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Assessing the relationship between practice changes and process improvement in new product development

Harvey Maylor*

School of Management, University of Bath, Bath BA2 7AY, UK

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Abstract

This paper reports the findings of a study into the process of new product development. Specifically, it challenges the limitations of the current research into the relationship between the adoption of new tools and techniques and performance improvements in new product development. The study was carried out on a sample of manufacturing firms. Cluster analysis yields a new classification of firms, which is shown to provide a significant explanation of the relationship between levels of tool and technique usage and managers' perceptions of improvements in outcomes. The existing evaluation of tools and techniques is shown to be deficient in not considering adoption jointly rather than singly. The study shows the benefits of a high level of overall tool and technique usage for improving key competitive objectives in new product development, but with limitations. Significantly, project costs are not improved by a high use of tools and techniques. Improved assessment of tools and techniques should be employed to reduce the gap between the rhetoric and the reality of process improvement. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Introduction

New Product Development (NPD) is currently receiving the kind of attention that Total Quality Management (TQM) did in the 1980s [1]. Furthermore, there is apparent unanimity in the literature with regard to the potential for firms (in both manufacturing and service sectors) to improve their New Product Development (NPD) processes (see for example [2,3]). This agreement is not just in the specialist new product development management literature (e.g. [4]), but

includes marketing and strategy (e.g. [5]), economics (e.g. [6]), sociology (e.g. [7]), operations management (e.g. [8]) and purchasing (e.g. [9]). Two observations from contact with firms led to the present study. The first was that despite an almost universal imperative to improve processes, the level of adoption of tools and techniques that would apparently yield improvements was very varied between firms. The second was the apparently poor understanding on the part of managers, of the nature of benefits that process changes would bring.

The purpose of this paper is, therefore, to determine the pattern of adoption of tools and techniques in firms, and to investigate the nature of the relationship between the tool and technique usage of firms, and the improvements in process performance resulting from

* Tel.: +44-1225-323886; fax: +44-1225-323902.

E-mail address: mnsham@management.bath.ac.uk (H. Maylor).

these. This is to determine whether the actuality of process changes is consistent with the literature on this subject. The evolution of the fourth generation model of NPD processes is discussed, along with its relevance to modern industrial performance. The weaknesses of current approaches are identified and lead to the research objectives, and a revised approach to this economically vital area of management.

The empirical basis of this paper is a study that was conducted across a range of UK manufacturing firms. This was designed to determine the pattern of adoption of tools and techniques and the resulting improvements in NPD processes. Such a finding provides an input into decision-making that will help managers understand which initiatives to undertake and the putative benefits, and guide researchers on how process changes should be assessed in the future.

Based on analysis of the responses, a classification of firms is proposed according to their level of tool and technique usage. The paper then discusses the internal and external validity of the classification, and applies it to predict the level of process improvement being obtained by a firm from the adoption of a pattern of tool and technique usage. This improves on previous work, which has largely focused on critical success factors and on individual techniques in isolation, rather than in combination. The overall benefits obtained from the application of tools and techniques are found to deviate from that predicted from the current literature.

2. Process improvement in NPD

In NPD, performance enhancement is achieved via improving the outcome of the process, the product itself (e.g. through improved performance, manufacturability, meeting customer demands), and improvement in the process itself (e.g. process completed in less time, less iteration involved, reduced development costs). Neither of these types of improvement have to be at the expense of one or other of the conventional considerations in a trade-off relationship, which usually involves the inter-play of time, cost and quality. For instance, it was previously held that the only way to reduce product development times was by the commitment of substantial additional financial resources, and/or the reduction in quality standards. The important difference in the changes proposed in the literature today is that these benefits are obtained through management action in the organisation and disposition of resources, rather than changing the balance position in the trade-off relationship [10].

In organisational terms, the emphasis has shifted from functionally-centred processes to project-centred processes. This requires greater integration of the par-

ties involved in NPD — typically customers, suppliers, marketing, R&D, support functions (such as after-sales-service), purchasing and operations/manufacturing [9,11–15]. Among the implications for managers is the need to re-organise the scheduling of activities. Considerable efficiency gains can be made and significant time savings achieved by making parts of the process that were scheduled sequentially overlap. The optimum degree of overlap is poorly covered in the literature, though it is reasonable to believe that the logic of the process cannot be altered to make all activities run completely in parallel. There is, however, considerable logic in running many of the sub-activities with appreciable amounts of overlap. This increases the intensity of the information transfer between upstream and downstream processes, removing much of the wasteful iteration that otherwise occurs between internal suppliers and customers in the NPD process. Overlapping activities in this way is termed ‘Concurrent New Product Development’ (CNPD) or ‘Concurrent Engineering’.

The following section considers the development and limitations of current models of NPD processes. The methodology for this study is next discussed and the analysis outlined. The implications of the findings are then presented.

3. NPD processes — the integrated approach and associated tools

In order to outline the context in which the study was conducted, the evolution of the *integrated* or *concurrent* approach to NPD will first be considered. Significant limitations of the current models are identified. Next, the role of a range of associated tools and techniques is discussed. Their evaluation in use has been the subject of a large literature, and the basis for this evaluation is questioned.

Rothwell [16] notes the diversity of approaches evident in the management of NPD and has attempted to define these in terms of their historical occurrence. This has resulted in a typology of processes, based around five historical generations. This evolution of NPD is summarised in Table 1. It is one of many categorisations of the development of processes. Cooper [17], for example, also uses an historical analysis, identifying three generations of process. There are significant deficiencies in these classifications of NPD processes, which need to be addressed — the generational model being too broad and only representative of an intention, rather than possessing measurable characteristics. Considerable discrepancy in the firms within this broad group is evident in practice, though again not considered within the literature.

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