Traditional Product Development Process:  
A Guide for Sustainable Entrepreneurs

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Traditional Product Development Process

§1 Introduction

This Guide describes the traditional product development process, including the role of each functional group in the development and launch of new products; identification and selection of new product opportunities; creation and evaluation of new product concepts; technical and marketing aspects of the actual development of new products; strategies and procedures for launching new products; and modifications or updates to existing products. The Guide also discusses various strategic and organizational issues that commonly arise in connection with product development activities, including the formation and management of product development teams; creation and implementation of marketing plans; common problems in the product development process; product discontinuation; evaluation of the product development process; and conditions for successful product development.

§2 Stages of the product development process

While there are many ways to describe the stages that must be completed in order to successfully create a new product, a common ordering used by many consultants and new product managers is as follows:

- Identification and selection of new product opportunities;
- Generation of product concepts that might satisfactorily address the new product opportunities;
- Evaluation of the new product concepts;
- Concept testing and initial formal definition of the new product;
- Formal product development, which includes discrete technical and marketing activities; and
- Product launch.

Companies may vary the stages listed above in an effort to simplify the process or knowingly shift the emphasis toward a particular way of conducting their business. For example, it is quite common to see companies combine the first three stages into a single activity that might be referred to simply as “Opportunity Identification and Selection.” On the other hand, the “development” and “launch” stages can easily and rationally be combined to recognize the need to closely monitor the new product after it has been introduced to the market to determine what changes might be required in marketing strategy and even in the design and technical attributes of the new product.

Not surprisingly, there are a number of variations when it comes to product innovation models and researchers such as Cooper and Kleinschmidt have broken the process out into thirteen successive activities: initial screening, preliminary market assessment, preliminary technical assessment, detailed market study/market research, business/financial analysis, product development, in-house product testing, customer tests of product, test market/trial sell, trial production, pre-commercialization business
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analysis, production start-up and product launch. While those researchers found evidence that new products were more likely to be successful if all of these activities were handled correctly, a finding confirmed by others, they also discovered that in the real world only a small segment of companies actually complete all of these activities. Another example is offered by Kono and Lynn, who identified four stages of new product development that included both strategic and operational elements: development policy (i.e., long-range product-market strategy, strategy for product areas, strategy for product development, collection of new ideas and organization of project teams); new product ideas and concepts (i.e., policies on market segmentation and product differentiation, collection of information on market and technology and definition of “concepts” and assumptions); trial model and testing (i.e., creation and testing of models, evaluation and selection, name/packaging/advertising strategies and test marketing); and launch and follow-up activities.

Obviously, while a linear sequencing of each stage of the product development process is useful for general explanatory purposes, the more realistic view must take into account that all of these stages are actually overlapping. Therefore it is common to find that many activities are going on, in some form, at the same time and usually well in advance of the stage where they will take on a primary focus. For example, while senior executives and other involved in the strategic planning process for the company are engaged in consideration of broader strategic issues as they attempt to identify new areas to which company resources should be devoted, engineers will already be working on technical issues that may have to be resolved in order for business strategies to be implemented. Similarly, the marketing group must provide continuous input on existing products which can then be used to gauge how the launch on a new product will impact the company’s overall product portfolio.

Step-by-step models have been praised as “rational tools intended to guide the decisions of product management across the entire process” and thus introduce discipline, control, efficiency, predictability and mechanization. Problems with this model, however, which has contributed to widespread rejection of what has been referred to as the “complete stage-gate approach”, include complaints about rigidity, time consumption and unsuitability to an environment in which product life cycles are shrinking. As a result, researchers have suggested alternative models of product innovation. For example, the “compression” model starts with the long-form step-by-step model and then accelerates, or compresses, the process through improved planning, simplification of the process through removal of unnecessary steps and overlapping of the remaining ones, supplier involvement and creation of rewards for increasing the speed of development. Predictably the concerns about compression and acceleration focus on lack of quality and

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4 The discussion of the alternative models of product innovation in this paragraph is adapted from M. Pina e Cunha, Determinants of Product Innovation in Organizations: Practices and Performance in the Portuguese Financial Sector (1998), 36-41.
omission of important steps. Another model, referred to as “flexible”, is based on the fundamental premise that the concept development stage should remain open for as long as possible and the innovation process should feature “rapid and flexible iterations through system specification, detailed component design, and system testing”. As the name implies, the goal is to achieve and maintain flexibility thought to be necessary for coping with uncertain and unstable environments; however, skeptics warn of serious delays due to constant modifications to the product concept. Finally, the “improvisational” model suggests that companies should “substitute planning by doing”, since planning is really of little value in unpredictable, high speed environments, and pursue innovation through frequent iterations and simultaneous alternative designs.

§3 Functional roles in product development process

It is common, and largely appropriate, to refer to product development as “innovation,” which has become the hallmark characteristic of emerging companies. While it is easy to oversimplify the innovation process, the creation, development and commercial exploitation of new products typically requires a good deal of cooperation among researchers, scientists, engineers, and marketing and sales personnel, as well as ongoing involvement of senior management. When an emerging company is first launched and is struggling to develop its first product in order to survive the organizational structure is loose or even non-existent and each of parties mentioned above interact continuously and informally with no administrative hurdles. As the company grows, however, a structure emerges and the effectiveness of product development activities becomes dependent on the willing involvement of, and cooperation among, multiple functional groups including research and development (“R&D”), manufacturing and production, sales and distribution, marketing and customer service/support. While each functional group hopefully understands the important of each new product initiative to the company as a whole, problems may nonetheless arise due to the fact that each group has its own unique culture and the members of each group have their own disparate skills and backgrounds.

§4 Research and development

R&D activities cover each of the activities enumerated in a traditional engineering-based model of the stages of the product development process—identification and verification of initial product concept; technical feasibility evaluation; development; testing and full-scale production. In most cases, a company will be involved in several different product development projects simultaneously, each with its own distinct set of risks and milestones. While a good amount of the company’s R&D may be conducted by its own

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6 For further discussion of emerging companies, see “Entrepreneurship: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).
7 For further discussion of the roles and responsibilities of the R&D group, see “Research and Development” in “Product Development and Commercialization: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).
personnel, it is not uncommon for companies to contract with third parties, including universities, to gain access to their special expertise.\(^8\)

§5 --Manufacturing and production

Manufacturing and production involves a wide variety of different activities dedicated to the commercial production of the company's products in quantities, and at rates, which are consistent with market demand for the products. While clearly R&D can be quite expensive, manufacturing will also represent a significant cost to the company, and every effort should be made to reduce manufacturing costs as a way for the company to obtain a pricing advantage over competitors. Activities during the manufacturing and production stage for a new product include construction of manufacturing facilities and related equipment, design and implementation of quality control procedures, development of a distribution system (i.e., shipment and warehousing processes), creation of customer assistance schemes, and procurement of parts, raw materials and other production items.\(^9\)

§6 --Sales and distribution

The key sales and distribution issue confronting the company is how it intends to make its new products available to eventual end users. There are a number of strategies that might be used, often in combination with one another. For example, the company could develop its own sales force; however, the cost of such a network may be prohibitive, especially if the company is relatively new. In other cases, the company might look to enter into one or more sales representative or distributor agreements with third parties under which the third party would assume the responsibility for selling the company's products in designated demographic and geographic markets. Also, distribution strategies will change as time goes by. As the company grows and acquires the resources necessary for it to develop its own direct sales capabilities, it may be able to reduce its dependence on outside distributors. In other cases, outside distributors will be brought in to assist the company’s entry into new markets, particularly in foreign countries, which are beyond its existing skills and resources.\(^10\)

§7 --Marketing

Marketing activities include a wide variety of issues. Certainly, the company's marketing plans should cover traditional issues such as promotional strategies, pricing strategies, and market identification and selection. However, modern marketing techniques recognize the factors that form the basis for the new simultaneous model of innovation,

\(^8\) For further discussion of strategies for developing and otherwise acquiring technology necessary for product development, see “Technology Management: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).
\(^9\) For further discussion of the roles and responsibilities of the manufacturing and production group, see “Manufacturing” in “Product Development and Commercialization: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).
\(^10\) For further discussion of the roles and responsibilities of the sales group, see “Sales and Distribution” in “Product Development and Commercialization: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).
and properly applied should extend to distribution, and to field service and product support, each of which are important elements of the value provided to customers. As is the case with sales and distribution activities marketing strategies will likely change substantially over time. For example, while demand-based pricing may be used at the beginning of the life of a particular product, at some point it may be necessary for the company to revert to cost-based pricing, particularly when the market becomes more competitive or demand begins to decline for other reasons. Also, entry into specific markets may be deferred until the company has achieved its initial objectives, particularly if further product development work is required to adapt the basic product to the requirements of another market (e.g. foreign markets with specific technical needs).  

§8 --Service and support

Support and service, which focus on activities that occur after the production and sale of the new product, are part of both the company's engineering and marketing strategies. From an engineering perspective, support and service means the ability of the company to provide technical instructions, warranty services and other repairs, spare parts and, in some cases, improvements and enhancements. As a marketing tool, support and service is a means for maintaining customer satisfaction, building loyalty and developing an ongoing relationship that allows the company to further understand the changing needs of its customer base. In fact, post-sale contacts with customers serve as the basis for identifying new product spin-offs or design changes that eventually become part of the company's product portfolio. Also, ongoing field service and support can be an important source of additional revenues to the company.  

As with manufacturing and distribution, the key choices for the company with respect to support and service are whether the company should conduct such activities directly using its own personnel or subcontract with third parties. The company should be mindful of the risks associated with using third party support and service providers. Obviously, any failure by such parties to perform their duties will lead to substantial customer dissatisfaction and harm the company's goodwill. Also, the company may be deprived of the opportunity to maintain regular contact with the end users of its products. Finally, if the company must transfer proprietary technical information to the third party in order for the third party to carry out its duties, there should be legitimate concern that the third party will use the technical information to reduce the company’s competitive advantage.

§9 Strategic planning for new products

There are a wide range of specific tasks and activities involved in the product development process and a great deal of time and effort must be spent on attempt to

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11 For further discussion of the roles and responsibilities of the marketing group, see “Marketing” in “Product Development and Commercialization: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).

12 For further discussion of the roles and responsibilities of the customer service and support group, see “Customer Service and Support” in “Product Development and Commercialization: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).
coordinate inputs from different departments within the company. However, it is important not to let the process overcome the fundamental requirement that any product development initiative must be consistent with overriding company strategy.\(^\text{13}\) For members of the product development team, this means that they must be familiar with the strategic goals and constraints that apply throughout the company and also be able to specifically create their own strategic guidelines to guide their activities as part of the development team.

