

TIME-DRIVEN PRODUCT DEVELOPMENT

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Abstract

The product realization process consists of product planning, design, process planning, and manufacturing. The development time is an important factor. Accelerated development of the product results in a longer sales life, a marketplace advantage by early acquisition of customers, a pricing advantage for the company, and the ability to use more up-to-date technology in the product. An increase in development time has a much greater effect on profits than an increase in production costs or development costs. The decision regarding accelerated product development must consider the trade-off among the parameters of interest such as product features, product cost, development speed, and development expense. Often, the development of a product is delayed in the early stages because no one in the company realizes its importance. Another factor that can cause delays is when a company tries to develop an entirely new product, often using new technology. There is less risk if a product is improved in stages, using only tried and tested technology. The chief factors that facilitate faster development of products are better communication between departments, which also leads to lower cost and higher quality products. The company increases its market share and enjoys higher profits through the early introduction of a product.

Key words

manufacturing, product, time-driven development

Time-driven product development

There is more competitiveness in manufacturing over the last years. The key ingredients of product innovation and quick development actuate products to market. The time from the moment that a company realizes that a product should be developed to the time it is in the customer's hands can be reduced by applying certain techniques of time-driven development.

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This is a procedure used by management to focus on reduction of the time taken to develop a product. There is the possibility of a 50 percent time reduction by companies that have applied the method of time-driven product development. Competition on the market requires that producers be able to present to customers products that are low in cost with attributes such as short delivery time and high quality. There are several steps in the production process, such as engineering aspects including planning, design, and manufacturing. The product specifications list and the product structure are important factors of a product's characteristics set during the planning phase. A management point of view must include a compromise study to determine the economic acceptability of rapid product development, product innovation by stages, and the overlapping of activities in planning, design, and manufacture.

Conventional product realization process

The product realization process consists of two steps: design and manufacturing. In order to understand the process, it is necessary to look at the whole life of a product, which begins with its planning and ends with its disposal.

Steps in the Product Realization Process

The *need* for a product must exist, and may come from external or internal sources. The external causes are a direct order from a customer, an outdated existing product, the availability of new technologies, or a variation in market demands. Internal to the company, new product ideas may come from developments within the company or the needs identified by the marketing department. After the need is established, the product has to be designed and manufactured. It must be said that in this process, which is sequential, each step must be completed before the next step begins, and this fact shows that this procedure can lead to delays, mistakes, poor quality, and high costs. Activities in the successive stages can be concurrent or overlap.

Product Planning is the selection and development of ideas for new products. A systematic approach to product planning should lead to a better means of meeting the constraints of cost and time. There are several activities like establishment of goals, market analysis, detailing of the customer's benefits from the product, deciding on the product's features, establishment of product performance parameters, economic analysis and setting the cost target, setting the expected sales volume, setting deadlines for completion of tasks, such as design, prototype building, and setting up the manufacturing line. The two most important entities involved in making the decisions are the company and the market. The company needs to define its objectives and examine its capabilities. An evaluation of resources and objectives will help focus the company on the type of product it should develop.

Design. The first major step in the design of a product is the preparation of the requirements or specifications list. The specific requirements are classified according to the life phases of the product and types of requirements (technical, economic, ergonomic, legal). Most important are the technical requirements for the product use. Conceptual design is the most important phase of design; it has the single largest influence on costs. Embodiment design leads the process through a more concrete stage, as the shapes and materials are determined. The final design phase leads to production drawings. The final decisions on dimensions, arrangement, shapes of individual components, and materials are made. The design proceeds

from the more abstract level of task clarification to the more concrete form as it approaches this phase.

Process Planning. Known also as production or manufacturing planning, process planning involves decisions on how the product is to be manufactured, the manufacturing processes, the machines required, and how the parts are to be mounted. The steps in process planning are producibility analysis, process design, vendor selection, and tooling design.

