3 areas - Research area (Common indicator: 4 items, 9 indicators; Specialized indicator: 4 items, 8 indicators) - Management area (common indicator: 5 items, 12 indicators)
2006	<ul style="list-style-type: none"> ◎ 12 items, 25 indicators in 2 areas - Research performance area (3 items, 6 indicators) - Management area (common indicator: 9 items, 19 indicators)
2007	<ul style="list-style-type: none"> ◎ 12 items, 25 indicators in 2 areas - Research performance area (3 items, 6 indicators) - Management area (common indicator: 9 items, 19 indicators)

Source: NRCS Evaluation Manual (1999-2007)

2.1.3. Evaluation criteria

In GRIs evaluation, the evaluation criteria on each item and indicator are not agreed upon among the government, research council and the GRIs. Moreover, the research performance of each GRI is evaluated in the form of absolute evaluation by considering the evaluation weights according to the research area. However, it is ranked by the scores achieved for each evaluation item. It is also important that it can damage the fairness of the evaluation since the GRIs are very different in terms of external indicators such as the characteristics of the research area, human resources, budget allocation, and history of the institute.

2.1.4. Evaluation participants

In evaluating the GRIs, the relationship between the evaluators and evaluatees is determined by the aforementioned laws and the Articles. According to the law, the Office of the Prime Minister and the research council in charge of supervision and monitoring become the evaluators and the 23 GRIs are evaluatees.

Also, the GRIs evaluation by the research council is conducted by a temporarily organized evaluation board. In the compositional aspect of the evaluation board, there is a need for improvement in the composition that considers expertise, integrity and responsibility. Also it is necessary to provide information on evaluation for the board members before the actual evaluation process.

2.1.5. Evaluation method

The evaluation method should be determined to allow sufficient communication and creation of knowledge among participants throughout the GRIs evaluation system. The GRIs evaluation method involves two stages: stage 1, self-evaluation by GRIs; and stage 2, external evaluation by the government and the research council.

However, GRIs might raise the reliability issue on the difference between the results of first and second evaluations, as well as the efficiency issue caused by the repeated evaluations by different Evaluation

Committee on the same items and contents.

In addition, during the second stage of evaluation, there are not enough times for effective communication and transfer of knowledge through face-to-face contacts between GRIs and the Evaluation Committee. Therefore, it is considered that GRIs should participate more in the evaluation process than now.

2.1.6. Distribution of Incentives

According to the 2006 performance of the research council (NRCS, 2007a), the GRIs evaluation result is utilized in the following areas: a) the establishment of GRIs development directions and planning of research directions; b) graded distribution of annual salaries of GRIs presidents through the determination by the Board (28th Board Meeting, Dec. 21, 2006); c) graded allocation of project budget during the deliberation on 2007 GRIs budget (25th Board Meeting, Sept. 25th, 2006), and strategic allocation of increased research budget (3% of project budget for GRIs) included in the budget for Research Council to institutes with excellent evaluation results.

However, most of GRIs members recognize that the size or distribution methods based on the current GRIs evaluation results are not enough yet to boost morale or confidence of GRIs. Therefore, improvements should be made in the efforts to expand both financial and non-financial incentives and achieve fair distribution of such incentives so that effectiveness of the evaluation system can be achieved and the performance management system can take root. (NRCS, 2007b)

2.2. GRIs evaluation system

GRIs evaluation, which is a different concept from the evaluations on public programs, can be defined as an organization-level performance evaluation on GRIs conducted by the government and the Research Council. Advanced countries such as the U.K. have carried out the evaluation for a long time by forming an external committee by the Research Council. There have been a few previous studies concerning the GRIs evaluation. The studies focusing on the system design

of the GRIs evaluation include Hee-Wun Choi (1987), Chul-Gu Min. et al (1994), Hwa-Jun Roh et al (1996), Chul-Won Lee (1997), Jae-Young Kim, Byung-Yong Hwang and Jae-Sun Byun (2001), and Jun-Yong Um & Heung-Soon Cho (2007). Studies that suggested the BSC model-based approach on the GRI's performance evaluation were done by Min-Hyung Lee (2001, 2005), Jang-Jae Lee et al (2003), and Young-Ho Nam and Byung-Tae Kim (2005). While Chan-Gu Lee & Seong-Kook Lee (2004) sought for the applicability of the intellectual capital model to the GRIs Evaluation System, Hyeong-Ju Song (2002), Chan-Gu Lee (2004), Byeong-Sang Hwang & Keun-Bok Kang (2005) conducted studies based on the meta-evaluation approach.

The previous studies above mostly contained theoretical discussion and analysis on the aspect of evaluation tool by focusing on the external framework and system establishment of the evaluation system. Furthermore, such studies lacked providing insights into the structural factor of the evaluation system to enhance acceptability of evaluated GRIs, and the relationship between the acceptability and the GRIs performances, which are the most critical variables to successfully establish the GRIs Evaluation System.

In addition, the success of the GRIs Evaluation System will be determined by whether the evaluators can satisfy the evaluatees or GRIs members through well-prepared evaluation system structure and operational procedure. Considering that, this study will come up with detailed structural factors of GRIs Evaluation System and review the details based on the previous studies.

2.2.1. Factors related to GRIs evaluation system structure

1) The rationality of the objectives of the evaluation and the result utilization

First, the evaluation objectives can be discussed in various aspects. For example, Vedung (1997) named a few including securing responsibility, improving projects and enhancing knowledge, while Chelimsky (1989) emphasized on the policy making, enforcement, and securing information on responsibility based on

the administrative evaluation. Chester (1995) and Kerssens-van Drongelen & Cook (1997) indicated the objective of performance evaluation as motivation for members and diagnosis on organization's activities, while emphasizing on using a proper measuring method according to the evaluation objective. As pointed out above, objectives of the evaluation can be summarized as the followings: first, financial objective for an effective distribution of limited resources; second, politic objective to enhance effectiveness in policy process and efficiency of management; and third, political objective to secure accountability and facilitate public opinion.

As aforementioned, if a primary goal of GRIs Evaluation System is to encourage a performance and customer oriented goal for GRIs, and to allow them with accountability and autonomy, the evaluation should be carried out based on specific evaluation objectives.

