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An effective R&D performance measurement system: survey of Korean R&D researchers

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Abstract

Without effective performance evaluation, R&D organizations will find it hard to motivate their R&D scientists and engineers: '*How should R&D managers design the performance measurement system most suitable to their own organization*?' is a critical question. Based on a large-scale survey covering over 1200 R&D scientists and engineers in Korean R&D organizations, we put forth the following lessons. Although most of the R&D personnel prefer their compensation based on their performance, they indicate that lack of fair performance evaluation system could be the biggest obstacle towards implementing such a compensation scheme. They also suggest that a fair performance evaluation should utilize more behavioral and qualitative measures such as leadership and mentoring for younger researchers, and bottom-up (e.g., R&D researchers' evaluation of their own bosses, say, R&D managers) as well as horizontal (e.g., peers and/or colleagues) evaluation schemes.

Keywords: Management of R&D; R&D; R&D Performance measurement system

1. Introduction

Economic compensation for R&D personnel is an important part of motivating R&D scientists and engineers to work more productively. Thus, it is important to design an effective compensation system [1]: R&D managers must have a fair and effective mechanism to measure the R&D performance. An R&D performance measurement system perceived by the R&D personnel as fair and effective is essential for them to feel satisfied with their compensation: when satisfied with their compensation, they have commitment to their job, which in turn translates into high R&D performance [2]. In effect, research on R&D performance measurement could shed light on designing an effective R&D compensation system.

Much of the previous research has focused on developing conceptual models: see [3] for a comprehensive review on the literature. On the contrary, we aim to develop an empirically derived model and thus fill the gap in the literature. That is, rather than casting the issue from the R&D managers' perspective, we take into account ideas of the R&D personnel, who are most affected by the performance measurement system in the end. In effect, we are asking "*What might be an ideal performance measurement system the R&D personnel believe to be most effective and desirable*?"

From two separate angles, we approach the primary research question: '*who should measure the performance of R&D scientists and engineers*?' and '*what criteria should be used to measure the performance*?' In order to answer the questions, we conducted a large-scale survey covering more than 1200 R&D scientists and engineers in Korea. Survey outcomes indicate that although they prefer compensation based on their performance, the R&D personnel seem

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to have great concerns about the performance measurement system in terms of both '*evaluators*' and '*criteria*'.

After reviewing the relevant literature in the next section, we detail our research framework including research model, propositions, and constructs in Section 3. Section 4 discusses our survey design and reports the analysis outcomes. Finally, we recapitulate the research conclusions and consider some practical implications as well as issues in relation to the research in this paper.

2. Literature

Before reviewing literature on the performance metrics, we need to justify *why it is important to have an effective performance measurement system in the first place*. To this question, Cordero [4] responded by establishing a substantive relationship between systematic performance measurement systems and R&D performance. That is, the basic premise is that an effective performance measurement system is a necessary condition for R&D productivity. Now we review the references that suggested various ways to develop an effective performance measurement metrics.

First, several researchers have focused on the unit of analysis. Collier [5] was among the first who postulated that project-level metrics be deployed as key performance evaluation criteria, followed by such researchers as Schainblatt [6], Patterson [7], and Cooper and Kleinschmidt [8]. In addition, individual-level metrics was suggested as the performance evaluation criterion by Schainblatt [6] and Wilson et al. [9], while team-level metrics by Stahl and Steger [10] and Moser [11], and firm-level metrics by such scholars as Cordero [4], Loch et al. [12], and Werner and Souder [13].

Regarding the issue of 'who should measure the R&D performance', Whitley and Frost [14] highlighted the role of researcher himself and his peers during the evaluation process, concluding that it is necessary to involve multiple evaluators rather than just the R&D project directors and R&D center chiefs. By emphasizing subjective elements such as 'self-esteem', Keller and Holland [15] underlined the delicate nature of the R&D performance evaluation process. In a similar vein, Werner and Souder [13] proposed multiple evaluators such as researcher himself, his peers, and external stakeholders.

For the issue of 'with what criteria to measure', there are several references, which explored the impact of more qualitative measures on developing a desirable performance measurement system. Barnowe [16] suggested 'leadership' as a critical performance measurement criterion, while Werner and Souder [13] regarded 'involving diverse evaluators such as researcher himself, peers, and external auditors' as means to utilize 'subjective measures'.

Others offered more comprehensive perspectives [17]. Brown and Gobeli [18] as well as Meyersdorf and Dori [19] put forth that R&D managers should incorporate the TQM concept into the development activities. Werner and Souder [13] presented an integrated measurement system, which combines both qualitative and quantitative metrics at the same time. Griffin [20] was among the first who suggested that it is important to use the method of 'process analysis' in evaluating the R&D performance. Dressler et al. [21] suggested that CSR (Cost Savings Ratio) be used to measure the R&D performance. It is intriguing to note that Hauser and Zettelmeyer [22] proposed that the performance measurement system should be tailored according to the R&D type in point, e.g., Research, Development, or Engineering. Furthermore, they suggested that the performance metrics should be differentiated across different R&D types. In this article, we also make such a distinction in order to develop a practically meaningful measurement system.

There are two deficiencies in the literature. First, each study has focused on a specific subset of issues important for understanding the R&D performance evaluation system in an integrating manner. Most studies have also lacked significant 'empirical implications' largely because of their emphasis on conceptual model development without extensive empirical testing. Our research aims to fill the gaps in the literature by conducting a large scale survey and verifying an integrative research model with the extensive field data.

3. Research framework

In this section, we first discuss the key dimensions considered in our research model, i.e., *who should measure the R&D performance* and *with what criteria*. Then, we develop propositions and discuss specific research constructs.

3.1. Research model—Critical dimensions of R&D performance measurement

The primary constructs of our research model include two critical questions: "*Who should measure the R&D performance*?" and "*With what criteria to measure*?" Fig. 1 shows the framework of our research. We presume that an ideal R&D performance measurement system should take into account the two dimensions, *evaluators* and *criteria*. As indicated in Fig. 1, in this paper we are not trying to show the entire chain of relationship. Our focus is on *how to design an effective R&D performance measurement system based on an optimal* (*e.g.*, *most desirable*) *combination of evaluators and criteria from the R&D personnel's perspectives*. Probing whether there is a positive correlation between the R&D personnel's perception about the fairness of the performance measurement system and the real R&D performance is referred to the existing literature [23,4].

3.2. Propositions

Using the research framework laid out above, we put forth three propositions.