- Obviously each product development team must be mindful of the overriding strategic mission of the entire company expressed in the company’s mission statement. For example, the mission statement might include very explicit direction regarding the company’s target business or markets, thereby eliminating any new product ideas that fall outside those areas.

- Within the company mission statement may be other clues regarding strengths and perceived competitive advantages that the company should be looking to exploit with its new product ideas. For example, the company may elect to focus on extraordinary design capabilities or a proprietary manufacturing process.

- Companies often signal tactical priorities through internal communications from top managers, such as preferences for being a “fast second” to the marketplace, avoiding direct combat with a specific competitor, relying on internal R&D, and competing on the basis of price.

In addition to these “corporate strategies,” which tend to apply throughout the company, larger firms typically have sub-strategies that apply to families of related products or product development projects. These areas of common interest are often referred to as “platforms,” and can be based on the creation and support of a particular “brand” or broken out into categories based on the type of product or the specific type of customer included in the target market. If the company is interested in establishing and building “brand equity,” it must develop a strategy for the brand and ensure that all products included therein conform to certain specifications. Most importantly, new products that are to be associated with a brand must conform to existing customer expectations regarding quality, performance and value that may already have been developed for other “branded” products. Still another example of a platform is the well-known “strategic business unit,” which formally recognizes the need to create what is, in effect, a free-standing business within the larger company structure to develop and commercialize a related set of products tied to a common technology or market.

Company mission statements and brand strategies are both examples of pre-existing standards and guidelines that might apply to the product development effort. In addition, product development may be based on information collected or otherwise received from other sources. For example, a decision by a key distributor to enter into a new market might cause the company to seriously consider whether it can use its existing resources to create a new line of products that might fit the distributor’s needs. Also, changes in strategic direction might be dictated by regulatory developments, such as approval of the

\(^\text{13}\) For further discussion, see “Strategic Planning: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).
use of new types of materials or the reduction of pre-existing restrictions on specific technologies.

The bottom line is that strategic inputs for the product development team can come from a number of places, both within and outside the company. An important initial task for each development team is to be sure that these strategic objectives are properly factored into the team’s activities. If this does not occur, the team runs the risk of developing product proposals that will be rejected outright for strategic reasons, thereby resulting in significant waste of resources and deterioration of morale and trust. One method for making sure that the team is able to move in the right direction for the group to develop its own strategic mission statement. Such a statement might address all or most of the following issues or questions:

- A description of the circumstances or events that have led to the launch of the product development initiative. In most cases, this is a statement of an identified opportunity to be exploited.
- Identification of the specific core competencies of the company that are to be exploited in the product development effort. For example, the activities of the team may focus on the use of a proprietary technology and/or building on the company’s reputation with specific end users.
- The goals and objectives for the proposed new product, typically measured in terms of profits, growth rates and/or market share.
- Additional rules and guidelines derived from the strategic inputs described above, such as the degree of innovativeness (e.g., first-to-market versus imitative), the timing of market entry, the impact on the company’s existing products or product lines, the degree of competition with specified competitors, and any resource constraints on the development effort (e.g., development costs).

§10 --Product development strategies for technology-based companies

Many companies, particularly those that have attracted the attention and support of venture capitalists, base their survival and success on their ability to develop or acquire innovative technologies that provide the foundation for products and/or processes that are truly revolutionary and which often serve as the catalyst for completely new markets or industries. For these technology-based companies the strategies selected for product development are especially critical decisions. There are obviously an almost infinite number of ideas about how companies should develop and implement their strategic plans and no one method has proven to be so successful that it has been universally adopted by a majority of technology-based companies. A useful point of reference, however, has been provided by researchers such as Abell and Slatter, who have posited several alternative strategies for technology-based companies—dominant sector, product group specialist, market specialist and technology specialist.14 While smaller companies may focus on a single dimension—products, markets or technologies—larger companies

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typically have a mix of activities and may elect to segregate their available resources in a number of different ways.

The overriding challenge for any technology-based company is to select the right projects to pursue at any point in time, monitor the use of available resources and retain the flexibility to divert resources quickly into areas that appear to be of the greatest immediate promise. For example, relatively newer and smaller technology-based companies, the so-called “emerging companies,” expect to thrive and prosper based on their ability to identify, create and commercialise new products that serve important, yet unfulfilled, market needs. In fact, a good deal of the initial business planning for these companies is based, in large part, on steps in the innovation process, particularly product development. However, emerging companies face interesting and difficult decisions as they begin their journey. While the potential payoff associated with the development of “new-to-the-world” technologies is obviously compelling, the risks associated with such a strategy, particularly for a new company with no alternative source of revenues and limited resources, are generally overwhelming. As such, it is not surprising that venture capitalists prefer companies that are pursuing promising new products based on attractive technologies that while young have already been significantly developed and positively vetted as promising and useful in the marketplace. This strategy carries the greatest possibility for relatively rapid revenue generation and allows the company to begin collecting the capital and other resources necessary for taking on more sweeping innovation projects in the future. On the other hand, larger companies with more assets are better positioned to follow one of the more aggressive strategies described below in order to increase revenues and grab market share even at the expense of some short-term erosion of overall profitability.15

§11 ----Dominant sector strategy

Perhaps the most ambitious, and risky, strategy for a technology-based company, particularly when it has just been launched, is seeking to become a “dominant sector” player; that is a company striving for a dominant and central position in a particular industry or sector thereof. This type of company does not specialize in a particular product or market; instead it participates in a number of product lines and customer groups that span the entire industry or sector. A dominant sector player is usually either the first in the marketplace or quick to enter the market after the first mover. Once in a market, the goal is to compete aggressively to achieve a significant market share. The conditions for acting like a dominant sector player include a major or radical innovation that is capable of revolutionizing an existing market or creating an entirely new market and access to the resources necessary to simultaneously enter and pursue multiple product and markets.

15 Reliance on truly innovative products is a preferred strategy for companies looking to increase sales and market share, as opposed to focusing on maximizing profitability and cash flow over the short term. J. Covin, D. Slevin and R. Schultz, “Implementing strategic missions: Effective strategic, structural, and tactical choices”, Journal of Management Studies, 31(4) (1994), 481-503.
As one might expect, there are not many examples of companies that have been successful in a dominant sector strategy. For one thing, a dominant sector player must be able to continue to develop and successfully introduce innovative products for each of its existing markets and for new markets that may emerge within the industry sector. In order to move into new markets, the company must be able to learn the unique requirements of customers in those markets and overcome the efforts of competitors that may be pursuing a more focused product or market strategy. The company must also be prepared to compete effectively with respect to both product and process innovation, including development of strategies to reduce costs of production and commercialization as markets mature. Finally, managers of a dominant sector player must learn to balance the allocation of resources across each of the major functions and must be comfortable with a variety of distribution channel strategies.

A dominant sector player may arise by developing a technologically superior product for one industry that can be continuously adapted and improved to meet the requirements of other industries in fairly rapid fashion. The result of these efforts is essentially the creation of a new industry based on the original product itself. A similar progression is the development and evolution of a company such as Apple Computer, which began with an initial product for the microcomputer market and then grew on the strength of a continuous series of new offerings that ultimately reached into all areas of the broader market of business computer users. The key in each case for the prospective dominant sector player is identifying and exploiting a large and growing industry sector.

§12 ----Product group specialist strategy

Given the extraordinary challenges associated with attempting to become a dominant sector player, most technology-based companies elect to specialize, at least initially, in a particular product line or customer group. Studies of smaller companies have shown that they are more likely to achieve higher growth by focusing on a single product or a narrow product line as opposed to pursuing a more diversified product development strategy. A “product group” specialist bases its strategy on the development of a general purpose product with enough applications and performance specifications to allow it to be marketed and sold successfully in multiple markets. At the beginning the company will generally sell standardized products; however, this strategy does not preclude some customization for particular customer groups. For example, a software company may develop a core platform and then create options that are linked to the main program that meet specific needs of certain types of customers. Obviously, the advantage of this type of strategy is that a product group specialist can approach a larger potential market and is not subject to unforeseen problems that suddenly close down what appeared to be an attractive niche. Product group specialists rely on technological innovation for their competitive advantage and can use the tools of intellectual property law to protect their early investment.

Product group specialists face a number of challenges in successfully penetrating the market initially and in continue to achieve the growth necessary for survival. For example, product group specialists run the risk of investing in technologies or products
that are rejected in the marketplace, perhaps because the company was so focused on technology that it neglected the actual requirements of the customers. Moreover, given that the strategy is based on the ability of the company to successfully develop innovative technologies, there is higher risk that it will fall victim to imitation by others or fail to complete the project before a competitive solution reaches the marketplace. Another challenge for product group specialists is the need to develop customized versions that can compete effectively against products offered by other companies following the market specialist strategy described below. Many product group specialists suffer from a narrow technology basis and limited resources. Any attempt to move into an adjacent product market may be blocked, however, by earlier entrants that have had an opportunity to develop a large market share through first mover strategies. Also, since product group specialists have relatively narrow technical and marketing resources, they are often vulnerable to competition from larger companies that quickly and easily replicate the necessary technology and introduce substantially imitative products that can then be aggressively marketed using their robust marketing savvy and financial resources. An illustrative example is the way that IBM followed Apple into the personal computer market and used its name and reputation to work its way into what Apple had ignited as a truly revolutionary market. Moreover, the need to build and manage large-scale manufacturing and distribution capabilities for initial their products often distracts management of product specialists from the ongoing task of continuing to develop and sell new and innovative products.

Several important conditions must apply in order for a company’s choice of the product specialization strategy to be successful. First, the company must have the technical expertise necessary to develop a robust general purpose product that meets the performance specifications of a large number of potential users. Second, the market for the underlying technology must still be in the emerging stages in order to keep the required development costs as a manageable level. As the market matures, the costs of developing what would truly be a breakthrough product in a crowded market may exceed the budget of a new company with significantly limited resources. Third, the company must be able to enter into licensing arrangements with third parties in various markets that can assist in identifying appropriate customized options for those markets and in distributing the core product in those markets. In addition, the company should anticipate the need to gather sufficient resources to quickly develop specialized products for various markets if it becomes apparent that those markets are likely to be more attractive than others. Taken to its extreme, the company may discover that a full or partial shift from product specialization toward market specialization discussed below may be warranted based on the success of the core product in those markets. In fact, while a limited number of products may be the preferred approach when the company is small diversification often becomes essential as the company matures in order for growth to continue.

