Chapter 1

Product Development Process: An Introduction

The product development process is a sequence of all the required activities that a company must perform to develop, manufacture, and sell a product. These activities include marketing, research, engineering design, quality assurance, manufacturing, and a whole chain of suppliers and vendors. The process also comprises all strategic planning, capital investments, management decisions, and tasks necessary to create a new product.

An important part of product development is the engineering design process, which can be defined as the process of devising a system, component, or process to meet desired needs [21]. Engineering design consists of several sequential and/or parallel activities that begin with identifying a need and conclude with a ready-to-manufacture product (prototype). The prototype is considered to be the first product completed in the production process. It is produced by using all manufacturing processes and test procedures called for by the design drawings and specifications.

1. THE EVOLUTION OF PRODUCT DEVELOPMENT

Product development is evolving from a sequential process carried out primarily by engineers to an integrated process incorporating a cross-functional team. Similar steps are followed in either case, but they are accomplished concurrently and with higher speed in the integrated process environment.

Four logical groups of activities can be identified in product development [20]:
• Identifying an opportunity or demand for a new product
• Creating the technical specifications for the new-product idea
• Developing the manufacturing process to produce the new product
• Fabricating the new product

In the first group, markets or potential markets are analyzed to generate customer needs, meaning the customer will eventually generate the requirements for the desired product features and functions. Market information is usually compiled by marketing specialists, who translate it into a set of product features or product descriptions that are intended to satisfy a certain target customer base. Also, this process includes analyzing other products that meet the target needs, offered by competitors, to find their points of both strength and weakness so that efforts can be made to overcome weaknesses and improve desired features. Selling-price ranges are also estimated at this point by analyzing the pricing of similar products. This, in addition to a value of desired profit margin, will set the criteria for the economic feasibility of the new product. These data are translated into cost and quality specifications.

The next step is to formulate the product into a concept based on the product feature set identified by marketing in the previous step, i.e., a first vision of how the product will look and perform is created. Then the technical specifications of the product are developed. Using this initial conceptual vision, the design process proceeds to design and test the product until a preliminary design is finished. Then a prototype can be created and tested to make sure that the product is functioning as it should. The prototype is considered the first finished product in the sense that it must be produced using all the manufacturing processes that the actual products will go through. Prototype testing may reveal a need for design modification; thus, the design will be refined and a new prototype produced. This will continue until no more modifications are required. The next step is to finalize the product documentation, and then the manufacturing process development may be initiated.

Manufacturing processes must be created so that the product can be produced in the production facility. Purchasing new equipment and training workers may be required if new technology is to be used. Tools, fixtures, and the sequence of steps in the manufacturing processes must all be developed to allow rapid, high-quality, cost-effective production. Also, it may be needed to rearrange the production facility to adapt to the new manufacturing processes.

After completing the product design and the manufacturing processes development, the business of producing and shipping the product begins. Raw materials can be purchased, and the production facility can go into operation. During first production periods some problems may arise as a