And the objective of the utilization of the evaluation results, classification can be varied based on which view is taken. However, as Rich (1977) classified, Instrumental Use and Conceptual Use are general types - Instrumental use involves in direct reflection of evaluation results on decision making, while Conceptual Use is about indirect effects of results on stakeholders. In order to enhance the utilization of evaluation results, useful information should be created through the evaluation, and effective feedback system should be in place. (Jae-Hui Park, 2002). In this regard, when designing the GRIs Evaluation System, there needs to develop the objective of evaluation results use in advance, which suits the objective of evaluation.

2) Systematicity of the evaluation item and indicators

Evaluation items and indicators should be systematic in a way to meet the objective and goals of the evaluation. It is also desirable to formulate them with sufficient number and contents, interconnectivity, and no redundancy on the basis of the causal relationships and the levels among them (Gil-Woo Lee, 2005). In addition, a study by Jin-Ju Lee et. al. (1990) suggested that the evaluation indicator is a specification of evaluation criteria or items, which might be classified

as normative/descriptive indicators and quantitative/non-quantitative indicators. In order to draw up reliable evaluation results and expand the use of such results, evaluation items and indicators should meet the objective and object of the evaluation with non-redundant system. That's because lack of consistency among evaluation items and indicators might cause confusion in establishing evaluation criteria, and the misunderstanding about the government policies on GRIs (Jae-Young Kim, Byung-Yong Hwang and Jae-Sun Byun, 2001).

3) Fairness of the Evaluation Criteria

More clear and specific evaluation criteria enable more accurate determination of right and wrong, high and low, many and few, and other levels. Specific goals jointly decided by the government and the research council can be used as microscopic evaluation criteria. When the evaluators and evaluatees reach an agreement over the evaluation criteria, GRIs will more easily accept the evaluation results. As for the macroscopic evaluation related to direction or strategy, the government and the research council also have to propose clear evaluation criteria (Jae-Young Kim, Byung-Yong Hwang, Jae-Sun Byun, 2001). In addition, evaluation criteria are bases for determination during conducting evaluation, and individual criterion has one or more evaluation indicators (Jin-Joo Lee et al, 1990). The policy goal of the government and the research council on the GRIs will be achieved effectively when the evaluation criteria is framed objectively quantitatively according to the characteristics and perspective of the organization.

2.2.2. Factors related to the operational process of the GRIs evaluation system

1) Confidence of the participants

First, mutual trust between evaluators and evaluated institutes serves as an important factor for securing confidence among evaluation participants. Reliability is the basis for knowledge capital, thus being crucial factor in the cooperation between and inside organizations (Bontis, 1999). In particular, it is considered as fundamental factor in the

success of knowledge transfer and learning among organizations (Albino et. al., 1999). In addition, studies have been actively conducted by Starr (1985), Smith & Kunreuther (2001) and other scholars on the relationship between the trust and acceptability. In specific, the study by Karft & Clary (1991) indicated that mistrust in the government and project implementers and emotional evaluation against policies are the main culprit for undermining acceptability.

Next, on top of the trust, prior knowledge can influence on the effectiveness of knowledge exchanges in the knowledge transfer and learning among organizations (Albino et. al, 1999). Prior knowledge which the actors have will all increase the capabilities to accumulate, restore and utilize new knowledge. Therefore, it can be concluded that the higher level of prior knowledge the actor has, the more effective knowledge transfer can be achieved.

Meanwhile, knowledge of some issues can affect the recognition and acceptability of such issues. In other words, the more knowledge they have, the higher level of preference can be attained (Slovic, 2000).

2) Sufficiency of two-way communication on the evaluation method

Active cooperation of an evaluated organization should be required in accepting evaluation results and recommendations, and efficient communication should be made to this end. In fact, during a face-to-face contact between the government, research council and GRIs, explicit and implicit knowledge about the GRIs evaluation is exchanged. In this process, prompt feedback, sufficient time for communication and above all, democratic two-way interactions should be key factors to effectively communicate such knowledge (Jae-Young Kim, Byung-Yong Hwang, and Jae-Sun Byun, 2001).

3) Appropriateness of the incentive

Incentive system is what cannot be left out to enhance the acceptability of GRIs members to the performance evaluation results. When the evaluated institutes cannot get appropriate rewards for the good

results, their morale to actively accept evaluation results and enhance the work performance will decrease (Atkinson, 1998; Daley, 1993).

In general, incentives given for the good evaluation results can be classified into two types. First, financial and non-financial incentives based on the form of incentives. Second, individual and group incentives based on a recipient. A proper incentive system to be introduced might be determined by reflecting the preference of evaluated GRIs members. Incentive system can contribute to enhancing acceptability of evaluation results, and further increasing GRIs performance when financial and non-financial incentives are appropriate in terms of size, and the distribution is made in a fair manner.

2.3. Acceptability of the evaluation results

From the viewpoint of organizational learning theory, to encourage members of organizations to accept evaluation results for enhancing work performances takes up large share in establishing an effective organization evaluation system. Nevertheless, all policies have intentions to control or influence the human behaviors by any methods (Anderson, 1984). GRIs evaluation also requires a change or control of GRIs members' behaviors. Evaluated institutes members affected by evaluation results respond to the evaluation results in any forms. The responses will vary according to the level of recognition on the evaluation system or response to the evaluation results, or profit and loss of affected individuals or institutes.

In relation to the concept of acceptability to the evaluation results, Receptiveness or Acceptability means, by dictionary definition, the quality of being judged as receptive/acceptable (Oxford English Dictionary, 1989). Furthermore, Duncan (1981) distinguished among Compliance, Acceptance and Conformity. He indicated that 'Compliance' referred to the behavior in accordance with norms or legislations, thus meaning the external behavioral changes, while 'Acceptance' means concrete changes in internal values and behaviors which includes comprehensive concepts ranging from external behavioral changes to internal changes in values and mental system.

He defined ‘Conformity’ as a change in behavior in order to fit in explicit or implicit norms of a group, which is a concept encompassing ‘Compliance’ and ‘Acceptance.’

The previous studies on overall acceptability include: a study focusing on the determining factor of acceptability by Jae-Eun Lee et. al. (2006); studies analyzing factors affecting and limiting acceptability by Hee-Tae Lee (2006), Hwi-Moon Ra (2007), Su-Jae Yoon (2002), Sung-Kyung Jo (2003); and studies seeking for policy direction and strategy for securing acceptability by Chun-Ho Ryu (2005), Jong-Yup Lee (2003) and Hwang-Sun Kang & Yong-Su Kwon (2004).

