Business Horizons (2010) **53**, 359—369

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Evaluation of performance in a product development context

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KEYWORDS
Performance measurement;
Innovation;
Product development;
Software-intensive products

Abstract In today's competitive environment, the need is greater than ever to deploy product development investments more effectively. To assist managers, we have developed two conceptual tools to support the evaluation of performance in product development. The Performance Measurement Evaluation Matrix (PMEX) helps managers evaluate performance measurement systems they currently use, in order to identify areas requiring improvement. Results from using the PMEX indicate that it is common to associate performance measurements with the efficiency aspects of time, cost, and quality, without monitoring the value created. Performance is largely perceived by managers in terms of time, cost, and quality of the activities in the later phases of the development process. We contend that an effective performance measurement system is based on performance criteria, and then derives measurements based on these. It is argued that there should be a change in the perception of performance, before performance evaluation systems can be improved. The Product Development Organizational Performance Model (PDOPM) assists in developing the perception of performance by relating uncertainty, efficiency, and effectiveness at three generic activity levels within the product development function. The use of our tools provides an improved perception of performance and its measurement, thus enabling improvements to the evaluation of performance.

1. Measuring performance in product development

In today's turbulent and competitive environment, the need is greater than ever to deploy product development investments more efficiently and effectively (Chiesa & Masella, 1996). Performance measurements may play an important role in achieving these objectives. *What gets measured gets done* (Peters, 2002) and *You are what you measure* (Hauser & Katz, 1998) are two well-known statements related to the use of measurements. In the context of evaluating the performance of product development activities, measurements are gaining importance because the effectiveness and the efficiency of

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0007-6813/$ — see front matter
doi:10.1016/j.bushor.2010.03.001

these activities not only determine a firm's competitive advantage, but also its very survival (Loch, Stein, & Terwiesch, 1996). The methods used in evaluating product development projects have not, however, been improved much during the last 50 years (Rubinstein, 2004). One explanation may relate to the five issues identified by Kuczmarski (2001) with respect to performance measurements within innovation: too many performance metrics, too much focus on outcomes, insufficient frequency, too much focus on cutting costs, and too much focus on the past.

In a recent survey of measurements in product development in the U.S., the following five measurements were identified as being those most commonly used: (1) R&D spending as a percentage of sales, (2) total patents filed/pending/awarded/rejected, (3) total R&D headcount, (4) current-year percentage of sales due to new products released in the preceding X-number of years, and (5) number of new products released (Teresko, 2008). These measurements are, without doubt, important; but, they do not support the evaluation of the current performance of the product development, since all of the measurements are either resource (cost) oriented or output (outcome) oriented, in line with the findings by Kuczmarski (2001). Early activities of the product development process—often referred to as the fuzzy front end—are not considered. Tough, effective management of the fuzzy front end activities of the product development process is one of the most important, but difficult, challenges facing innovation managers (Kim & Wilemon, 2002).

The overall aim of our inductive research is, in broad terms, to explore how performance is perceived and evaluated in the development of software-intensive products; that is, products incorporating software, electronics, and mechanical components, usually developed in large organizations, in a business-to-business setting. This qualitative inductive research used focus group interviews (Patton, 2002) followed by multiple exploratory case studies (Yin, 2003) as the main sources in collecting data. Software-intensive products usually have long life cycles and are becoming increasingly software intensive. Development activities are best described as incremental or evolutionary, rather than radical, in character. Normally, there is a platform or architecture as a basis, in order to be able to manage the technical complexity of a product and reduce the development time and resources required to include new functionality.

The focus group interviews were performed with senior managers of product development from eight organizations; managers were selected on the basis of their experience in developing software-intensive products. Participants were representatives of international companies, with the exception of one management consultancy firm, all being active in Sweden. Even though the companies develop different products within transportation, telecommunications, automation, and the automotive industry, they all share the same challenges in evaluating the performance of their product development activities. The aim of the focus group interviews was to identify and understand what is important for successful product development activities. Since none of the participating companies were direct competitors and share many of the difficulties, it was possible to have open, constructive discussions during the interviews. The outcome from the focus group interviews was a categorization of success factors, which was used as input toward the development of a framework for evaluating the performance measurement system: the Performance Measurement Evaluation Matrix (PMEX).

The PMEX is a tool that can be employed by managers to evaluate the performance measurement system they use; this incorporating a matrix having the success factors enabling high performance as one dimension and the gate model representing the timeline, when the actual measurement is conducted as the other dimension. By mapping a performance evaluation system into this matrix, it is possible for managers to evaluate their evaluation system. Are they measuring what is important for performance? Our findings from exploratory case studies using the PMEX are that early activities of the product development are neglected and the focus is on later stages of the development, when it is expensive or too late to change the current project.

The primary sources of data collection in the exploratory case studies were 54 semi-structured interviews, the interviewees being mostly line managers, project managers, product managers, and other decision makers at five case companies. All of the interviewees were asked how they perceive performance in product development. The results indicate that the perception of performance is focused on the efficiency of the later phases of the product development process in terms of time, cost, and quality. The effectiveness perspective—for example, "Are we developing the right product?"—is not considered. It seems as if measurement influences the perception of performance, instead of the reverse. No common perception of performance was identified within the case companies.

To enable a common and more holistic perception of performance, we developed the Product