§13 — Market specialist strategy

A market specialist player bases its strategy on developing and marketing products that suit the specific needs and requirements of identifiable customer groups (i.e., “markets”).
Rather than competing on the basis of technology, market specialists seek to become leaders in a tightly defined market by providing a comprehensive solution to a recognized problem or need and construct their product lines based on specialized knowledge and experience with particular customer groups. Predictably, products tend to be highly customized and are developed based on feedback received in the course of close relationships with customers. The market specialist seeks to build substantial market share in each of its customer markets by offering a comprehensive and fully integrated set of products and services. As opposed to the product specialist approach, market specialists resist the urge to take on too many vertical markets at one time, realizing they lack the resources to address the needs of all potential user groups and provide adequate support. A market specialist strategy is generally less costly than product specialization and is well suited to companies that were founded by persons with extensive market-specific knowledge and experience. Market specialization is also less risky than product specialization since the market focus is less vulnerable to uncertainties associated with developing new technologies. In turn, the downside of this approach includes the possibility that the chosen market is simply too limited to justify the investment or support long-term growth. Also, market specialists must avoid getting bogged down with satisfying the requirements of one or more pushy customers that realize the company has a limited set of end user alternatives.

A “niche player” is essentially a special example of a market specialist in that it focuses on a unique product or service that is of interest only to a particular user group. Niche players generally have no more than a handful of products, often just one, and the potential market for its product line is extremely limited. Given that a niche strategy generally requires a very limited set of resources and competencies, it is very difficult, if not impossible, for the companies following this strategy to successfully pursue any of the most common diversification strategies to attain growth.

Market specialists of all sizes grow and succeed on their ability to understand and satisfy the specific requirements of identifiable customer groups. Market specialization is a preferred method for new entrants to emerging and growth markets where there are still ample opportunities to locate and service customer groups that have not been approached by larger players. The challenge, of course, arises when competition arises in the specific market and most of the customers have had their initial product and service requirements satisfied. Since the strength of the market specialist is based on marketing, rather than technical, advantages, continued growth will depend on the company’s ability to identify and develop new markets for its existing products. This typically calls for extending current markets by moving into market niches that are adjacent to the company’s traditional areas of activities; however, there are several risks associated with this strategy, notably a lack of understanding of the new customer groups and the real possibility that the company will no longer be perceived as a “specialist” by customers in the company’s existing market segments.

§14 ----Technology specialist strategy
Some companies, rather than focusing on offering tangible technology-based products, build and maintain their business on the basis of being a “technology specialist.” As the name implies, these companies focus on R&D activities in a core technology area and then adopt various strategies with respect to commercializing their resources in this area. The choices made by the company dictate its customer base, its positioning in the marketplace, the required technical and human resources and the form of internal company structure.

Some companies falling into the technology specialist classification are content to limit their functional activities to R&D and to generate revenues by performing contract R&D and consulting services for other companies. Since these types of arrangements generally call for the resulting technology to be owned by the commissioning party, the company conducting the R&D activities does not develop its own portfolio of proprietary intellectual property rights and growth opportunities are severely limited. Successful contract R&D companies understand and appreciate that they are “selling” a service and thus make an effort to provide technical excellence, reliable service and performance and identify potential customers with the ability to understand and pay for the technology in which the company specializes. Contract R&D companies depend on their ability to attract and retain talented technology specialists in order to survive, flourish and build a strong reputation. These companies avoid complex company structures and multiple levels of management and expansion tends to be horizontal as the company takes on projects in new technological areas. In many cases, expansion is preceded by one or more pilot projects, generally outside of any contract with a third party, to gather experience in a new technical area. On occasion, the company will negotiate for ownership rights in certain technology created during the course of a particular project or will conduct its own speculative research work to develop its own proprietary portfolio of technology rights.

As opposed to contract R&D companies, other technology specialists define their business models around product development through speculative R&D rather than focusing solely or primarily on delivering consulting services to others. In contrast to product group and marketing specialists, however, these “core technology specialists” generally limit their product focus to technical products that are highly specialized and sophisticated, which means that the initial market for their work is somewhat limited to customers looking for a window on the future through relationships with these types of firms. The key in this strategy is to select products and customers so as to avoid battling with larger competitors that may be able to overwhelm the upstart with greater marketing and financial resources. If the company is successful, it will develop core technologies that have a wide range of potential applications in a number of different markets; however, the challenge will then be managing each of these opportunities. Ultimately, many of the core technology specialists settle for one or two specific markets and license

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16 For discussion of the roles and responsibilities of the R&D group, see “Research and Development” in “Product Development and Commercialization: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org). The discussion in that Part assumes that the company has not opted for the technology specialist strategy and that the R&D group is one of several functional groups within the organizational structure.
the core technology to larger companies in other markets looking to use the core technology as part of their own growth strategies in those markets. Also, although the core technology specialists are more product-oriented than their counterparts that focus on contract R&D, they often elect to sub-contract the manufacturing and marketing activities by entering into licensing arrangements with outside parties that have the resources in these functional areas to place the products into the marketplace. Not surprisingly, core technology specialists often become acquisition candidates.

Many technology-based companies begin as some form of technology specialists, particularly those formed and launched by so-called “technical entrepreneurs” that come out of university environments or the R&D departments of larger enterprises. In many cases, the technology can be used to create products that form the basis for new markets or revolutionize existing markets. The challenge for these companies is marshalling the resources for what is often a lengthy and expensive road to completion and commercialization of a viable product line. One strategy that may be used by these new ventures is to take on technology consulting projects for third parties. These projects can provide various benefits to the fledgling company, not the least of which is the opportunity to generate revenues to recruit and retain additional employees. Consulting projects can also build credibility with other potential customers and provide valuable information on the preferences and needs of actual users that can be factored into the development effort. In order for this strategy to be successful, however, the founders must select projects that both fit within their existing technical expertise and that generate outcomes that are directly related to issues or questions that the company itself has identified as being crucial to its own independent product development process. In addition, while revenue is an important factor in a consulting strategy, the founders must take care to avoid over-commitment to a particular project as this will create a risky reliance on a single source of income and perhaps delay progress on other projects. In short, it is important to remember that consulting is a means to an end and that goal of actually introducing a new product should not be lost during this process.

Technology specialists willing and able to focus on product development may grow through selection of market segments where the company’s technology can compete effectively with the current solutions. If those efforts are successful, the company may be able to transition into a dominant sector player or change its focus away from technology to specific products or markets. In many cases, however, technology specialists are ultimately acquired by larger companies looking for opportunities to move quickly into a promising new technology. As for contract R&D companies, they are often able to supplement their revenues from contract R&D and consulting services by identifying suitable opportunities to develop and “spin off” certain technologies for their own account to new firms or larger existing businesses. In this way, the company can receive royalty or licensing fees from the other entity or even share in any appreciation in the value of other entity in cases where the company decides to accept an equity interest in exchange for contributing the technology.

§15 Market development
One of the key challenges for new companies founded to commercialize products based on promising, yet unproven, technologies is market development. Market development involves establishing both the company and its products in the selected market segments. While market development is crucial to the success of the enterprise, many new companies seriously underestimate the amount of time and financial resources that must be invested in this area. In fact, the market development, as well as related support and service of the products once they are sold, may cost twice as much as the product development activities and often more. Several problems converge to explain, in large part, the high costs of market development, including the need to build and maintain credibility with customers and suppliers and the unpredictability of customer decisions during the ordering process.

Many small companies run into significant cash flow problems because they consistently underestimate the amount of time that will be required for customers to move from an initial expression of interest to the point where they are willing to place an order and actually pay for the products that have been ordered. The amount of time required to land the order will vary depending on the circumstances; however, certain types of customers have traditionally evidenced very lengthy approval processes. The very nature of the product itself may cause unforeseen delays. For example, if the firm is introducing a new product to take advantage of a recent technological breakthrough, the party doing the purchasing may need to sell the concept internally before the order will be approved. Similarly, if the product is being sold in a market that has recently been deregulated, the customer may need to modify its procurement systems to take into account the influx of new, and smaller, suppliers.

New technology-based companies must also overcome the natural concerns of prospective customers regarding the ability of the firm to survive long enough to fulfill its promises regarding delivery, service and support of its products. Customers realize that new companies typically lack the financial resources to survive if there are problems with the timing or success of the initial product launch. Accordingly, a good deal of time and effort will need to be expended in sales presentations attempting to convince prospects that the company can meet its commitments. A related problem is the lack of a track record regarding the quality and performance specifications of the products developed by the new company.

Management must anticipate the need to develop the required credibility through communications and educating prospects about the product and the company’s skills and capabilities. Companies should consider development of a demonstration product that can be used to show prospects that the proposed product actually works and reinforce the desirable attributes of the product. A demonstration product not only provides evidence that the company can develop and build the promised product, but also serves as a tool for educating prospects about new technologies that may be unfamiliar to them. Another common tactic in this battle is securing an initial set of satisfied customers that are willing to serve as references on behalf of the new company. For example, reference customers may allow the company to install one or more prototype units to provide a
venue where other prospects can come to see how the product performs in a “real world” operating environment.

Small companies sometimes extend the customer reference strategy one step further by negotiating large contracts with customers that are already well established in their specific market segments. These types of contracts are obviously a good way to quickly create a predictable stream of revenues and move the company forward quickly on a growth path. In many cases, however, the company must be willing to deviate, albeit temporarily, from its standardized product design to create a customized version of the product that is better suited to the requirements of the particular customer. This is generally acceptable as long as the company does not lose sight of its goals and objectives in the broader product market, although care must be taken not to enter into a contract that unduly restricts the ability of the new company to sell the same or similar products to other businesses that may compete with the initial customer. A large contract of this type provides a good opportunity for the small company to learn about the specific needs of the customer and such arrangements often involve intensive pre-development consultations to ensure that time and effort is not wasted on designing and building a product that is not suited for the customer.

§16 --Timing of market entry

Companies need to be mindful of the developmental stage of the relevant market when making decisions regarding product development and market entry strategies. Emerging markets provide opportunities for companies to grow as the product class develops and specific market sectors begin to appear. Entrants at this stage can select from among a wide variety of potential marketing strategies and can develop with relative freedom from competition. The downside, of course, is that significant uncertainties exist regarding the size, growth rate and viability of the market. For example, early entrants may find that it takes longer for sales to take off than was originally anticipated and, as a result, those companies experience cash flow difficulties that may prevent them from moving forward even if the market ultimately proves to be promising. Another problem is that many emerging markets never develop into growth markets. In other cases, the development of the market is delayed because existing technologies prove to be more difficult to displace as incumbent firms fight to hold their advantage through incremental changes in their technology or aggressive price reductions.