In specific, the study by Su-Jae Yoon (2002) conceptualized the acceptability as implementation of evaluation result follow-ups, while Hwang-Sun Kang & Yong-Su Kwon (2004) understood it as the will to reflect evaluation results in the future. The study distinguished the will to reflect recommendations from the will to reflect negative evaluation results. The study used the evaluation system factors as independent variables including appropriateness of the evaluation procedure, rationality of the evaluation indicators, appropriateness of the incentives and understanding of evaluation system. It also used the recognition of evaluation’s efficacy and responding attitude to evaluation as mediating variables, while using the acceptability of evaluation results as dependent variable. However, our study sees that such approach has the redundancy in that mediating variables can already be measured with the level of recognition on the evaluation system factors.

Meanwhile, Chun-Ho Ryu (2005) saw the acceptability as the level of accepting audit results or recommendations in public audits, thus expanding the range of acceptability into not only audited organization but also national assembly and civil society. Jong-Yup Lee (2003), in the evaluation on the acceptability of ‘division of prescription and dispensation’ policy, defined the policy acceptability as the state of accepting favorably the contents, implementation process and achievements of the concerning policy in an independent manner. However, he did not require internal and mental changes as an essential condition.

Putting above discussions together, the acceptability of GRIs can be defined as ‘the attitude where the members of evaluated organization recognize the GRIs evaluation results as information worthy of acceptance through sharing of their understanding, and favorably respond to them. Here the attitude to ‘favorably respond’ doesn’t necessarily require the internalization and mental changes as an essential condition. In other words, although the internalization has not occurred during the evaluation process, evaluation results can be accepted if the members of evaluated organization have future will to reflect the results.

2.4. Performance of the GRIs

It is said that the performances related to the organization’s mission are more important than financial performances in the case of non-profit and public organizations (Brinckerhoff, 1994). Accordingly, various forms of outcomes can be achieved. In particular, research areas are known to be very hard to measure the achievements and take long time to achieve outcomes.

Recent discussions on the GRIs performances by public sectors have placed more focus on the operation of organization on top of palpable achievements. The followings are some of such discussions.

First, measuring organizational performances focusing on the effectiveness of a research institute. Audit model (Chiesa et. al. 1996), Kanter model (Kanter, 1988), Hurley model (Hurley, 1997), Environmental Context Taxonomy model (Crow & Bozeman, 1998) are included in this approach. Abovementioned models relate innovation, creativity and excellence of scientific technology to the structure, culture, characteristics, activities and process of a research organization. Furthermore, they have made large contributions by identifying which factors would affect the performances of research institute, and that their performances can be measured through the analysis on such factors. (Jordan and Streit, 2000). However, those models have not reached the level which includes comprehensive achievements related to mission and goals of the organization, and addresses the learning aspect and the relationship between the organization and outside

entities (Jang-Jae Lee et.al., 2003).

Second, applying the Balanced Score Card (BSC) to assess the performance of the GRIs. BSC approach was proposed by Eccles in 1991 as an alternative to the conventional financial performances evaluation in the performance management of businesses. Based on his idea, Kaplan and Norton (1992, 1993, and 1996) developed the BSC approach. It is very useful tool for performance management of GRIs in that it addresses organization's performances from various aspects. Nevertheless, this approach requires modification for those public research institutes whose financial structure and performances are relatively difficult to be measured (Olve, Roy & Wetter, 1999).

As the first of its kind, the study by Min-Hyung Lee (2001, 2005) applied the BSC approach to GRIs. It expanded the performances of evaluatees into 6 areas, and thereby emphasizing the aspects of customer and financial performances. The study also proposed the aspect of customer satisfaction. The study by Jang-Jae Lee et. al. (2003) used the general framework suggested by Kaplan & Norton (1996) in an attempt to analyze performances from 4 aspects including finance, customer, internal process, and innovation and learning. Moreover, the study by Young-Ho Nam & Byung-Tae Kim (2005) presented a performance model with total 6 aspects. In specific, it divided customer aspect into long-term and short-term customer aspects, and internal process aspect into research management and strategy direction aspects, and changed learning and growth aspect into human resources aspect. In addition, the study by Byung-Tae Kim (2004) suggested specific examples to assert that the financial aspect of GRIs has placed much focus on the stability due to the budget allocation system of the Ministry of Strategy and Finance (MOSF), and the conservative budget execution of the research institute.

Given that the performance indicators for GRIs under NRCS have not been established as a common standard at the organizational level, this study considers the characteristics and mission of the GRIs, identify comprehensive performances and relation, learning aspects of GRIs and other BSC approaches, and reshape detailed performance items in a way to suit the study objective.

3. Research design and analysis method

3.1. Research model

The objective of this study is to examine the influence of the GRIs evaluation system on the level of acceptability of the evaluation results and on the performance of the GRIs, as shown in the Figure 1.

3.2. Major variables and hypothesis

3.2.1. Independent variables

The GRIs evaluation system is referenced from the variables proposed by Jin-Ju Lee (1990), Daley (1993), Atkinson(1998), Albino, et. al.(1999), Jae-Young Kim, Byung-Yong Hwang and Jae-Sun Byun (2001), Jung-Won Lee (2000), Jae-Hee Park (2002), and Gil-Woo Lee (2005). In specific, it formed detailed items based on 6 variables: the rationality of the objective of the evaluation and the utilization of the evaluation result ; Systematicity of the evaluation item and the indicator; ; fairness of the evaluation criteria ; the confidence of the participants ; sufficiency of the communication, and appropriateness of the incentives.

3.2.2. Intervening variables

This study measures GRI's acceptability of evaluation results by dividing their responses into the will to reflect recommendations and the will to reflect negative evaluation results in the future. To this end, the study referred to detailed items suggested by Su-Jae Yoon (2002), Hwang-Sung Kang & Yong-Su Kwon (2004) and the study by Hwi-Moon Ra (2007).