Manufacturing includes material handling, production of parts, quality control, and related activities. Items such as overall design arrangement of the manufacturing process, form design of components, materials for components, and purchased parts related to production capacity have the largest influence on manufacturing. There are also additional steps of the process, such as marketing and product disposal.

Accelerated product development

A shorter time to market does not necessarily mean higher costs. A well managed program can produce products at a low cost and under the allowed time. It also depends on how the development process is managed.

Cost and Price

From the time when the development of a product begins, its cost starts to grow because of the resources used for its production (personnel, facilities, equipment). The price of a competitor's product decreases with time. There are several reasons for the optimization of the production and manufacturing processes, cost-driven development in design, and increased knowledge about the product.

Benefits of rapid product development

Time-driven product development, in comparison to the conventional development process, yields benefits to a company in many ways, as does extension of the product's sales life. Early introduction of the product gives a marketplace advantage by gaining early customers who lock on to it, develop loyalty, and who are less likely to switch to another product. Also, the company gains a pricing advantage ahead of the competitors. A company that applies rapid development methods on a product later than a traditional company will use more up-to-date technology in the product. The status of the technology indicates what advantage the technology has according to time. The state of technology is advancing. Companies may reach the market with their products in the same time. But there is a difference between the companies, and the company that applies rapid development methods with newer and more advanced technology is at an advantage compared to the company preferring the traditional development process which starts at the same time with technology obtained a longer time ago. The market is a moving target. The length of time it takes for product development is very critical. The longer the time to product introduction, the more uncertain the market forecast will be, and therefore the greater the risk. The effect on profits due to deviations in development time, production costs, and development costs shows, for example, that an increase of 50 percent in development costs can decrease profits by 10 percent, but an

increase of 10 percent in development time can reduce profits by up to 30 percent. Therefore, it benefits a company to shorten the development time, even at the expense of some increased development costs.

Management for rapid product development

The primary initiatives in achieving rapid product development must come from the top management of the company. There are several decisions that must be made and procedures to be implemented, for example economic decisions, decisions regarding product innovations, project management, etc.

Economics of Rapid Product Development

Decisions regarding the product development project must be based on facts rather than intuition. It may appear at first that it is difficult to quantify the costs and benefits of the various development goals. Nevertheless, even the use of gross estimations is better and more easily justifiable than an instinctive decision.

The four primary elements to be considered in the product development decision are the following:

- a) The characteristics of the product relating to its performance, which is an important determinant of its market success. The product's public presentation is determined by the customer and the marketplace, not only by satisfying what is in the specifications.
- b) Product cost over its life cycle, including the purchase price and the operating, maintenance, and disposal costs.
- c) Development speed. Time to market is obviously the most critical factor. This is the total time from the moment when someone thinks about developing the product to the time it is in the customer's hands. The speed of product development determines the time to market; it can be important to the success of the product. It pertains to all of the company's departments, not just design engineering.
- d) Development expenses are the one-time costs associated with the development of the product, including the one-time costs associated with the product and extra expenses for items such as overtime, facilities, and consultants. Although rarely an overriding concern, this expense must be justified to the upper management. Rapid product development will show extra costs on the balance sheet and must be justified by savings in time that would otherwise be spent.

Each of these factors needs to be weighed against the other three on the basis of costs and benefits before the decision to proceed can be made. It leads to better decisions and is usually preferable to more sophisticated and complex approaches and is certainly an improvement over a decision based on intuition only.

Early Stages of a Project

The lack of management of a product in its earliest phases can account for the greatest loss of time. A project can become inactive without people realizing it, as there is no one responsible to keep track of it; there may be several reasons for this. There might be a perceived need for the product but not enough importance is dedicated to it. The company might be not sure it

has the technology for all parts of the product, or is not sure the expenses of the product increase only after its importance is recognized, while the market window of opportunity is closing.

Product Innovation by Phases

In all new projects, there is a certain level of novelty, which includes unknowns and therefore more risk is attached to the product's development. Rather than innovation on the whole product, as far as possible it is better to improve only on parts of the product one at a time.

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