The ideal situation for the technology-based firm is introduction of products at the beginning of the growth stage for the market. At this point, the above-described risks associated with emerging markets have dissipated and the firm is confronted with an existing worldwide market with anticipated annual growth rates over the next four to five years in excess of 100% annually. While competition will be intense, a number of entrants will generate real demand that will translate into better opportunities for companies to reach “break even” cash flow more quickly. Another advantage of entry at this point is traditional market creation and development problems, such as definition of patent and other proprietary right should have largely been resolved; however, the state of
the technology will still be in flux providing new firms with opportunities to pursue other
development strategies without encumbrance from broad patent positions.

The advantages of market entry during the growth phase are readily apparent and
generally lead to a number of new entrants and a corresponding leap in competitiveness
and complexity of the marketplace. However, many of these new companies appear
without any particular competitive advantage and their impressive sales performance is
often short-lived and followed quickly by insolvency or sale of the business to a stronger
player. New companies lack the resources to attempt to simultaneously develop new
products that will be suitable for two or more of the segments of the broader product class
that will be defined during the growth phase. As such, successful market entry will
depend on the ability of the company to select and focus on a particular segment that will
allow it to quickly differentiate its product offering and capture market share in that
segment. This is not necessarily an easy task, since it is likely that others will select the
same segment and that the technology best suited to that segment may still be evolving.
Also, while the product class is more fully developed at this stage, the business
opportunities in any specific segment may still be emerging, meaning that the companies
involved in that segment must confront a number of risks articulated above with respect
to emerging markets.

The mature stage is probably the least attractive entry point for technology-based
companies looking to achieve above average growth performance. At that point, there
will likely be a number of established companies and the likelihood of substantial product
innovation will be substantially reduced. Remaining opportunities, if any, will generally
be limited to development of either “customer-specific” products with little or no broader
appear or focusing on specialized products that are not worth the time and effort for
companies that rely on standardized products. In either case, the market available to the
new entrant at this point is relatively small and the likelihood of successfully moving
from these smaller markets into other segments is low given that the existing competitors
will fight hard to protect their market share and can rely on the knowledge advantages of
having been in the segment for a long time.

The decision regarding the timing of market entry often goes hand-in-hand with
determining whether the company should be the “first mover” into the relevant market or
should wait until others have open the door and then proceed with a so-called “second
mover” entry strategy. Neither of these approaches is absolutely right in all situations
and each requires a distinct set of capabilities and conditions in order to be executed
successfully. For example, a company should not consider a first mover strategy unless it
can move through the entire product development and launch process quickly and it
reasonably believes that it can achieve a strong position vis-à-vis prospective late comers
once the product is introduced. This generally means that the company must be confident
that it will achieve solid intellectual property right protection, impose high switching
costs on its customers and obtain control over complementary assets that competitors
would need in order to effectively penetrate the market.  

41-58.
It is the rare situation that a new company is in a position to effectively execute a first mover strategy unless it is well funded and the technology or product at issue is exceptionally innovative. In many cases, smaller companies will rely on their specific competitive advantage of being able to act quickly and with flexibility to enter the market as a second mover based on imitative products or products that include improvements or enhancements to early entrants in the market. While this may allow the company to get a foothold in the market, the strategy is vulnerable to further competition and price erosion from other entrants and will rarely allow the company to achieve sustainable growth. In order for the company to ultimately be successful, it must either be able to repeat this approach again and again in multiple markets or use the revenues from the earlier products to develop a new generation of products that are more likely to be candidates for a first mover strategy.

§17 Organizational structures for product development

While it is easy to oversimplify the product development process, the creation, development and commercial exploitation of new products typically requires a good deal of cooperation among researchers, scientists, engineers, and marketing and sales personnel, as well as the continuous support and attention from senior management. When a company is first launched and is struggling to develop its first product in order to survive, there typically is little or no formal structure for the product development activities since everyone associated with the company at that point—founders, other managers and employees—are caught up in all the tasks that need to be completed to develop the initial product or service and collect all the resources necessary to finish the development work and offer the product or service to the marketplace. At this point, interaction among all the involved parties is continuous and informal and administrative hurdles are shunned.

However, once the development of the initial product or service is over and the company can realistically look at building its product or service offerings to continue to grow and survive it becomes important to create a formal company structure for product development activities. As the structure emerges the effectiveness of product development activities becomes dependent on the willing involvement of, and cooperation among, multiple functional groups including research and development (“R&D”), manufacturing and production, sales and distribution, marketing and customer service/support. While each functional group hopefully understands the importance of each new product initiative to the company as a whole, problems may nonetheless arise due to the fact that each group has its own unique culture and the members of each group have their own disparate skills and backgrounds.

There are a number of organizational structures and strategies that can be used for product development activities. For example, Kono and Lynn suggested that companies can, and should, use different organizational structures and strategies depending on whether their new product development activities are for traditional markets or new
markets. In traditional markets, for example, planning is generally conducted at the divisional level with a short- or medium-term planning horizon and strategies that focus on improving existing technologies and products in order to increase market share with relatively low levels of risk. On the other hand, new product development activities in markets that are “new-to-the-company” require top down planning orchestrated at the head office in order to overcome organizational resistance and effectively launch what is essentially a new business. The product development structure for new markets should be broad enough to support and promote development of new technologies and expansion of competencies and the strategy is typically long term with higher risks being assumed in exchange for the opportunity to increase sales and profits. The discussion below describes a couple of different approaches identified by Kuczmarkski that maturing companies might follow in designing and implementing a structure for the development and launch of new products and services.

§18 --Function-based new product specialist approach

The first approach, commonly seen in larger companies, relies on new product specialists in each functional area. For example, the marketing department may have a new product manager who works with the marketing managers for each of the product lines to develop new product ideas that may be identified in the course of day-to-day contacts with customers. Similarly, the product development managers in the R&D and engineering departments will be responsible for ideas generated by technicians and process and design engineers as they work on issues relating to existing products. Given that the applicable new product ideas in this situation are primarily derived from experience with existing products, this approach works best when the emphasis is on development of new products that are closely related to the current line of business of the company or the improvement of existing products.

The formal reporting structure in this case is relatively decentralized. For example, the company may appoint an R&D director and a marketing director, each of whom will report separately to the appropriate senior executive at the headquarters or divisional level. Each director will have his or her own staff, such as product managers on the marketing side and engineers and technical specialists on the R&D side. New product managers on the marketing team would be responsible for coordinating technical aspects of a new idea with the appropriate technical specialists and working with the applicable product managers on budget matters and launch schedules. In most cases, the functional approach is accompanied by more formal procedures and reliance on strict financial controls and criteria that must be satisfied for a new product to be approved. This structure generally can be implemented without disruptive changes to existing reporting patterns and emphasizes the importance of continuing innovation to protect current products; it is not well suited to diversification initiatives as few resources are freed for planning outside of existing business activities.

§19 -- Fraternal approach

The second approach, based on what is referred to as the “fraternal” style, involves the formation of a formal committee of four or five senior managers to act as an oversight group for evaluating prospective new products, deciding which product ideas to pursue and coordinating the required resources from each functional area to support the actual development of the accepted ideas. This approach is recommended for use when companies are primarily interested in entering new business and adding products to their existing product lines. By visibly involving senior managers in the new product process, and encouraging ideas from throughout the company, the fraternal approach demonstrates commitment to, and support of, innovation throughout the company. An important factor in the success of this approach is the development and communication of clear procedures for evaluating new product ideas.

Effective implementation of the fraternal approach requires the creation of a distinguishable product development company within the company’s broader reporting structure. For smaller companies, this may simply mean formation of a new product steering committee that includes the chief executive officer, the marketing director, a new product manager and representatives of various functional groups that form part of the product development team. Members of the team should be given the freedom to devote at least 20%-30% of their time exclusively to product development activities and specialists should be drawn from R&D, marketing, sales, market research and finance. Larger companies can institutionalize this type of collaboration by having a separate director of new products at the same seniority level as the directors of R&D and marketing and providing that all three directors report to the same senior executive. In this way, coordination can be encouraged while still allowing the new product group to perform autonomously in generating new ideas that are outside the current business lines of the company.

§20 -- Entrepreneurial approach

The third strategy, referred to as the “entrepreneurial approach,” is considered to be most suitable when the company is looking to develop a new product line or products that are “new to the world”. As those projects carry extremely high risk and may take years to generate a payback of any type, companies must be able to create an internal environment that is relatively unstructured and encourages participants to engage in the creative thought necessary for such a project to be successful. In order to meet these requirements, company will establish an autonomous, free-standing business unit that operates largely outside of the functionally-based departments and rules used in other parts of the company. For example, companies may establish a separate “venture group” or a new product department, or establish a multidisciplinary team that focuses on product development. Regardless of the structure that is selected, if will be staffed by persons from each of the key functional disciplines, including sales, marketing, finance, engineering, R&D and manufacturing, who will be freed from their regular responsibilities and allowed to work almost exclusively on the new product initiative. Formal business and financial planning is less important for these initiatives, at least
initially, since the final objective is often unclear until the project is well along. In
addition to internal development of new products, one or more members of the
entrepreneurial team will also focus on acquisition opportunities, which is often a
preferred strategy to allow the company to move quickly into new markets or businesses
or obtain needed technologies.

§21 --Impact of structure on success of development projects

While identifying the structural alternatives, Kuczmarski also observed that he felt that
the company structure had minimal impact on the likelihood of success for development
projects and that it was more important to select a structure that was workable and could
be sustained over time. He argued, rightly so, that constantly changing the structural
approach to product development would be too disruptive and undermine the
achievement of the overriding goals and objectives. However, there are clearly
exceptions to this general rule that must be recognized when the company is confronted
with changes in its business environment. For example, a company may discover that its
best future growth opportunities lie in a market where it currently has a poor competitive
position. The response in that situation may be to move away from the functional-based
approach that may have worked well in markets that have become mature toward a
fraternal approach that involves senior managers from all departments and facilitated
communication and quick decisions for all major product development initiatives. In
turn, pressure from foreign competition and demands from customers for price reductions
without loss of performance may trigger a shift toward a functional structure with more
formal controls and a focus on developing improvements and enhancements to existing
products that “add value,” improve service and lower manufacturing costs.