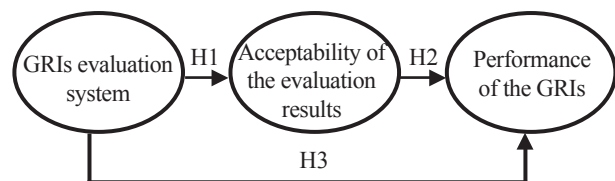


Figure 1 A research model on the influence of the GRIs evaluation system on the acceptability of the evaluation results and the performance of the GRIs

3.2.3. Dependent Variables

As for GRIs performance factors, this study used BSC-based performances which are recognized by GRIs members, based on the references of Min-Hyung Lee (2001, 2005), Kaplan & Norton (1996), Jang-Jae Lee et. al. (2003), Byung-Tae Kim (2004), Young-Ho Nam & Byung-Tae Kim (2005). Specifically, financial performance factor is measured by appropriateness of financing, soundness of financial flow, and soundness of financial condition. Customer performances are measured by improvement of project performance and enhancement of customer satisfaction, while internal process performances are determined by improvement of strategy development process, improvement of project management process, and improvement of budget management process. As for the learning & growth performances, they are measured by growths in human resources and organizational culture.

Summarizing the operational definitions related to above variables makes Table 2, and each item is measured based on 7 point Likert Scale.

In addition, based on the research model, this study establishes the following hypotheses to verify the relations among the variables.

<Hypothesis 1> The GRIs evaluation system will have significant effect on the acceptability of the GRI members.

<Hypothesis 2> The level of acceptability of the GRI members will have a significant effect on

the performance of GRIs.

<Hypothesis 3> The GRIs evaluation system will have a significant effect on the performance of GRIs.

3.3. Selection of targets and subject of Questionnaire

This study collected and analyzed related laws and literature researches to establish a study model, and then proceeded based on the empirical methodology which verifies hypothesis by conducting a survey and statistical analysis.

The survey was carried out on researchers and staffs in 23 GRIs under NRCS. A total of 551 respondents participated in the study and they were comprised of appointed persons, labor union authorities, researchers and administrators who were directly related to the function and role of the research council and the performance of the GRIs. The size of the concerned institute was also taken into consideration. The survey questionnaire was distributed during the period of August 1st to 24th, 2007 and collected en bloc. They were analyzed by using SPSS for Windows 15.0 and AMOS 16.0 package.

Although the sample group is smaller than that in general researches, it can be considered as appropriate and reasonable given that it is a qualitative research group with higher level of understanding for all the questions. (Jill Hussey & Roger Hussey, 1998).

Table 3 shows the demographic classification of the final sample.

Table 2 Operational definitions of the variables influencing on the acceptability and performances by GRIs Evaluation System

Factor	Item	Measure	Remarks
Compositional factors of the GRIs evaluation system	Concreteness of the evaluation objective	7 point scale	Eui-Hwan Cha (1999), Jung-Won Lee (2000), Young-Se, Moon (2001), Jae-Hee Park (2002), Myung-Su Kim (2003), Byung-Sik Park (2003)
	Rationality of the objective of the evaluation and the result utilization	7 point scale	
	Correspondence to the evaluation objective and the subject	7 point scale	Dae-Hee Song (1985), Jin-Ju Lee (1990), Chul-Gu Min (1994), Olve et al.(1998), Eui-Hwan Cha (1999), Jae-Hee Park (2002), Gil-Woo Lee (2005)
	Systematicity of the evaluation item and indicator	7 point scale	

Table 2 Operational definitions of the variables influencing on the acceptability and performances by GRIs Evaluation System (cont'd)

Factor		Item	Measure	Remarks
Compositional factor of the institutional evaluation system	Fairness of the evaluation criteria	Objective determination of evaluation criteria based on characteristics and aspects of GRIs	7 point scale	Jones (1991), Dae-Hee Song (1985), Jin-Ju Lee (1990), Olve et al. (1998), Chul-Gu Min (1994), Eui-Hwan Cha (1999), Young-Se Moon (2001), Jae-Young Kim, Byung-Yong Hawng, Jae-Sun Byun (2001), Jae-Hee Park (2002), Byung-Sik Park (2003), Myung-Su Kim (2003)
		Degree of quantification of the evaluation criteria	7 point scale	
	Confidence of participants	The research council's trust on the GRIs	7 point scale	Eui-Hwan Cha (1999), Bontis, N,(1999), Albino, et. al.(1999), Jae-Young Kim, Byung-Yong Hawng, Jae-Sun Byun (2001),
		Possession of research council's preliminary knowledge required for the evaluation	7 point scale	Young-Se Moon (2001), Jae-Hee Park (2002), Myung-Su Kim (2003), Byung-Sik Park (2003)
		The GRI's trust on the research council	7 point scale	
		Possession of GRI's preliminary knowledge required for the evaluation	7 point scale	
	Sufficiency of communication	Two-way communication	7 point scale	Eui-Hwan Cha (1999), Young-Se, Moon (2001), Jae-Young Kim, Byung-Yong Hawng, Jae-Sun Byun (2001), Jae-Hee Park (2002), Byung-Sik Park (2003), Myung-Su Kim (2003)
		Sufficiency of time	7 point scale	
	Appropriateness of the incentives	Appropriateness of the size of monetary and non-monetary incentives	7 point scale	Daley (1993), Atkinson (1998), Eui-Hwan Cha (1999), Young-Se, Moon (2001), Jae-Hee Park (2002), Byung-Sik Park (2003), Myung-Su Kim (2003)
		Fairness of the incentive distribution method	7 point scale	
Compositional factors of the acceptability of the evaluation result	Response to the GRIs evaluation result	Will to reflect on improvement suggestions	7 point scale	Soo-Jae Yoon (2002), Hwang-Sung Kang, Yong-Su Kwon (2004), Hwi-Moon Ra (2007)
		Will to reflect negative evaluation results in the future	7 point scale	
Composition factor of the performance of the research institution	Financial performance	Appropriateness of financing	7 point scale	Min-Hyung Lee, et al. (2001, 2005), Kaplan & Norton (1992, 1993, 1996, 2001), Eickelmann (2001), Jang-Jae Lee et al (2003), Niven (2003, 2005), Byung-Tae Kim (2004), Young-Ho Nam, Byung-Tae Kim (2005), Chang-Gil Lee (2007)
		Soundness of financial flow	7 point scale	
		Soundness of financial conditions	7 point scale	
	Customer performance	Improvement of the project performance	7 point scale	
		Enhancement of customer satisfaction	7 point scale	
	Internal process performance	Improvement of the strategy development process	7 point scale	
		Improvement of project management process	7 point scale	
		Improvement of budget management process	7 point scale	
	Learning & growth performance	Growth of HR(human resources)	7 point scale	
		Growth of the organization culture	7 point scale	

