Performance Impact of Concurrent Engineering on Product Development in 2-Wheeler Auto-Industry

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ABSTRACT: In the recent times, introducing a new product in any industry has become a challenge in order to align the product features with the customer satisfaction, compete with other vendors and increase the business benefits. Concurrent Engineering has considerable significance in the product design and development especially new products in automobile industry and other industries. Concurrent engineering is indisputably the wave of the future for new product development for all companies regardless of their size, sophistication, or product portfolio. In order to be competitive, firms must alter their product and process development cycle to be able to complete diverse tasks concurrently. The aim of the paper is to evaluate the impact of concurrent engineering in the new product design and development with special reference to automobile industry. The survey presents its evaluation based on the data analysis using cumulative weighed average (CWA) with the help of the data which was collected through a pre-tested, well defined questionnaire. The research findings established that the two wheeler manufacturing companies in India were realizing maximum benefits with the improved performance with the implementation of the concurrent engineering in new product design and development. The research study further recommends that companies must focus on frail areas of product design and development in order to enhance the productivity.

Keywords: New Product Development, Concurrent Engineering, R&D, Process Management.

Introduction

In the rapidly changing product design features and momentarily changing market raising new features to solve the ever changing design problems in order to satisfy the customers. There are many frameworks and approaches available in the design world, but it may oftenly applied during the last stages of the Product Design and Development Process (PDDP) as a unique activity, but it would be integrated more efficiently working from the first stages throughout the whole process according to the Concurrent Engineering philosophy Moreover, they must be able to significantly reduce their time to market and adapt to the changing business environments, because of product's shorter life period. Therefore, concurrent engineering has emerged as way of bringing rapid solutions to product design and development process. Concurrent engineering is indisputably the wave of the future for new product development for all companies regardless of their size, sophistication, or product portfolio.

In order to be competitive, firms must alter their product and process development cycle to be able to complete diverse tasks concurrently. This new process will benefit the company, although it will require a large amount of refinement in its implementation. This is because concurrent engineering is a process that must be reviewed and adjusted for continuous improvements of engineering and business operations. Scott E. Dahne of Westinghouse Electric Corporation (1992) [1] in his paper "A Concurrent Engineering Model of the Design and Manufacturing Process for Electronic Assemblies" writes that the global marketplace for manufacturing of electronics has become increasingly competitive and promises to become even more so in the next decade. In order to remain competitive, manufacturers must utilize the abundant resources of the information age along with the philosophy embodied by concurrent engineering to reduce costs and improve efficiency in all aspects of their enterprise. The study of concurrent engineering (CE) and its implementation has been the greatest themes in the engineering sciences. Many disciplines have developed theoretical literature and empirical findings about the origin, development, transformation, decay, and decline of the system. Concurrent Engineering defined as "a business strategy which replaces the traditional product development process with one in which tasks is done in parallel and there is an early consideration for every aspect of a product's development process". This strategy focuses on the optimization and distribution of a firm's resources in the design and development process to ensure effective and efficient product development process [2-3]s.

Literature Review

Product design and development is a sequence of tasks which are organized in a specific way in order to reach products that meets the requirements of a project. Most of these processes are iterative in order to evaluate and test ideas, concepts or proposals. Ray Gosling in his study "The Reality of Concurrent New Product Development" (1998) [4] have concluded that many companies are going for concurrent

design and redesign of new products by using the new techniques which have worked best in industries. The success of many industries lies in using certain technologies which are in the domain of product development manager. They have also shown that these technologies are better than the high levels of usage of technology. Finally conclude that this type of using workable technologies to develop product has significant effect on firm's investment policy. The limitations are the firm has to train the management in project management and training. The design decision on the number and size of 'chunks' (subsystems, modules, parts, etc.), i.e., the function-component allocation scheme, translates into the number and size of teams working to develop the product. The number and size of the teams determines their internal complexity as well as their external communication requirements. Both factors in turn determine the teams' level of efficiency. Design for manufacturing (DFM) aims at simplifying manufacturing processes, which results—in addition to lower investment—in reduction of process variability and ultimately in faster process rates and higher yields, and thus lower cost. In contrast, DFA generally emphasizes part count reduction, the use of only one assembly direction and the preference of symmetrical parts [5].

