Available online at www.sciencedirect.com

ScienceDirect

Procedia CIRP 50 (2016) 65 – 69

www.elsevier.com/locate/procedia

ru26th CIRP Design Conference

Manufacturing involvement in new product development: An explorative case study in heavy automotive component assembly

Mariam Nafisi[a,b], Magnus Wiktorsson[b], Carin Rösiö[b,c]

a Scania CV AB, Södertälje, Sweden
b Mälardalen University, Eskilstuna, Sweden
c Jönköping University, Jönköping, Sweden

* Corresponding author. Tel.: +46-855-383-383; *E-mail address:* mariam.nafisi@scania.com

Abstract

A clear and well-defined new product development (NPD) process, cross-functional development teams and project fit with manufacturing resources and skills, are three areas critical to achieve lower cost, high quality and short time to market in NPD. However it is not clear who from manufacturing function should be involved and in which phase during the NPD project. In order to address this issue, the purpose of this paper is to identify how and when manufacturing functions such as engineers and operators are involved in a NPD project. Results from a conducted case study in heavy automotive component assembly show that manufacturing engineers have been more actively involved compared to manufacturing operators during the early phases of the studies NPD. It confirms earlier results that it is not easy to involve operators in the early phases of project due to abstraction and ambiguity associated with early design.

Peer-review under responsibility of the organizing committee of the 26th CIRP Design Conference

Keywords: New product development; cross-functionality; manufacturing; assembly

1. Introduction

The new product development (NPD) process is usually defined as a process with a series of activities that result in the final product. Ulrich and Eppinger [1] state that a process flow diagram can be used to illustrate the product development process since this process follows a structured flow of activities and information. In the generic NPD process as shown in Figure 1 there are six phases in this process which are principally followed by a gate to check that the phase is completed. Most organisations have these development methodologies in the form of a structured phase gate process for NPD. In a survey on product development performance metrics and practices within 211 US businesses, Cooper and Edgett report that 90 percent of the best performers, compared to only 44 percent of worst performers, have a clear, defined new product development process that guides NPD projects from idea to launch [2].

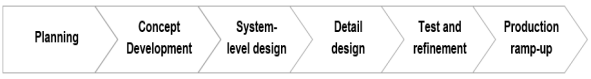

Fig. 1. A generic NPD process by Ulrich and Eppinge [1]

In addition to an implemented structured NPD process, *cross-functional development teams* is a key success driver to achieve lower cost, high quality and short time to market in NPD. Simultaneous engineering, joint product and process development or concurrent engineering (CE) are established approaches in which activities overlap and multiple departments collaborate from the beginning [3]. The fact that activities are carried out at the same time or overlapping by different groups requires an efficient coordination with project organizations that are dedicated to a certain project. Most often manufacturing system should be updated and developed when new products are developed to ensure that the product can be manufactured when customer orders are placed. Figure 2 shows

Peer-review under responsibility of the organizing committee of the 26th CIRP Design Conference
doi:10.1016/j.procir.2016.04.201

the interface between product design and manufacturing system design in NPD projects. It is important to work cross functionally and communicate efficiently in NPD project since there is dependency between functions and their deliveries [4].

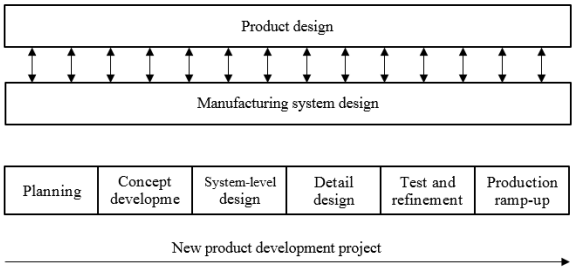

Fig. 2. Product design and manufacturing systems design in NPD process

There are different factors that have proved to be significant in successful NPD through various research studies. Cooper [5] mentions factors such as: A strong market orientation, a unique superior product, a strong market launch, an attractive market, synergy in a number of areas, top management support as well as good internal and external communication. The factor 'synergy in a number of areas' pertains how fit the project is with corporate resources and skills in the areas of technology, marketing and manufacturing [5].

The majority of these factors, and especially the project fit with manufacturing resources and skills, are influenced earlier than in the detailed product design phase (see Fig 1) in the NPD process. In the concept development phase, various requirements from e.g. sales, service, purchasing and manufacturing are gathered and balanced. However, there seems to be a tendency to consider upstream communication as more closely associated with greater success in meeting customer requirements rather than manufacturing-related requirements [6]. Research results from 20 American manufacturing sites indicates that achievement of manufacturability is strongly associated with communication between designers and downstream processes such as manufacturing [6]. In an early survey with data from 1991, only 9% of the investigated companies reported any type of early manufacturing involvement in new product development projects—that is, involvement in the concept development stage [7].

Manufacturing requirements can be best expressed and evaluated by persons that work in the manufacturing system, e.g. manufacturing engineers, manufacturing supervisors and operators. They can provide useful insights and feedback in the NPD to the design of a product. There is previous research that indicates the importance of NPD team integration and manufacturing involvement on the results of NPD [4] and [7]. In the review by Dekkers et al. [8] of the literature and empirical evidence on how to manage the interface between 'product design and engineering' (i.e. NPD) and manufacturing, the Integrated Processes and Coordination is identified as one key area of research. The transition from the engineering phase to the manufacturing stage is one key area of research, where formalised approaches and specific launch teams have been pointed out as potential success factors [9]. The relation between adopted practices for manufacturing involvement, such as concurrent engineering and design for manufacturability, and the success of the NPD process have been studied in initial studies [7] and [10]. However, the empirical evidence of the impact of manufacturing involvement in NPD in the results are generally weakly investigated [6]. In fact, the literature gives few, if any, details on manufacturing or operations involvement.

Based upon this identified research need, this paper addresses the following question: *How and when is manufacturing personnel (such as engineers and operators) involved in early phases of new product development, to safeguard that manufacturing system requirements are communicated to product development teams?* This serves as a current state analysis of how manufacturing personnel are involved in a typical NPD project. The result advances the knowledge on the involvement of manufacturing in NPD process in order to identify shortcoming and improvement possibilities, and serves as an initial exploratory base for further studies within the area.

2. Method

The findings of this paper are obtained through an exploratory single case study. Single case study method which is used in this study is considered to be appropriate since it allows investigating a contemporary phenomenon in depth in its real world context [11]. In case study research, the researcher does not control the phenomenon. These criteria apply to the question that this research attempts to address.

2.1. Case description

The case company is a large company that manufactures heavy automotive. The design and product development is centralized while manufacturing and assemblies are present in several countries. A new product development (NPD) project is chosen to be studied where a new product consisting of several components is being developed. At the time of the study, the project was in late detailed design phase and the production system was undergoing changes to be able to produce the new product. The unit of analysis is the interactions between manufacturing and product development unit. Involvement of manufacturing functions (personnel) in early phases of NPD is in particular interesting in this study.

2.2. Data collection and analysis

Eight in-depth face to face interviews by one of the authors with research and development (R&D) project leader, manufacturing project leader (MPL), and manufacturing engineer were conducted over a period of four months. The interviews lasted for 30-60 minutes. An interview guide was developed and followed during interviews. Interviews were