Table 3 Distribution of respondents

Characteristics	Item	No. of Samples	Percentage (%)
Age	Under 30s	193	35.0
	40s	252	45.7
	50s	95	17.2
	60s	-	-
Work type	Research	309	56.0
	Administration	191	34.7
	Office work	31	5.6
	Other	12	2.2
Position	Junior (Researcher)	127	23.0
	Senior (Assistant research fellow)	109	19.8
	Chief (Research fellow , senior research fellow)	214	38.9
	Others	83	15.0
Duty	Person in charge	258	46.8
	Position in charge	198	35.9
	Others	76	13.8
Education	Bachelor	184	33.3
	Master	130	23.6
	Ph. D	222	40.2
Labor Union Member	Member	148	26.9
	Non member	382	69.3
Duration of employment	1-5 years	145	26.3
	6-10 years	127	23.0
	11-15 years	107	19.4
	16-20 years	108	19.6
	21-25 years	37	6.7
	More than 25 years	18	3.3

* Note: No. of samples include some missing values.

3.4. Analysis method

In order to verify the study model, this study first validates reliability, and dependency of each variable through Confirmatory Factor Analysis (CFA). Then hypotheses are verified by Structural Equation Model (SEM), using Covariance Matrix calculated based on the preliminary data. The appropriateness of the model is generally tested by employing index suggested by Bollen (1990), and Jaccard & Wan (1996).

4. Analysis Results

4.1. Reliability and validity analysis

4.1.1. Reliability verification of variables

The Cronbah's α coefficient of the customer performance variable is somewhat low, but the

Cronbah's α coefficients of all the other variables are over 0.6 as shown in Table 4 to secure internal consistency. Therefore, the question items of the questionnaire are considered as proper to drive factors.

4.1.2. Verification of validity

The CFA was conducted to secure the compositional validity of the measuring items. The purpose of this analysis is to eliminate the items that would impede the unidimensionality. The optimal status of the respective composition of each factor was evaluated through the goodness-of-the-fit index (GFIs) such as CFI (Comparative Fit Index), NFI (Normed Fit Index), RMSEA (Root Mean Square Error of Approximation), CMIN, and P value. The result is in Table 5 as follows.

As a result of the analysis, all the factors were mostly satisfactory on the fit index. Although the RMSEA value was slightly higher than the standard

Table 4 The result of reliability analysis of each variable

Constructs		Initial No. of Items	Final No. of Items	Cronbach's α
GRIs evaluation system	Confidence of participants	4	4	0.914
	Rationality of the objective of the evaluation and the result utilization	2	2	0.917
	Systematicity of the evaluation item and indicator	2	2	0.914
	Fairness of the evaluation criteria	2	2	0.868
	Sufficiency of communication	2	2	0.951
	Appropriateness of incentives	2	2	0.899
Acceptability of the evaluation results	Response	2	2	0.920
Performance of the GRIs	Financial performance	3	3	0.937
	Customer performance	2	2	0.556
	Internal process performance	3	3	0.945
	Learning & growth performance	2	2	0.913

Table 5 The fit index of the CFA result

Factor	CMIN	df	P	CFI	NFI	RMSEA
GRIs evaluation system	3.858	71	0.000	0.977	0.969	0.072
Acceptability of the Evaluation results	6.534	60	0.000	0.964	0.958	0.097
Performance of the GRIs	5.526	31	0.000	0.975	0.970	0.090

and the P value for CMIN was very low of 0.000, the other values including CFI and NFI all satisfied the requirement of good model. (Kye-Soo Kim, 2004; Byung-Seo Kang and Kye-Soo Kim, 2005).

4.2. Correlation Analysis

As a result of the CFA, the unidimension of each factor was confirmed, and therefore the correlation analysis was carried out to identify the level of correlations and direction among those factors, as shown in Table 6.

The significant positive correlation between the major variables is found on the 0.01 level. Especially, 'the rationality of the evaluation (utilization) objective' showed strong correlations (0.854) with 'the confidence of the participants', and 'the learning & growth performance' showed strong correlations (0.811) with 'the internal process performance'. On the other hand, 'the financial performance' showed weak correlations (0.414) with 'the confidence of participants' and 'the rationality of evaluation (utilization) objective'. Furthermore, 'the customer performance'

showed weak correlations with 'the appropriateness of the incentives' (0.415) and 'response attitude' (0.410).

4.3. Hypothesis verification

Major task of this study is to verify correlations among the GRIs Evaluation System, the acceptability of evaluation results, and the performance of GRIs, through the structural model equation. Among the compositions included in the study model, the GRIs Evaluation System and the acceptability of evaluation results are determined as independent cause latent variables according to the results of factor analysis. Meanwhile, the variables related to the performance of GRIs are set as the effect latent variable.

As shown in Table 7, the fitness of the Structural Equation Model (SEM) proved to be reasonable.

The path coefficients of SEM, shown in Figure 2, were confirmed in order to identify overall mechanism among the GRIs Evaluation System, the acceptability of evaluation results, and the performance of GRIs, together with the proposed hypotheses.

Table 8 shows the analysis results of the cause-

Table 6 The result of correlation analysis of each factor

	Average	Standard Deviation	1	2	3	4	5	6	7	8	9	10	11
1. Confidence of the participants	3.57	0.59	1										
2. Rationality of evaluation (utilization) objectives	3.77	0.57	0.854	1									
3. Systematicity of the evaluation item and indicator	3.36	0.61	0.659	0.654	1								
4. Fairness of the evaluation criteria	3.17	0.66	0.656	0.679	0.683	1							
5. Sufficiency of communication	3.29	0.56	0.716	0.683	0.751	0.723	1						
6. Appropriateness of the incentive	3.83	0.54	0.740	0.741	0.650	0.739	0.698	1					
7. Response attitude	3.50	0.59	0.649	0.636	0.569	0.714	0.601	0.704	1				
8. Financial performance	3.12	0.66	0.414	0.41	0.486	0.464	0.471	0.449	0.437	1			
9. Customer performance	3.16	0.68	0.421	0.421	0.454	0.452	0.560	0.415	0.410	0.671	1		
10. Internal process performance	3.18	0.63	0.480	0.480	0.546	0.531	0.505	0.419	0.468	0.741	0.742	1	
11. Learning development performance	3.43	0.71	0.458	0.458	0.535	0.538	0.601	0.515	0.502	0.731	0.687	0.811	1

* The correlation coefficients between all the factors are significant at the level of $p < .01$.

