AN EXPLORATION OF THE PRE-DEVELOPMENT PHASE OF NEW PRODUCT DEVELOPMENT IN NEW ZEALAND MANUFACTURING SMALL AND MEDIUM ENTERPRISES

A thesis presented in partial fulfilment of the requirements for the degree of Master of Engineering in Product Development at Massey University, Auckland, New Zealand.

WARREN ARTHUR BAIER

2008

Abstract

Developing successful new products in New Zealand Small and Medium Enterprises (SMEs) is difficult due to several factors. These include greater expectations, new technology, reduced product lifecycles, high project failure rates, and the pressures from competition. This presents a significant challenge for a product development team as it leaves companies searching for opportunities to gain an advantage in the market place.

The low level of research performed in relation to SMEs over the past number of years, especially in the field of New Product Development (NPD), has resulted in an increase in interest by practitioners and academics.

This research was aimed at exploring the pre-development phase currently employed by SMEs within the New Zealand manufacturing industry. The purpose was to gauge the understanding and importance of this early stage in NPD amongst practitioners from these SMEs, as the literature highlighted this as an area of weakness requiring empirical research. Specifically, the objectives set for this research investigation were to survey manufacturing SMEs in New Zealand, compare the findings with past and current research on a national and international level, and make conclusions in relation to:

- The nature and complexity of the pre-development activities performed by New Zealand manufacturing SMEs.
- The difficulties and/or limitations New Zealand manufacturing SMEs encounter whilst implementing the pre-development activities.
- The importance of and attitude towards the pre-development phase with regards to the overall NPD process and the company's product development efforts.

The study consisted of a questionnaire survey, run during June and July 2007 with twenty-two SMEs representing the light engineering/manufacturing, electronics, and food industry sectors. The questionnaire survey was followed up with one-on-one interviews with some of the participating companies allowing for both quantitative and qualitative data to be obtained.

The research investigation found that the difficulties in carrying out the five pre-development activities studied were common, compounded by the lack of skills in-house to do so. Of the five pre-development activities studied, the preliminary technical analysis was found to be given the most attention by the companies with regard to overall project time, with lesser emphasis placed on the other four activities. Many of the companies developed 'new to the world' products or entered new markets with existing products where they primarily took part in the business-to-business market. Good relationships existed between the manufacturing SMEs and their suppliers, distributors and customers.

Management were found to have a high level of involvement in product planning, as they tend to be involved in key decision making in NPD in SMEs. Many of the companies had difficulty when it came to identifying opportunities and customer needs, with the addition of numerous barriers limiting the implementation of NPD. The greatest difficulties arose during the practical implementation of tools and techniques due to several challenges, such as limited budgets, lack of time and resources as well as incompatibility within the existing company culture.

Clearly, the pre-development phase is the basis for the remainder of the NPD process with essential development decisions being made here. This phase is therefore crucial in determining the likely outcome of NPD projects. The research findings suggested that greater consideration and effort should be placed on the pre-development phase, even more so with the cost increasing exponentially when mistakes are made later in development. The study highlighted the need to improve the tools and techniques available for use during the pre-development phase, as companies are aware of its importance but find it the most difficult to undertake. High new product failure rates; over-expenditure of project time; lack of awareness, commitment, and formality; and the high level of difficulty experienced by the New Zealand SMEs studied, suggests there is a need for the implementation of better tools and techniques during the pre-development phase to aid successful NPD in New Zealand manufacturing SMEs.

Acknowledgements

I would like to acknowledge those that helped me over the period of this research by providing advice, support, and encouragement. This thesis would not have been possible without it.

I would like to express my sincere gratitude and appreciation to many people who made this thesis possible. In particular, to my thesis supervisor, Doctor Aruna Shekar, I thank her for her assistance, encouragement and expert guidance. Many thanks also go to Professor Olaf Diegel for his assistance during the initial and closing stages of this research project.

I would like to show my appreciation and gratitude to the Massey University Scholarships Committee for awarding me with the Catherine Baxter Scholarship. It was a great honour to receive this scholarship.

I would like to give special thanks to Thomas Giordano (United States of America) for making himself available and taking time to answer questions that relate to this research project drawing from his extensive knowledge gained over his 28 year career with Philips Medical Systems.

I am grateful to all my friends, colleagues and the administrative staff of the Institute of Technology and Engineering, Massey University for creating and maintaining a helpful and very friendly atmosphere.

A big thank you needs to be given to the companies who took the time and effort to participate in the research. This thesis would obviously not have been possible without the information and feedback received from their responses.

Finally, I would like to thank my family for their patience, love and support which enabled me to concentrate and complete my work.

Publications

A research paper, co-authored by Dr. Aruna Shekar, based on this research study was submitted and accepted into the Industrial Engineering and Engineering Management (IEEM) 2008 Conference held in Singapore during the month of December, 2008. The paper will be presented at the Conference as well as being publicised in the Conference proceedings. A copy of this research paper is included in Appendix I.

Table of Contents

Definitions

Pre-development Phase, Front End (FE), Pre-phase 0, Pre-project Activities: "The messy 'getting started' period of product development. Preceding the more formal product development process, it generally consists of three tasks: strategic planning, concept generation, and, especially, pre-technical evaluation. These activities are often chaotic, unpredictable, and unstructured. In comparison, the subsequent new product development process is typically structured, predictable, and formal, with prescribed sets of activities, questions to be answered, and decisions to be made" (Belliveau et al., 2002, p.444).

New Product Development (NPD), Product Development (PD): "The overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and commercialization of a new product. Also frequently referred to just as 'product development'" (Belliveau et al., 2002, p. 450).

Small and Medium size Enterprise (SME): There is no official definition of an SME in New Zealand. However, according to Organization for Economic Co-operation and Development (*The OECD small and medium enterprise outlook*, 2000) they are considered to:

- Involve personal ownership and management
- Have few or no specialist managerial staff
- Be no part of a large business enterprise

In addition to the above, Cameron and Massey (1999) and the Ministry of Economic Development (2007) define a SME as an enterprise employing between zero and 99 employees whereas of February 2006, SMEs made up 99.4 percent of New Zealand enterprises (*SMEs in New Zealand: structure and dynamics*, 2007).

New Zealand Manufacturing Industry: Companies within the New Zealand manufacturing and production industry have been defined by Statistics New Zealand (2007) as: those producing "goods from raw materials or assembles products from components. It supplies the domestic and international markets and some specialist niche markets".

List of Tables

List of Figures