The best answer in this area, although admittedly difficult to achieve, is the creation of a
product development structure that is flexible enough to cover the entire range of possible
projects that the company might take on over a sustained period of time. In order to
accomplish this objective, some combination of the fraternal and entrepreneurial
approaches is probably the best path. For smaller companies, it should be relatively easy
for all members of the senior management team to meet on a regular basis to discuss, and
plan for, product development and coordinate the activities that each manager will be
required to carry out in order for a particular idea to be implemented. As the company
grows, however, senior managers will need to spend more time tending to management
of their existing businesses and assets. Accordingly, it is important to designate a single
senior manager who will remain primarily responsible for product development
throughout the company and making sure that all activities in that regard are
appropriately coordinated and that recognizable results are achieved. Ideally, this senior
manager will report directly to the chief executive and operating officers to emphasize
the importance placed on innovation and continuous product development within the
company. The goal is to achieve accountability; however, such a structure permits
product managers within the marketing department to focus on minor changes and
enhancements, for which they are best suited, while the senior manager for product
development monitors such activities and focuses his or her staff and other resources on
more entrepreneurial activities.
§22 --Managing functional boundaries

Regardless of the company structure selected for product development activities the company must be prepared to manage those points in the development process where it is necessary for two functional departments to interact and collaborate with each other. In order to effectively manage the functional boundaries for the typical company, management must continuously emphasize and foster good horizontal working relationships and attempt to minimize the impact of individual functional cultures. When the company is just starting out and lacks the resources to support a separate R&D function, the key functional areas at the time the company is developing its first product generally include marketing, engineering and manufacturing. However, given the importance of ongoing customer service and support as a means for differentiating new product offerings, particularly products that are technology-based, it is also common to recognize service as a separate function.

While each functional area has its own specific set of activities and competencies, the role of senior management is to view each of the functions as a multi-disciplinary team and allocate the resources from each function in a manner that achieves the overall company goal of successfully developing and commercializing a new product. The best way to ensure that the activities of the various functional groups are managed and coordinated is to focus on each of the key activities, or deliverables, during the product development process. Each activity or deliverable will certainly have one function to which primary responsibility can be allocated; however, this process ensures that the all relevant areas will be involved and informed.

Riggs identified sets of key issues that typically arise at the “interface” between the engineering, manufacturing and marketing functions. First, with respect to the engineering and marketing the main issues are product development, forecasting market requirements, application engineering, technical manuals and customer training. Second, with respect to marketing and manufacturing the main issues are sales forecasting, capacity planning, establishing manufacturing priorities, managing order/delivery cycles, and field service management. Finally, with respect to engineering and manufacturing the main issues are allocating engineering resources, scaling up production, introducing product improvements, documentation and vendor relationships.

Obviously, initiation and pursuit of product development ideas requires collaboration among all functional areas. The initial concept may come from any of the three functional groups. For example, marketing may identify a promising concepts based on its assessment of customer needs and the potential market. Alternatively, the engineering or manufacturing groups may identify a new or improved technology that can serve as the basis for a new product or a significant improvement in the performance or production of an existing product. The other issues are more subtle, however, and are often overlooked during the management process. Some companies often make the simple, yet crucial, mistake of setting engineering or manufacturing priorities without taking into account the

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expectations and recommendations of the marketing group with respect to priorities among product development projects and target dates for introducing new products. Similarly, capacity planning and the timetable for scaling up production requires coordination, and information sharing, between marketing and manufacturing.

Ettlie et al. studied various aspects of the new product development processes used by durable goods manufacturers in five dispersed countries using the case study approach. They noted the attention that researchers had paid to “concurrent engineering”, which has been generally described as: “... a systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and support. This approach is intended to cause the developers, for the outset, to consider all elements of the product life cycle, from conception through disposal, including quality, cost, schedule and user requirements.” Other scholars have observed that concurrent engineering became the “new norm” among companies in many parts of the world—North America, Europe and Japan—during the 1990s and had emerged as a popular recommended strategy for organization and management of the new product development process to achieve shorter development cycles at lower overall costs and with fewer design changes from the new product has been released.

Ettlie et al. were particularly interested in cross-national comparisons of various measures of coordination between functions and disciplines. For example, they noted that the ratio of design to manufacturing engineers various considerably across the companies in their survey, ranging from 3:1 in Japan to 1:3 in Hungary with firms from the other countries falling somewhere along the middle of these two extremes: 2:1 in Germany and Sweden and 1:1 in the US. Ettlie et al. noted, however, that in another survey of 43 American durable goods manufacturers the ratio of design to manufacturing engineers was 4.7:1 and that Ettlie and Stoll had conducted a survey in 1987 and found an average ratio among US firms of 2.9:1. When the focus of measurement was the proportion of degreed design and manufacturing engineers, Ettlie et al. found the percentages in Germany were 100% for each category, not surprising given that almost all engineers in Germany complete formal training to earn a degree. Parity, albeit at lower levels, was also observed in the firms from Japan (95% degree design engineers to 80% degreed

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23 U. Menon and M. Graham, “Concurrent Engineering: Effective Deployment Strategies”, Belo Horizonte, 6(2) (1996), 165, 166. Menon and Graham noted that “... in general, we would expect to find some elements from the following phases of Concurrent Engineering in any implementation: Concept Development: The Front-End Process; Identifying Customer Needs; Establishing Product Specifications; Concept Selection; Product Architecture; Design for Manufacturing; Effective Prototyping; and The Economics of Product Development”. Id. at 170.
manufacturing engineers) and Hungary (70\%:70\%). The ratio at the US firm in their survey was 60\%:15\%; however, Ettlie et al. noted that in another survey Ettlie and Warner had found ratios of 90\% and 60\% for design and manufacturing engineers, respectively.\textsuperscript{27} Sweden showed the largest variance: 90\% of the design engineers were degreed but only 10\% of the manufacturing engineers had a degree.

While engineering obviously plays a central role in new product development, companies generally involve representatives from other disciplines and functions on the design team and the results from the survey conducted by Ettlie et al. were similar to prior surveys in finding the marketing and quality were most frequently represented on the design teams in each of the countries.\textsuperscript{28} Ettlie et al. pointed out that their survey participants in the US and Sweden had the broadest range of participation from other departments in their design efforts: the US company included participants from purchasing, marketing, inventory and technical services and the Swedish aerospace firm had representatives from quality assurances, material and aerodynamics laboratories and instrumentation. In Germany, the firm brought in specialists from production planning, sales and quality and sales and suppliers were represented on the design team for the Hungarian company.

Ettlie et al. sought responses from the participants in their survey regarding both key factors for successful product design and barriers to achieving high quality product designs.\textsuperscript{29} The participants from the US and Germany reported that customers were most important and essential sources for new product ideas while the Hungarian firm, which generally embarked on product development efforts by responding to RFPs, was most concerned about production documentation. As for barriers, or impediments, in the design process the most daunting factor reported by firms in the US, Germany and Hungary was resource constraints (e.g., absence of successful installation of a CAD system company-wide in Hungary and lack of trained engineers and engineering tools in the US and Hungary). In a prior survey among just US firms, Ettlie and Warner had found complaints about the adverse influence that time pressure had upon achieving successful product development.\textsuperscript{30}

Finally, Ettlie and his colleagues developed a bundle of factors to be used as a means for measuring the degree of design-manufacturing integration in the product development process including the use of outside training and development in design-for-manufacturing techniques, the adoption of manufacturing sign-off at design review stages, the installation of new organizational structures (e.g., teams) to help with coordination, job rotation between functions and mobility between functions.\textsuperscript{31} They noted that the Swedish participant in their survey scored highest with respect to the adoption of the various listed integration practices, actually scoring higher than the mean

\textsuperscript{29} Id. at 149.
scores of the firms in prior US-only studies, and that the participants from Germany and the US came next followed by the Japanese and Hungarian firms in that order. Ettlie et al. commented that the relatively poor score of the Hungarian firm was consistent with reports of problems of structural adaptation and acquiring resources for that firm.

§23  --Cross-cultural studies of new product development structures

Comparison of organizational structures for new product development across borders is a fertile area for research. For example, as part of their study and comparison of product development benchmarks in the UK and German food industries Haake et al. examined differences in organizational processes and structures and made several interesting findings. First, with regard to strategic orientation, the German companies were much more long-term oriented than firms in the UK with the Germans pushing planning horizons out for five years while UK companies generally limited planning to no more than three years. A related finding was that German companies projected product life cycles of 70 months while the UK companies typically expected that new products would be on the market for only 12 months. The actual experiences of the companies supported these expectations given that product renewal cycles were much shorter in the UK than in Germany (i.e., 32% of the sales of UK firms came from products launched in the previous two years while the comparable percentage for German companies was just 12%). As for their organizational structures for new product development UK firms were characterized as having “loose” structures while the German companies preferred tight, task centered structures. UK companies focused their new product development activities on product development and commercialization while the German companies had a decidedly research orientation. Finally, organization of product development projects in the UK companies tended to be flexible while the German firms opted for structure and strong formalization.

32 J. Ettlie, C. Dereher, G. Kovacs and L. Trygg, “Cross-National Comparisons of Product Development in Manufacturing”, The Journal of High Technology Management Research, 4(2) (1993), 139, 150. For each of the five factors firms received three points if they have adopted a practice, one point if they had not adopted a practice and two points if they were in the process of adopting a practice. This created the possibility of a maximum score of 15: the Swedish firm had a score of 12, the German and US firms each scored 10, the Japanese firm scored 9 and the Hungarian firm scored 8. Mean scores for US firms in previous surveys were 11.44 and 9.15 in J. Ettlie and M. Warner, Managing Design Systems in Manufacturing (1991) and J. Ettlie and H. Stoll, Managing the Design-Manufacturing Process (1990), respectively.

33 S. Haake, C. Moore and N. Oliver, Recipes for Success—Product Development Benchmarks in the UK and German Food Industries (2000).

34 While this study found German companies to be more formalistic than UK companies with respect to new product development activities German firms in a different study of the early stages of innovation projects were somewhat less formal in their approach than the Japanese companies they were compared to. Specifically, the researchers in the second study reported: “... with regard to efficiency, a different approach was identified in the Japanese compared to the German projects. Whilst Japanese projects relied on a thorough planning and strict controlling to minimize deviations from front end specifications and enhance efficiency, in German projects all relevant functions were integrated early in the process, partly already during idea generation, to ensure that all information and points of view were taken into consideration right from the start. Responsibilities were assigned during the front end and rarely changed during project execution to reduce deviations and enhance efficiency.” See C. Harstatt, B. Verworn and A.
§24 Identification and selection of product development opportunities

Product development initiatives can be based on a variety of sources and ideas. For example, a company in the start-up phase can base its initial activities on exploitation of opportunities provided through former employers of the founder or the needs of an identified initial customer that is willing to provide financial support for a consulting project or the development of a specified new product. Other alternatives that are commonly explored include the pursuit of a specific technological innovation, identification of unfulfilled need in a particular customer market, or an assessment of competitors’ products.