Table 7 Fitness of structural model

GFI	CMIN	df	P	CFI	NFI	RMSEA
fitness	234.384	42	0.000	0.967	0.960	0.091

Table 8 Cause-effect analysis among factors

Proposed path	Path coefficient	Standard deviation	t-value	P-value	Hypothesis
GRI's evaluation system → Acceptability of the Evaluation result	0.826	0.047	16.646	.000	Adoption of Hypothesis 1
Acceptability of the Evaluation result → performance of the GRI	0.739	0.057	13.631	.000	Adoption of Hypothesis 2
GRI's evaluation system → performance of the GRIs	0.592	0.059	13.778	.000	Adoption of Hypothesis 3

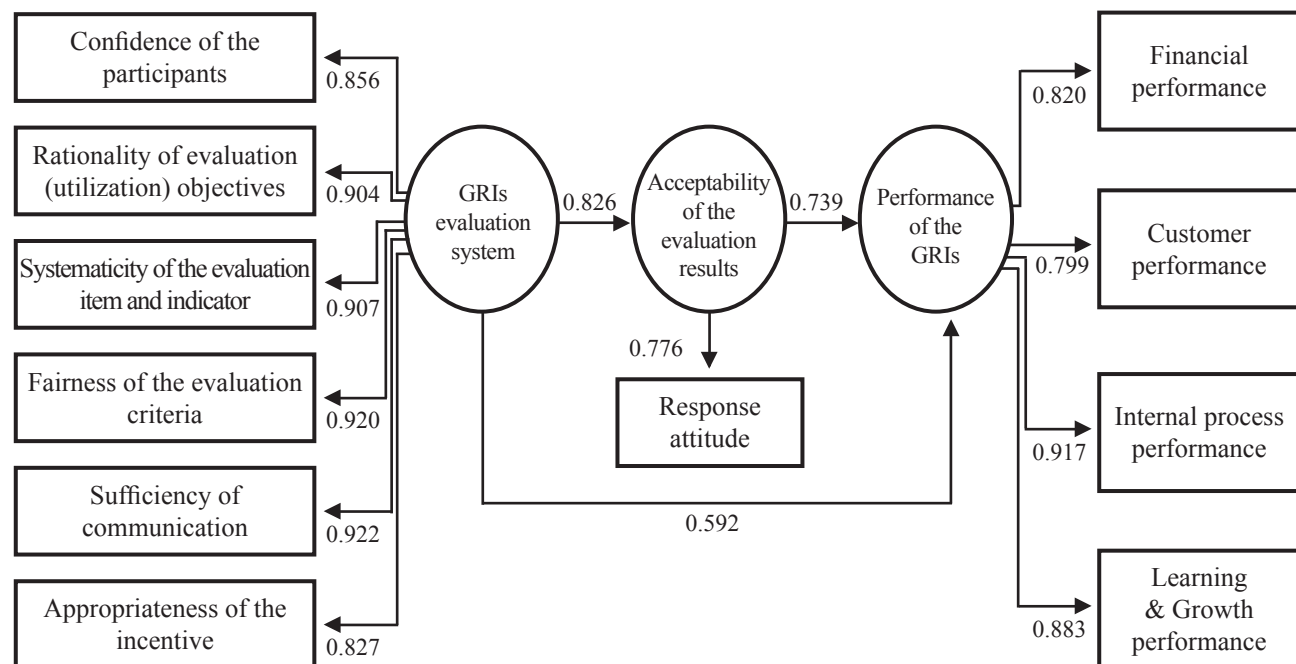
effect relationship among factors. First, the GRIs evaluation system has significant and positive influence on the acceptability of the evaluation results and the performance of the GRIs. Second, the acceptability of the evaluation results was confirmed to have relations with the performance of the GRIs. In detail, the direct effect of the GRIs evaluation system on the performance of the GRIs was 0.592, while the indirect effect through the acceptability on the evaluation results was 0.610, which was larger than the direct effect. As for indirect effect, it is drawn based on the study of Gye-Su Kim (2008), by multiplying the path coefficient of the evaluation system to the acceptability (0.826) and the path coefficient of acceptability to the performance of GRIs.

Next, it is found that all the factors consisting of the GRIs Evaluation System serves as important defining factors as shown in Figure 2. In particular, 'Sufficiency of communication', 'Fairness of evaluation criteria', and 'Systematicity of evaluation items and indicators' receive more weights among those factors, while 'Confidence of participants' and 'Appropriateness of incentives' have relatively less weights. This might be interpreted as the importance of developing the

evaluation criteria and indicators which would most reflect the characteristics of GRIs in the operation of GRIs Evaluation System, through effective communications. Furthermore, mutual trust and prior knowledge among evaluators and evaluatees, proper incentive size and distribution method should be further improved urgently.

The factors for acceptability of evaluation results are also found to be crucial determining factors. In addition, as the acceptability of evaluation results has relations with the performance of GRIs, there should be complementary policies in place in order to enhance the acceptability.

Lastly, it is also found that all the factors consisting of the performance of GRIs serve as important determining factors. Especially, 'Internal process performances' takes up more importance than 'Customer performances.' It means that the evaluation results greatly influence on the improvement of GRIs' management process, while they have less influence on the research performance or customer satisfaction. In this regard, complementary policy measures should be developed.



* All the path coefficient values have significance at the level of $p < .001$.

Figure 2 The analysis result of the structural equation model

5. Conclusion

As part of discussion on the development measures of the GRIs evaluation system to enhance the performance of the GRIs, this study is aimed to identify the effects of the GRIs evaluation system on the acceptability of evaluation results, and the resulting effects on the performance of GRIs.