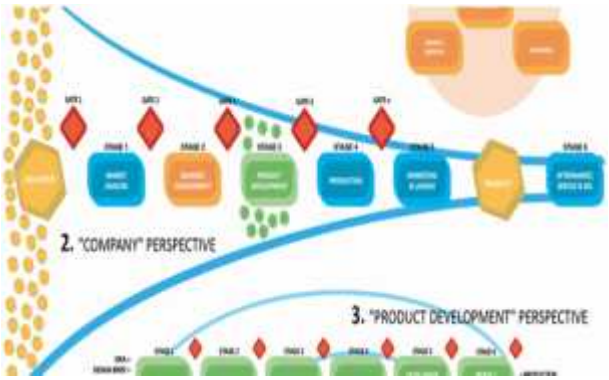

Fig 1. Product Development and Resource Items

Concurrent engineering replaces the more traditional sequential design flow, or Waterfall Model. In concurrent engineering an iterative or integrated development method is used instead. The difference between these two methods is that the 'Waterfall' method moves in a linear fashion by starting with user requirements and sequentially moving forward to design, implementation and additional steps until you have a finished product. In this design system, a design team would not look backwards or forwards from the step it is on to fix possible problems. In the case that something does go wrong, the design usually must be scrapped or heavily altered. On the other hand, the iterative design process is more cyclic in that, all aspects of the life cycle of the product are taken into account, allowing for a more evolutionary approach to design.

As shown in figure 2, the product life-cycle naturally have at least 7 steps and some are complex and time consuming. The concept of concurrent engineering shortens the life cycle time of product development and design stage and getting it to the market and also highlighted factors influencing successful approach of the concurrent engineering [7].

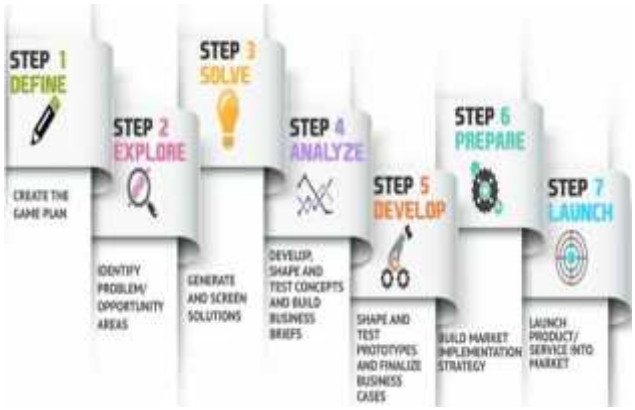

Fig 2. New Product Development Life-Cycle

Purpose of the Study

The objective of the research study is to evaluate and establish the effect of concurrent engineering on product design and development of Indian two wheeler automobile industries.

Methodology

Evaluation of the research study is based on the data analysis of the primary data using Cumulative Weighted Average statistical analysis technique. The primary data was collected through a well-structure questionnaire from the 91 respondents of design, production and marketing groups of two wheeler manufacturing companies in India. The questionnaire was sent to 200 respondents of 3 automobile companies of Chennai and the usable response rate was 56% and the data is presented in Table 1.

Table-1
Response Rating of the Survey

Type of organization	Number of Organizations		Response Ratio (in %)
	Question-naire Sent to	Response Received	
Two Wheeler Industry Automobile manufacturers	05	05	100%
No. of Respondents	200	112	56%

Data Analysis and Interpretation

The data pertaining to the impact of concurrent engineering in new product development in two wheeler manufacturing companies are presented in the Table 2.The scores of CWA that are determined from the primary data are plotted on a radar diagram as illustrated in Figure 3, which summarizes the affect of each factor.

The data presented in the Table 2, clearly establishes that the realized benefits of concurrent engineering in new product development of two wheeler companies is considerably high.