The process of identifying “new product opportunities” is at least one step removed from identifying specific new products. Instead, this is the important preliminary stage where the company reviews and evaluates its current business and the competitive environment to formulate a core corporate strategy that will be followed throughout the new product process. While the company may establish a separate team to conduct this review and evaluation, the more likely scenario is that opportunities will arise out of the regular marketing and strategic planning processes, as well as special audits of company resources. In any event, the desired opportunities can be illustrated through the following categorical descriptions:

- An existing resource or competence with the company that is currently underutilized, such as exceptional manufacturing competence or strong relationships with vendor or distributors;
- A new resource that is discovered or otherwise acquired by the company, such as a new proprietary technology;
- An external event or trend, such as new legislation or introduction of new products or technologies by one or more competitors; or
- Establishment of an internal goal, such as the need to increase sales revenues by a specified amount over the next five years.

Once the universe of opportunities has been defined, the company must select those that have the highest probability of success and promise the greatest risk adjusted return on investment.

Opportunities that might be exploited by new products are often voluminous and one of the most important activities of the product development team is to efficiently evaluate each opportunity and to select only those that are most likely to satisfy the company’s product development strategies. The consequences of failing to make a thoughtful and analytical selection of opportunities can be substantial. At worst, the company will spend a significant amount of time and money on development of a new product that does not fit with the core competencies of the company. At a minimum, scarce product development resources will be diverted down the wrong path while competitors move

forward in the proper direction. For senior managers, a continuing failure to make the right choices regarding business opportunities will ultimately lead to dissatisfaction among outside directors and professional investors.

The main sources of potential opportunities, such as underutilized or new resources or material changes in the regulatory or competitive environment, have already been explored. Since viable product concepts, which are the first stage of the product development process, must generally have both a technology and market component, it is logical to base opportunity evaluation and selection on both technological and market factors. While each of set of factors can be evaluated separately, it is important to remember that the strongest product concepts clearly integrate technological and market strengths. For example, while a company may develop groundbreaking new technology, one which is capable of adding substantial power or speed to an existing product solution, it may be of little value unless there is a significant perceived need and use for the new attributes in the marketplace. In many cases, companies discover that customers are not able or willing to incorporate new technologies into their businesses, perhaps due to the expense associated with acquiring other equipment or human resources to properly exploit the technology.

Technology-based opportunities can be identified in each function involved in development and commercialization of a particular product. For example, technology may allow the company to produce products that exceed the performance capabilities of existing items available in the marketplace. In the alternative, technology may be used to create sleeker and more efficient product designs or improve quality and reduce costs associated with production and manufacturing. Technology can also be an important tool in improving overall management of the company’s resources. When evaluating a new technology under consideration for inclusion in the product development process, the following factors are relevant:

- How unique is the technology and can the company attain a strong proprietary position with respect to the technology?
- What are the prospective uses of the technology and how valuable are those uses to the company and/or the company’s customers?
- How much time and resources will be required to complete any further development of the technology that may be required in order for it to be ready for commercial application?
- What risks are associated with further investment in commercialization of the technology, including competition and regulatory uncertainties?
- Does the company have the requisite skills, resources and support to successfully implement and commercialize the technology or is a partnership with an outside party going to be required?

Prospecting for technology-based opportunities becomes even more challenging when companies are willing and able to look outside their companies for technology. While companies may be launched on the strength of internally generated intellectual property rights, further growth often depends on alliances with outside technology developers. As
such, companies will often consider licensing or even acquiring technology through mergers and/or asset purchases. This strategy obviously raises other issues, such as the ease of absorbing the licensed or acquired technology.

Market-based opportunities are defined by identifying and addressing a need or problem of a particular group of users. Such opportunities may come from current customers, including end users or parties in the distribution chain (e.g., wholesalers or retailers), or from evaluating a demographic or geographic market. In some cases, actions by competitors may raise the sense of urgency for product development in a specific market, particularly if competitive action threatens the position of an existing product.

Evaluation of market-based opportunities should be conducted in two stages. The first stage deals with the potential market on a more general basis and asks the following types of questions:

- What is the estimate size of potential demand in the market and how does it compare with the size of the company’s existing markets?
- Is there a direct and verifiable link between the company’s core competencies and the target market?
- What experience does the company have in this market and how difficult will it be for the company to obtain and refresh information on customer needs and satisfaction?
- What is the competitive situation in the market and does the company have the requisite channel capabilities to sell into the market?

The second stage evaluates potential linkages between the market and a specific technology-based opportunity. First and foremost, the company must determine whether it has, or has access to, the proper technology to take advantage of the market opportunity. Second, the company must explore whether the potential customer base would actually be interested in using the specified technology to solve an identified need or problem. Finally, an early analysis should be made of the ease or difficulty associated with educating the potential market about the utility of the proposed technology.

Many companies evaluate technology and market opportunities by assigning objective numerical measures to the response to each of the questions posed above. For example, if a new technology is unique and offers the company a substantial proprietary advantage over competitors, the score on this measure might be “five” on a scale of five. On the other hand, a technology that is more pedestrian and cannot be easily protected from duplication would only score “one” on a scale of five. In any event, in order for a given opportunity to survive for further review, it generally must achieve an aggregate score on one of the opportunity measures that is higher than a threshold set in advance.

In the past, companies often prided themselves on being driven solely or primarily by either technology or “the market.” For example, a technology-driven company would focus on developing groundbreaking inventions that pushed the envelope of existing science and engineering; however, such companies often found that the large expense associated with the development effort went for naught when customers were unwilling
to attempt to use new products based on these novel technologies. On the other hand, market-driven companies bet on new product ideas generated primarily from marketing personnel with little or no input from the engineering and design departments that would actually have the job of creating the products. Experience has taught both types of companies about the value of building new products on technology and a demonstrated market. Accordingly, it has become more difficult for new product opportunities to move forward without a fairly strong evaluation in both categories.

§25 Generation of new product concepts

In traditional models of product development, the process begins with the generation of one or more “concepts”, which are ideas for new products or processes or improvements to existing products or processes. A concept includes two distinct elements. First and foremost, it should describe the proposed benefits to the end user in relation to a specific problem or need identified at the opportunity stage. Second, it should identify the form of the product to be created to provide the benefits, including the technology to be used in order to create the desired form. It is possible to develop a viable concept that covers less than all of these elements. For example, agreement can be reached regarding the form of the proposed product and the anticipated benefits, while further consideration of the required technology is reserved.

Relatively little research has been done on “concept development”. Ettlie et al. undertook the task of identifying and analyzing the methods that firms used in order to generate ideas for new products and processes before the better understood period of concurrent engineering (i.e., simultaneous design of products and manufacturing processes) began.\textsuperscript{35} They noted initially that it would seem to be difficult to explicitly manage concept development since the source and timing of ideas is inherently unpredictable; however, they cited an example of a firm that had used two separate teams, each with its own separate manager, in a successful product development effort: one team was dedicated to the “entrepreneurial phase”, which included concept development, and the other team handled and completed the latter stages of development once the concept development was completed. They also cited evidence from another case study relating to the development of an aircraft jet engine to the effect that as much as half of the new product development costs were determined before the commencement of concurrent engineering activities. Based on these examples, Ettlie et al. argued that successful product development required more than just expertise in concurrent engineering and that efficient and skillful concept development was also necessary in order for firms to get to the market faster with high quality products.\textsuperscript{36}

Concept generation is obviously an intensively creative process and a wide range of strategies and theories have been developed to assist companies in coming up with ideas.


Traditional Product Development Process

for new products. A large number of ideas for new products actually come from sources that are already in existence. For example, the product development team should be prepared to mine the following sources on a regular basis:

- Numerous studies, as well as anecdotal evidence, have recognized that perhaps the best source of new product ideas are employees. Sales personnel often generate ideas as a result of conversations with customers and engineers are frequently anxious to see how their own inventions will fare in a commercial setting. Companies may want to create incentives for employee ideas, including bonuses, and establish a formal system for collecting employee suggestions.
- Not surprisingly, customers are a second leading source of new product ideas. Customers tend to be most interested in suggesting changes to existing products, as opposed to totally new products. Companies should constantly monitor the feelings of their customers through surveys and focus groups and should also include members of this group in testing and evaluation of new product concepts.
- Companies that use indirect marketing channels should develop communications with their resellers, including distributors, brokers and other sales representatives to obtain feedback on trends among end users. In some cases, it is even possible to enter into a formal partnership with a reseller for development of new products customized to the strengths of the reseller.
- Suppliers and vendors have proven to be valuable partners in suggesting new product concepts based primarily on improved forms of the product or on innovative technologies that improve the performance of the product or product efficiency.

Ideas can also be generated from scanning the environment in which the company participates. For example, companies must always carefully monitor new products that might be announced by competitors. In addition, company representative should attend important trade shows and also maintain contacts with companies, such as venture capital firms, that regularly provide support for inventors that may develop new ideas that might be useful to the company. Finally, companies may look for new ideas from consultants, advertising agencies, market research firms, and even other manufacturers who might be interested in selling or licensing technologies that do not fit into their own long-term strategic plans.

In addition to the various methods for harvesting new product ideas that may already be in existence, many companies use other strategies that are more akin to “brainstorming” by an organized team formed specifically to generate ideas that are truly innovative. For example, the team may make a concerted effort to create an inventory of the “problems” that may be confronting the company’s target customers and then use different strategies to identify possible “solutions.” An interesting variation on this theme, which is more forward looking, applies scenario analysis and calls for the team to look out into the future over a specified period to anticipate social, economic or technological changes that might create problems or needs for the company’s customers. These exercises are most productive when the product development team includes representatives from a wide range of disciplines, such as key company functions and trained experts in the areas of sociology, psychology and design.
New ideas may also be generated through careful analysis of the attributes of the company’s current products. For example, the group might consider the effect of suggesting changes to the size or form of a current product or perhaps changing the number of units that are included in a package. Similarly, the possibility of enhancing the “performance” of the product might be explored, such as making the product faster. Changes in color or taste would also fall into this type of analysis. Companies may also use “gap analysis” to identify combinations of otherwise desirable product features that are not currently being addressed by any specific product. Even more sophisticated techniques include conjoint analysis of data collected from customers with respect to their expressed preferences regarding key product attributes.

In order for concept generation to be effective, management must be pro-active in recruiting and rewarding the appropriate human resources and making sure that they receive the requisite support. Human resources professionals within the company should be mindful of the various techniques that are available for measuring creativity and specific types of education and experience can be indicators of suitability for work on concept generation. A large number of companies actually provide “creativity training” and management should continuously emphasize the importance of creativity and innovation to the company’s business. The company culture should not unduly penalize mistakes made in a good faith effort to run down what appears to be a promising lead. Finally, the company should establish a suitable system for rewarding persons that generate the most promising concepts, including a delicate mix of individual and group rewards.