As a result of analysis on 551 members of 23 GRIs, the GRIs Evaluation System has significant and positive influence on the acceptability of evaluation results and the performance of GRIs. Furthermore, the acceptability of evaluation results has relations with the performance of GRIs. Specifically, indirect effect via the acceptability of evaluation is larger than the direct effect of GRIs Evaluation System on the performance of GRIs. However, overall weakness of the GRIs Evaluation System results in the low acceptability, and also brings limitation to the active use of evaluation results. According to this study, identified overall weakness of the GRIs Evaluation System should be complemented. Furthermore, among the factors consisting of the evaluation system, acceptability and the performances, more important factors should be further developed while less important ones should be improved. In this regard, this study suggests the followings:

First, as for the GRIs Evaluation System, the objectives of evaluation (and results use) should be specific and reasonable so that they serve as specific guidelines for the GRIs evaluation participants. In addition, in order to strengthen the strategic aspect of GRIs evaluation, evaluation indicators should be employed and the weights be placed by most reflecting on the characteristics of GRIs. Furthermore, the indicators should be agreed among the government, Research Council, and GRIs, while the evaluation should be changed to the absolute evaluation on the achievement based on their own goals. Past performance indicators and future indicators should be balanced, and the efficacy should be enhanced through the connection to internal performance management. Second, in terms of the operation of GRIs Evaluation System, the government and the Research Council as evaluators need to strengthen the collection and accumulation of relevant information and knowledge including current states

and issues of GRIs. They also make further endeavors to form an evaluation committee in consideration of expertise, integrity, and accountability, and to provide the committee with prior knowledge about GRIs. Moreover, mutual interactions including face-to-face contacts among evaluation participants should be continuously reinforced to consolidate communications. For example, earnest discussion will be held among the evaluation committee and GRIs to come up with reliable and useful evaluation results before the official announcement of evaluation report. The volume of incentive and its distribution method should also be improved. Current incentive system is not sufficient to boost the morale and confidence of GRIs. Therefore, in order to secure the efficacy of the GRIs Evaluation System, incentive volume should be increased and distribution should be made in a fair manner.

Third, in relation to the enhancement of acceptability, monitoring system should be established which can reflect upon the evaluation result in the actual duties. Lastly, as for the enhancement of the performance of GRIs, weights for evaluation areas should be redefined and evaluation indicators should be improved. In addition, standardized performance category and measurement tool for GRIs should be developed. Concerning future study direction and the limit of this research, there should be an elaborate review whether the low acceptability and less utilization of the evaluation results are general characteristics prevalent in Korean GRIs evaluation system including science and technological areas. Also it measured the performance of GRIs by subjective satisfaction of individual members of GRIs rather than based on quantitative data. That's because standardized performance category has not made yet for GRIs after the consolidation of the National Research Councils. Therefore, it will be also meaningful to compare this study with a future study which would measure performances based on the data accumulated for the next 3~5 years. In addition, this study has difficulty in measuring the concepts of acceptability of the GRIs Evaluation System due to the limit of a survey. Therefore, further precisely designed survey or test should be conducted for the analysis on difference in performances among highly acceptable and low acceptable organizations.

6. References

- Albino, V., Garavelli, A. and Schiuma, G. (1999), Knowledge Transfer and Inter-Firm Relationships in Industrial Districts: The Role of the Leader Firm, *Technovation*, 19:53-63.
- Atkinson (1998), Strategic Performance Measurement and Incentive Compensation, *European Management Journal* 16(5):552-561.
- Bontis, N. (1999), Managing Organizational Knowledge By Diagnosing Intellectual Capital: Framing and Advancing the State of the Field, *Int. J. of Technology Management*, 18(5/6/7/8):433-462.
- Brinckerhoff, Peter C. (1994), *Mission Based Management*, New York: John Wiley Sons, Inc. pp. 10-24.
- Chelmsky, Eleanor. (1989), Evaluating Public Programs, In James L. Perry(ed.), *Handbook of Public Administration*, Jossey-Bass Publishers. pp. 259-273.
- Chester, Arthur N. (1995), Measurements and Incentives for Central Research, *Research Technology Management*, pp. 14-22.
- Chiesa, V., Coughlan, P. and Voss, C.A. (1996), Development of a technical innovation audit, *Journal of Productive Innovation Management*, 13:105-136.
- Cho, Sun-Kyung (2003), Comparative Analysis of the Acceptability between the Government and Local Residence on the Policies Concerning the Radioactive Waste Management Facility - Intelligence, Trust, Recognition, Acceptability and Participation, *A Study on Public Policies of Korea*, 13:59-77.
- Choi, Hee-Wun (1987), A Study on the Development of Comprehensive Management Method and R&D Evaluation Model of the GRI, and the Comprehensive Evaluation Analysis of Specific R&D Projects, *Ministry of Science and Technology*.
- Crow M. and Bozeman B. (1998), *Limited By Design: R&D Laboratories in the US National Innovation System*. New York.
- Daley (1993), Productivity Tools and Employee Incentives: Availability and Association among North Carolina Municipalities, *Public Productivity & Management Review*, 17(2):161-171.
- Duncan J.W. (1981), *Organization Behavior*, 2nd, ed, Boston, Houghton Mifflin.
- Grants, R.m. (1996), Toward A Knowledge Based Theory of Firm, *Strategic Management Journal*, 17:109-122.
- Hurley, J. (1997), *Organization and Scientific Discovery*, New York.
- Hwang, Byung-Sang and Kang, Keun-Bok (2005), Discussion of Developmental Plans of the GRI evaluation: Focused on the Meta-Evaluation on the Evaluation Examples of KRCF, *Korea Policy Analysis Seminar*, 14(1):121-149.
- Hwang, Byung-Yong (2006), 2005 NRSC Evaluation Report, Cabinet Office
- Hwi-Moon Ra (2007), Analysis of Influential Factor on the Acceptability of the Result of Local Administration Innovation Evaluation, *Study on Local Administration*, 21(2):199-224
- James J. Jaccard and Choi K. Wan (1996), *LISREL Approaches to Interaction Effects in Multiple Regression (Quantitative Applications in the Social Sciences)*, a SAGE University Paper.
- Jill Hussey & Roger Hussey (1998), *Business research*, pp. 114-121.
- Kang, Byung-Seo and Kim, Gye-Su (2005), *Social Science Statistic Analysis, Data Solution*
- Kang, Hwang-Sun and Kwon, Yong-Su (2004), A Plan to Promote the Acceptability of the Members on the Performance Evaluation Result, *KAPAE Spring Academic Seminar*
- Kanter, R.M. (1988), When a thousand flowers bloom: structural, collective, and social conditions for innovation in organizations, *Research in Organizational Behavior*, 10:169-211.
- Kaplan R.S. & Norton D.P. (1992), The Balanced Scorecard-Measures That Drive Performance, *Harvard Business Review*, 70(1):71-79.
- Kaplan R.S. & Norton D.P. (1993), Putting the Balanced Scorecard to Work, *Harvard Business Review*, 71(5):134-147.
- Kaplan R.S. & Norton D.P. (1996), Using the Balanced Scorecard as a Strategic Management System, *Harvard Business Review*, 74(1):75-85.
- Kenneth A. Bollen (1990), A Comment on Model Evaluation and Modification, *Multivariate Behavioral Research*, Apr, 25(2):181.
- Kerssens-van Drongelen, Inge C. and Cook Andrew (1997), Design principles for the development of measurement systems for research and development processes, *R&D Management*, 27(4):345-357.
- Kim, Byung-Tae (2004), A Study of Validity of the GRI Evaluation System using BSC, *Kukmin University PhD Thesis*
- Kim, Gye-Su (2004), (AMOS) SEM Analysis, *SPSS Academy*
- Kim, Gye-Su (2008), SEM Analysis, Seoul: Hannarae Publishing
- Kim, Jae-Young, Hwang, Byung-Yong and Byun, Jae-Sun (2001), A Plan to Improve Institutional Evaluation System of the GRIs, *KISTEP*.
- Lee, Chan-Gu (2004), *The Development Direction of the*