In specific, the variables of benefits with CWA score is greater than 3.5 on a 5-point scale: Contribution in reduction of time to market, Ensuring rank the consistency of value of the product in project portfolio structure, intensity of NPID to align with the business strategy, level of optimum composition of products in project portfolio, level of the data availability for product-performance-evaluation, improvement in production planning development process, abilities of NPID in ensuring Competitive Edge, Level of NPID effectiveness in balancing revenue, usage of advanced technologies in proto-typing, role of NPID in reducing market failure rate.

Table- 2:

Effect of Concurrent Engineering on PD – CWA Scores

Factors that Impacting the Concurrent Engineering	CWA
Rank the consistency of value of the product in project portfolio structure	3.78
Intensity of NPID to align with the business strategy	3.62
Level of optimum composition of products in project portfolio	3.86
Level of data availability for product-performance-evaluation (PPE)	3.71
Improvement in production planning development process	3.35
Abilities of NPID in ensuring Competitive Edge	3.61
Level of NPID effectiveness in balancing revenue	3.22
Usage of advanced technologies in proto-typing	3.72
Role of NPID in reducing market failure rate	3.85

(Source: Field Survey) CWA: Cumulative Weighted Average

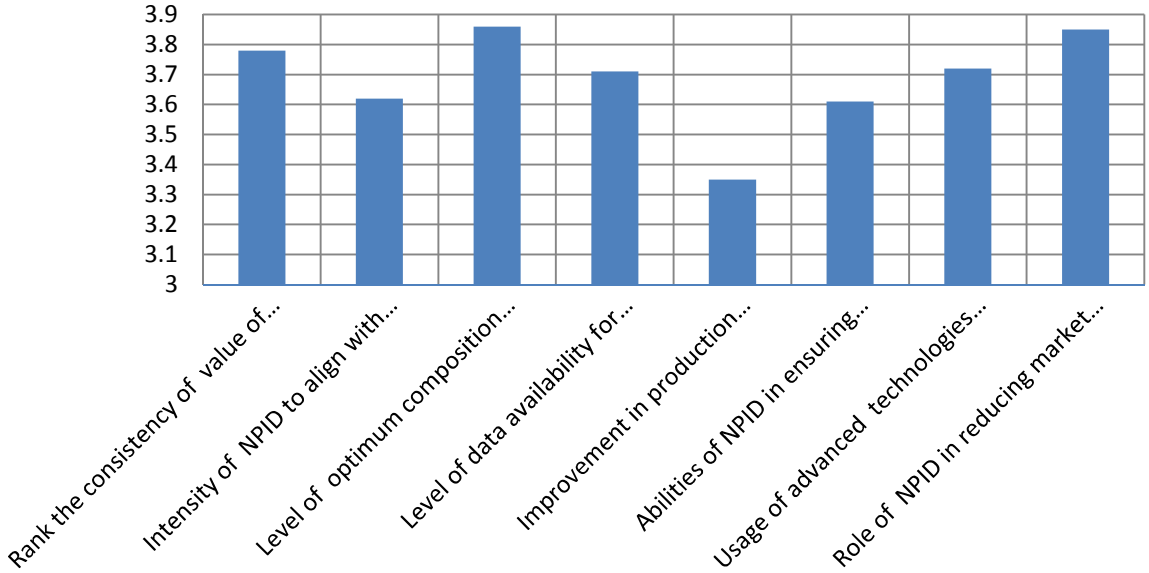

Fig.3: Impact of concurrent engineering in automobile industry

Conclusions

Concurrent engineering has great impact on new product design and development in Indian two wheeler automobile companies. The design and development of products have to have significance efforts for sustainability because of growing competition in the market. Also the customer's preferences are changing day by day as the purchasing power of the individuals is growing due to increased level of earnings. Even though companies that implementing concurrent engineering is able to realize maximum benefits and performance, they need to focus their attention in identifying the appropriate cutting-edge technologies for proto-typing and thus increased the cost savings on product development.

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