Although each of the methods for generating new product concepts can be useful at any given point in time, small companies are strongly advised to consider the feasibility of developing a new product is collaboration with a major customer. Under such an arrangement, the customer may underwrite all or a portion of the development costs by providing advances in amounts sufficient for the company to hire the necessary personnel and procure other required inputs. Obviously, customer assistance allows the company to move forward more quickly with the development of the product and, if successful, the project will provide the company with a satisfied referral source. However, there are risks associated with this strategy, including overdependence on a single project and the real possibility that the specific requirements of the customers will focus the development effort away from product characteristics that might ultimately have broader appeal. The problems with this approach are exacerbated if the customer places limitations on the company’s ability to perform similar work for other types of customers or appropriates ownership or exclusive usage rights in key technologies arising out of the development project.

An obvious candidate for an initial key customer relationship is a former employer of one of the members of the founding team. Many technology-based companies are founded to pursue products or technologies that a former employer discarded as being outside of its current and projected line of business. In that situation, the former employer may be willing to allow the new venture to exploit the relevant intellectual property. In addition,
the former employer may provide access to capital, business relationships (e.g., suppliers and other potential customers) and know-how and support from its own employees. In addition, the start-up may derive benefits from the endorsement provided by the former employer in the course of providing the assistance described above.

While a handful of companies, such as Apple Computer, may have the rare ability to identify a need before the customer even realizes it, the more prudent route for most companies is to look to the customer for guidance as to their requirements for product specifications. Accordingly, it is important for the product development function to adopt specific strategies for collecting information from customers. For example, companies with sufficient resources will develop customized or semi-customized products for certain of their customers along with the standardized products that are offered to the broader market segment. By taking on the more specific development projects, the company has an opportunity to gain a better understanding of customer needs and this information can be used to improve the standardized version and to generate ideas for completely new products. The same theory of learning from the customer applies to the decision to establish an in-house product support and service function, as opposing to outsourcing those activities. By interfacing with customers that need assistance in remedying a defect in the product or understanding how best to use the product, the company can build trust and collect information that can be used to improve product performance and the customer’s experience with the product.

Ettlie et al. studied various aspects of the new product development processes used by durable goods manufacturers in five dispersed countries using the case study approach. They used a combination of questionnaires, interviews and visual data collected from site visits to put together profiles of how new product development was done at firms in the US, Sweden, Germany, Hungary and Japan. Among other things, Ettlie et al. carefully studied similarities and differences among the participants in their survey group regarding concept development processes. They observed that the concept development process in the German electric motors firm could be described as follows: “... most ideas come from the design department, which would be expected from the culture’s technical and organizational traditions. The sales department gives advice and feedback from customers, but the opinion was that these are immediate, short-term customer needs only. In order to anticipate future, long-term customer needs, more has to be done. Designers typically visit customers or interact with potential buyers at trade shows and fairs. The technical project leader provides vision and direction in this German company.”

The Hungarian firm in the survey was engaged in the mass transit vehicle industry and thus it was not surprising that its concept development process was strongly influenced by the requirements set out in requests for proposals (“RFPs”) or quotes received, in most

37 Ettlie et al. noted that the choice of countries was intended to ensure that there was representation from five of the major economic alliances or regions of the world at the time of the study (i.e., the early 1990s): North America (the US), EFTA (Sweden), ECC (Germany), the old COMACON trading bloc (Hungary) and the Far East (Japan). All of the firms were relatively large and supplied industrial or consumer markets in durable goods industries.

cases, from local municipalities; however, since the firm received and filled orders on a global basis from customers in all parts of the world, meaning that requests often varied substantially, Ettlie et al. commented that “[t]here appears to be a 50-50 play between understanding these RFPs and the ‘creative hats’ of design teams”.

The Swedish firm in the survey was a supplier in the aerospace industry that provided components to a consortium of European companies that built launchers and engines using funding provided by various governments. The cooperative nature of this entire arrangement meant that firms, such as the one in Sweden, could be expected to be contracted to provide components for which they had the greatest expertise and this allowed them to “work ahead” in the development cycle based on the reasonable assumption that a contract would be tendered within a reasonable period of time. Among other things, the Swedish firm was able to proactively address and reduce technological uncertainty in its development processes since it had more time to resolve technical issues and stabilize human resource allocation before contract-based delivery requirements needed to be met.

Finally, Ettlie et al. noted that the survey participants from the US and Japan both followed what was described as a “team approach to concept development” that featured influences from both marketing and technical representatives with respect to the ideas that were reviewed. In the US, various types of ideas were developed and vetted—new products, product enhancements and development work—and formal proposals were reviewed by division management, which also would occasionally take the lead in proposing their own ideas. Function-based departments in the US firm had other, more specific roles and responsibilities: the engineering group would oversee the pace of technological development to ensure that it kept up with idea generation and the technical services and distribution groups would take the lead in documenting customer need information and distribution plans. The Japanese firm was similar in its “bottom up, top down” approach; however, the process was less rule-driven and influenced by “hints from market and technological trends”.

§26 Concept evaluation and testing

In many cases, companies have little trouble generating a wide range of new product concepts. The next step, however, is far more difficult and involves the evaluation of the universe of ideas and the selection of those which will be the subject to further development. Concept evaluation is a complex process that relies on both formal analytical tools and on the intuition of the persons conducting the evaluation. The process is made even more difficult by the fact that the point of reference, and “acceptance hurdles,” will continue to shift as the concept moves closer and closer to the ultimate marketplace.

39 Id. at 147-148.
40 Id. at 148.
41 Id.
42 Id. at 145.
Regardless of the amount of time and detail used in evaluating new product concepts, the team should always be mindful of several fundamental rules of thumb. First of all, it should always be clear that the product concept will fulfill a need of the target users that has actually been identified and acknowledged by those users. Accordingly, concepts that are not directly tied to a particular need or resolution of a specific problem should be viewed with skepticism unless the team is confident that the issues will be worked out through market tests, training, and advertising. Second, the product must perform in a way that adequately meets the identified need or solves the specific problem. Moreover, meeting the need or solving the problem will not be enough if use of the product is inconvenient or simply too costly to the customer. Finally, the team needs to remember that while they will ultimately be immersed in the value and design of the product, all this will have little impact on the success of the product unless the company is able to fully and clearly communicate the potential value to customers.

While the team must necessarily conduct a specific evaluation of each concept and ultimately made a “go” or “no go” decision about each of them, it is important to remember that each decision will be made within a broader context. Most importantly, companies rarely limit their product development activities to a single concept or product regardless of the strategy they are pursuing. The more likely scenario is that companies will be continuously generating and evaluating concepts to create, maintain, and replenish a new product portfolio. As such, a company may be willing to accept, or at least devote further study to, a relatively risky new product concept if it already has several lower risk concepts in development. Another thing to carefully consider is that the risk associated with making a decision about a new product concept changes as the product moves through the evaluation and development process. For example, if a new product concept would require large expenditures on development and refinement of new technology, as is typically the case with pharmaceuticals, software, and other technology-based industries, it is essential that the early evaluation be as accurate and thorough as possible. On the other hand, while a concept that does not require significant technology development costs may face a lower initial standard, the stakes will ultimately become higher as the company moves closer to deciding whether to move forward with an expensive marketing campaign to support the launch of the product.

Ultimately, companies must realize that concept evaluation is a fluid, and sometimes messy and open-ended, process that may require constant reassessment of a concept as the company gathers information and makes further refinements to the concept and the proposed product itself. For example, the company must be prepared to constantly review and revise its financial analysis of the concept. Obviously, the team will need to make a quick initial estimate of the anticipated development costs and compare them to projections of price and purchase volume. However, each of these factors will change as time moves forward and the firm must attempt to keep an “open mind” before allowing these numbers to prematurely kill a project that ultimately would have been successful or keep a project alive that, in the end, would fail to meet the company’s return-on-investment requirements. Another factor to bear in mind is the possibility of deferring some of the major financial decisions until the company has better information regarding demand and the costs of following a particular development strategy. For example, a
company may opt to outsource manufacturing for a fixed period of time to reduce capital expenditures until it is clear that a product will be sustainable and that an in-house manufacturing strategy would be cost-effective.

Companies should also recognize that it is difficult, and often counterproductive, to establish specific timetables for commencement of certain activities. For example, it is common for companies to set a date for the launch of a marketing campaign. In reality, however, some sort of marketing is occurring at each point of the concept evaluation and product development process. Companies will need to approach customers early in the process to obtain definitive information regarding customer needs and the degree to which the customers perceive that a particular concept will actually meet their requirements. In addition, even when a product has been approved for full-scale production, companies will often rely on a limited launch of a new product (i.e., confined to a specific type of customer or geographic area), thereby reducing the scope of its marketing activities for some period of time. In most cases, the results of an initial limited launch will cause companies to modify their marketing plan before expanding it into other markets.

Experienced companies also realize that there are always certain points in the evaluation process that must always be given higher priority since they relate to what are known to be critical success factors for most of the company’s new products. For example, a company may have a high level of comfort that it will be able to identify new products that meet customer needs and that it has garnered sufficient trust among customers to efficiently communicate the value of the new product to them. However, a new product may not make sense to a company if it is unable to manage the cost of manufacturing the items. In that case, the evaluation process will need to be structured in a way that allows the company to quickly collect and analyze manufacturing data. In other situations, manufacturing capability may not be an issue; however, the area of greatest risk might be the availability of intellectual property protection to prevent an imitator from quickly launching a lower-price alternative. The point is that companies must be mindful of hurdles that have impaired development of otherwise sound new product concepts in the past and make sure they are addressed at an early stage in the concept evaluation process.

§27 – Initial evaluation

It is a large, and often treacherous, leap from brainstorming to generate ideas for new products to the point where the company decides to actually undertake formal development of a new product. The first step in this journey is testing and evaluation of the various new product concepts. During this stage, concepts will be eliminated, retooled, ranked and eventually, in the case of the most attractive, pushed forward down the road toward actual commercialization.

The concept testing process begins with a quick preliminary screening of the concept that will assist the company in managing the flow of ideas and reducing the workload to a manageable size. At this point, the product development team is usually working with
very little hard information and in most cases will be making decisions based primarily on training, experience and a little bit of intuition.

Companies have adopted a variety of procedures for these initial assessments. In most cases, at least two people are involved in the decision and the decision team generally does not include the person who may be responsible for generation of the idea in the first place. Companies often attempt to solicit input from a number of functional departments and this can be accomplished by requiring that the evaluation must be conducted by persons outside of the department where the idea was created. For example, if the concept is proposed by the sales group, the evaluation will be conducted by a team composed of managers from the finance and engineering departments.