- Institutional Evaluation System of the Science and Technology Research Councils: Focused on the Examples of KOCI, A Study on the Korean Society and Administration, 15(1):405-433.
- Lee, Chan-Gu and Lee, Sung-Kuk (2004), A Search of the Feasibility of Applying the Intellectual Capital Model on the GRI Evaluation, Korea Technological Innovation Seminar Autumn Paper.
- Lee, Chul-Won (1997), The Design and Management Status of GRI Evaluation System, Science Technology Policy, 7(10):35-48.
- Lee, Gil-Woo (2005), A Study on the Influential Factors of the Operation of the Institutional Evaluation System, Technology Innovation Seminar Journal, 8:70-77.
- Lee, Hee-Tae (2006), Analysis of Acceptability of Public Officers on the Local Administration Innovation, KLOG Spring Seminar Paper.
- Lee, Jae-Eun, Kim, Young-Pyung, Jung, Yun-Soo (2006), Analysis of Decision Factor of Social Acceptability of the Risk of the Power System, KIPA Winter Seminar Paper.
- Lee, Jang-Jae, Kim, Jae-Young, Kim, Hyun-Min (2003), Establishment of a Balanced Performance Management System of the GRIs in the Science and Technology Area, Study of Governments, 9(2):57-92.
- Lee, Jin-Ju et al (1990), A Study on the Development and Application of R&D Evaluation Model, ETRI.
- Lee, Jong-Yup (2003), Policy Acceptability Evaluation of the Prescription Policy, KIPA Summer Seminar Paper.
- Lee, Jung-Won (2002), A Study on the Theoretical Establishment and the Application of the R&D Evaluation System, STEPI
- Lee, Min-Hyung (2001), Analysis of the institutional performance evaluation index system of GRI, STEPI.
- Lee, Min-Hyung (2005), Performance Oriented Management of the GRI that Applied BSC, Book of Science Technology Policies no. 154.
- Min, Chul-Gu et al (1994), An Institutional Evaluation Model for the Activation of the GRI, Trend of Science Technology Policies, 4(1):70-77.
- Nam, Young-Ho and Kim, Byung-Tae (2005), BSC Perspective Analysis of the GRI Evaluation Index of the Science and Technology Area, Study on Technology Innovation, 13(1):265-293.
- NRSC (2006), 2006 Research Institution Evaluation Handbook.
- NRSC (2007a), 2006 Task Performance.
- NRSC (2007b), The Result of 2007 Research Institution Evaluation.
- Olve N. G, J. Roy & M. Wetter (1999), Performance Drivers, John Wiley & Sons Ltd., pp. 299-300.
- Park, Jae-Hee (2002), An Effective Management Plan of the Institutional Evaluation System, Seoul: KIPA.
- Rich, R. F. (1977), Uses of Social Science Information by Federal Bureaucrats: Knowledge for Action versus Knowledge for Understanding, In C. H. Weiss(ed.), Using Social Research in Public Policy Making, Lexington, MA: Lexington Books, pp. 199-211.
- Roh, Hwa-Jun et al (1996), A Study on the Development of Evaluation Factors and Setting up Weight, STEPI.
- Ryu, Chun-Ho (2005), A Study on the Public Audit and the Acceptability, KAPA Winter Seminar Paper.
- Slovic, P. (2000), The Perception of Risk, Earthscan, UK., pp. 220-231.
- Smith, H. and Kunreuther, H. (2001), Mitigation and Benefits Measures as Policy Tools for Siting Potentially Hazardous Facilities: Determinants of Effectiveness and Appropriateness, Risk Analysis: An International Journal, 21(2):371-382.
- Song, Hwan-Bin (2004), A Comparative and Analytical Study of the Public Research Institution Evaluation System in Korean and Japan, Graduate School of Korea University PhD Thesis.
- Song, Hyung-Ju (2002), A Study on the Meta-Evaluation of the GRI, Seongkyungkwan University Master's Thesis.
- Starr C. (1985), Risk Management, Assessment, and Acceptability, Risk Analysis, 5:97-102.
- Um, Jun-Yong and Cho, Heung-Soon, A Search of Development Directions of the GRI Evaluation System in NRSC, Study of Educational Problems, 27:107-133.
- Vedung, Evert. (1997), Public Policy and Program Evaluation, London: Transaction Publishers.
- Yoon, Su-Jae (2002), Analysis of the Influential Factor on the Acceptability of Policy Evaluations of the Central Administration Institution, KIPA Summer Seminar Paper.