

Chapter 3

Design for Additive Manufacturing and Advanced Development Methods Applied to an Innovative Multifunctional Fan

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ABSTRACT

In an increasingly competitive business world, the “time to market” of products has become a key factor for business success. There are different techniques that anticipate design mistakes and launch products on the market in less time. Among the most used methodologies in the design and definition of the requirements, quality function deployment (QFD) and design for Six Sigma (DFSS) can be used. In the prototyping phase, it is possible to address the emerging technology of additive manufacturing. Today, three-dimensional printing is already used as a rapid prototyping technique. However, the real challenge that industry is facing is the use of these machineries for large-scale production of parts, now possible with new HP multi-fusion. The aim of this article is to study the entire product development process taking advantage of the most modern models and technologies for the final realization of a case study that involves the design and prototyping of an innovative multifunctional fan (lamp, aroma diffuser and

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fan) through the Multi Jet Fusion of HP. To begin with, issues related to the DFSS, the QFD and their application to identify the fan requirements are explored. Once the requirements have been defined, the modern CAD design systems and the CAE systems for the validation of the case study will be analyzed and applied. Finally, HP's Multi Jet Fusion methodology and design rules for additive manufacturing will be analyzed in detail, trying to exploit all the positive aspects it offers.

1. INTRODUCTION

New product development means new products for the market that have never appeared before. In some cases, these already exist on the market, but they are new to the company. A process of product development can also take place in terms of improving products made by the company and on the market, seeking to reduce costs. Generally speaking, innovation can be defined as market-pull innovation (starting from customer needs), technology-push innovation (made by scientific breakthrough) and design driven innovation.

The development and launch of new products in the market is one of the most frequent activities in the business environment and it is always a very risky action to take up. In many sectors, the ability to develop new products quickly and efficiently has become a fundamental and indispensable element for the success of the company. Therefore, the positive outcome of businesses depends on their ability to identify the needs of consumers, to design and manufacture products that meet these targets quickly and at low cost. Reaching these objectives is not just a commercial or design problem: it's closely linked to innovation and product development that involves all the company functions. For these reasons it is necessary to build and adopt modern models, processes and technologies to minimize risk and costs. In addition, nowadays businesses are marked by:

- Strong product customization
- High production mix
- Variability
- High quality
- Low Time to Market
- Prices

In order to fulfill these goals, businesses implemented different types of resources. For instance:

- Flexible manufacturing systems
- Product development techniques
- High product modularity
- Flexible Automation
- Integrated production systems and new technologies

For decades, economists and researchers have been focusing on the entire process of product development. A generic process involves different stages as shown above. The whole process can be compared

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