While the volume of new product concepts usually makes it difficult for the group to spend too much time on any one idea, it is important for the evaluation process to be based on some objective factors. First, any concept that obviously violates any key strategic guideline or constraint must be eliminated. For example, if it is clear that a concept would require an investment beyond the means of the company at that time, it should not be considered. Similarly, concepts based on products that could not be easily integrated into the company’s branding strategies probably should be given a low priority. Other considerations that should be taken into account at this stage include the following:

- Is it reasonable to assume the product would interest an identifiable group of potential customers? In other words, is their a sense that the product would generate a market demand sufficient to justify the additional development costs?
- Would the product be a valuable addition to the company’s existing product line? Companies should pursue new product concepts that are a good fit with the company’s core competencies.
- Can the company reasonably expect to become and remain competitive with the product in the target market? Obviously, the ability to exploit a competitive advantage, through intellectual property rights or otherwise, can be an important “plus factor” for a new product concept.

Generally the assessment at this stage is wholly internal; however, in some cases the evaluation team may seek limited input from experts outside the company. Communications with potential customers should be left to later stages of the testing and evaluation process.

Another criterion that should be understood and applied relatively early in the evaluation process is the degree of risk associated with pursuing a particular idea for a development project. In targeting and evaluating potential candidates for product development efforts, it may be useful to make reference to accepted categories of product “newness.” The
work of various researchers has led to the following list, organized by reference to the degree of difficulty and cost typically associated with the development process:\textsuperscript{43}:

- A truly innovative product that is totally “new to the world” and which creates an entirely new market;
- A product that is totally new for a specified market but which has already been successfully introduced in other markets;
- A product similar to one that already exists in a specified market but which is totally new to the company and offers new features in relation to competitive products;
- A product line that is totally new to the company but which will compete with similar products that have already been introduced in the market;
- A product that is new to the company but fits within one of the firm’s existing product lines and can be sold in an existing market;
- A significant modification to one of the company’s existing products; and
- A minor enhancement or modification to one of the company’s existing products.

Evaluation of concept for a “new to the world” product will obviously be more challenging and demanding than consideration of a minor modification to an existing product and the more innovative the concept the more likely it is that senior executives of the company will need to be involved to ensure that the overriding strategic goals and objectives of the company are being considered.

§28 --Feasibility study

Once a promising product concept has been identified it is tempting to proceed immediately to writing up a comprehensive business plan that can be used to obtain funding or other resources for developing the concept. While a business plan is absolutely essential in establishing the direction for any new product, service or business it should not be written unless and until some sort of feasibility study has been conducted on the concept and the company resources that would need to be collected to execute and support it. A feasibility study is not simply a test of a product prototype and should instead be thought of a rigorous and objective assessment of several key issues—is it technologically feasible to create, efficiently manufacture and distribute the proposed product in volumes that will be sufficient to capture the projected market share; what is the size of the potential market for the product; what competitive challenges will confront the company in launching the new product or service; does the internal sponsor of the concept have the skills and experience to create and manage the company structure necessary for launching the product; and what is the projected financial performance of the proposed concept.

The answers to some of the questions listed above can be found by researching available data and information on industries, markets and average profit and expense percentages. However, in order for the feasibility study for a new product concept to be useful and

effective there must be tough and honest feedback from potential customers and other business partners. A short description of the product or business concept, no longer than a single page, should be created and circulated to persons that have knowledge of the applicable technologies and markets. Prospective customers can provide their opinion on whether they would be interested in buying the product or service described in the concept and, if so, how much they would be willing to pay and how much of the product or service they would be willing to purchase over a specified period. Potential manufacturers should provide feedback on the costs associated with the actual design and manufacture of the product. In order to expedite the process of obtaining feedback one or more focus groups can be put together quickly by advertising on online services such as Craigslist. Software packages are also available to assist in navigating the process of completing a feasibility study.

§29 --Concept testing

Ideas that make their way through the initial screening and feasibility studies will then pass forward to a more thorough "concept test." While companies may use a variety of testing methods at this stage, the general objective is to evaluate the clarity and correctness of the company's belief that the idea does, in fact, include features that potential customers will both understand and believe that they will derive benefits from. Again, a new product concept will rarely emerge as a successful product if customers are not able to get a good idea of how the product works or the product fails to deliver real value to the customer.

In general, concept testing requires the development of a product concept statement that includes the following:

- A description of the anticipated features of the new product;
- A description of the benefits that customers will realize from the features of the new product;
- A demonstration of how the benefits derived from the new product will exceed those offered by currently available products or solutions; and
- An initial estimate of the proposed pricing for the new product.

While concept testing normally is limited to evaluation based on the product concept statement, companies may attempt to enhance the process through the use of simple physical prototypes of the proposed product. Alternatively, customers could be provided with a sketch or drawing that assists them in visualizing the overall look and feel of the new product. However, this type of detail is the exception rather than the rule, since the goal at this stage is to gather as much information as possible without spending additional time and money on any sort of development work, even if it is fairly easy to create a prototype or sketch.

The product concept statement may be tested in a variety of ways. For example, the company may arrange for interviews to be conducted with potential customers by an outside testing company. Alternatively, the survey can be conducted through the mail or
online. In either case, the statement must of course be accompanied by a short list of questions that, if answered completely, would fulfill the following key goals and objectives:

- Identifying product concepts that should be rejected out of hand;
- Generating an initial assessment of the potential market share and revenue performance of the new product;
- Identifying potential marketing issues for the new project, such as any indication that potential customers may not fully understand the use or benefits of the product; and
- Collecting suggestions that can be used to strengthen the concept and focus the actual development work.

The most common question seeks to collect information on how likely it is that the customer would buy the product. The customer will generally be given several different ways to indicate intensity of interest ranging from "definitely would buy" to "definitely would not buy." Most companies generally look to see what percentage of the total respondents have indicated that they would either "definitely" or "probably" buy the product. They realize that these raw scores would need to be discounted in attempt to create a prediction of actual sales; however, it does allow the company to create some ordering of multiple concepts.

While the primary benefit of concept testing lies in the information collected about the specific new product concept, the process is a valuable opportunity to learn more about the needs and preferences of potential end users. For example, if the survey is conducted through an interview format, the session might begin with a few questions about the interviewee's current strategies for addressing the needs and problems that will hopefully be solved by the new product. Other questions may be used to get a better idea of how the end user perceives competing products. Obviously, these responses cannot be digested quickly enough to allow the interviewer to change the specific new product concept that will be discussed during the interview; however, they can be used after the initial feedback has been received as a way to identify any changes that might make the concept more attractive to that end user.

Another issue to consider at this stage is the use of group surveys rather than individual interviews or questionnaires. The popular "focus group" is a commonly used method for testing new product concepts. The session might begin with a short survey that each individual completes privately without interacting with other members of the groups. Once that information has been collected, the entire group is free to exchange their own ideas and opinions about the concept and collectively brainstorm about things the company might be able to do to improve the proposed product.

While the anticipated end users of the new product should be the primary focus of the concept testing procedure, an effort should also be made to elicit feedback from all parties that might have some role in the successful commercialization of the new product. For example, if the product will be sold primarily through distributors and other agents, it will obviously be important to get their assessment of the concept as early as
possible. They can often provide excellent advice regarding the requirements of the end users and are can also be a good source of information on pricing trends and the utility of other products and solutions that customer might be considering as they choose whether or not to purchase the new product. Similarly, suppliers should be asked to review the design of the new product with an eye toward improvements that may increase the benefits for end users. Suppliers can also give the company an early estimate of manufacturing costs that can be used to develop the price estimate to test with end users.

While concept testing should be a regular part of the product development process, there are situations where the results may carry less value or may be much more difficult to collect and interpret. For example, it is often impossible to adequately describe a concept that is based on assessment of factors based on one or more personal senses, such as taste or smell. Concepts based on radically new technologies may also be difficult to gauge at this point since the company may not fully understand the steps required for further development. Similarly, concepts that require extensive explanation of what the company believes might be a customer “problem” that will be addressed by the product may not do well simply because the customers do not understand what they may be missing.

§30 --Full screen

New product concepts that survive the concept testing stage are then ready for more extensive evaluation of a wide range of technical and commercial factors. As opposed to concept testing, which involved a finite group of focused questions designed to generate a preliminary assessment of marketing understanding and interest in the concept, the focus at this stage is strictly on those factors that, in the company’s experience, have proven to be indicative of successful new products in the past.

While the concept test tapped into the opinions of various stakeholders outside the company, the full screen is based primarily on the assessment and collective experience of those departments within the company that would be involved in the development and launch of the new product if the concept was accepted. The main purpose of a full screening is to establish a ranking of various new product concepts to identify those which hold the most promise and those which should still be maintained on a “waiting list” in the event that the leaders stumble along the way. Of course, concepts that perform poorly at this stage should be rejected; however, since the screening is more comprehensive at this point, the company can use the results as a way to improve their concept testing methods. Finally, this stage is the first opportunity for the company to make objective assessments of the resources that will need to be devoted to full-scale development of the product. This information will be essential to creation of a pro-forma budget and the actual development and marketing plans.

There may be situations where the company feels that it does not need extensive new information on technical and commercial factors, such as when the new product concepts pertains to what is essentially a minor enhancement to an existing product. In that case, most of the evaluation will have been completed during the concept testing stage. In
most cases, however, companies will devise a comprehensive scoring model procedure that assigns a numerical evaluation, or “score,” to the new product concept for each of a number of important factors. A “higher” score on a factor will contribute to the overall attractiveness of the concept to the company, while a “lower” score will have an opposite impact. For example, if the company is using a “one-to-five” scale for evaluating the technical difficulty of actually creating the new product, a score of “five” indicates that no major problems are anticipated while a score of “one” may be a “red flag” in this area.

Companies are obviously free to test any number of factors; however, research has indicated that there are probably diminishing returns with respect to the quality of the information for decision making purposes once the company goes beyond 12 to 15 key factors. Factors that are commonly considered include the following:

- Product characteristics, including quality, uniqueness, superiority and demonstrable economic advantages to potential customers;
- Market characteristics, including size, growth rate, company experience and the need for the product in the relevant market;
- Functional capabilities, including procurement, engineering, manufacturing and distribution;
- Technical requirements and uncertainties, including development and design capabilities, likelihood of projected results and cost of development work; and
- Marketing requirements and uncertainties, including sales requirements, channel availability, promotion costs, market acceptance risks and competitive reactions.

Depending on the circumstances, the company may include additional factors that are particularly relevant to the specific industry or the scope of its business activities. For example, in technology-based industries, careful consideration should be given to any legal and other regulatory issues associated with the new product concept, including the need to secure regulatory approval for testing and marketing and the availability of some form of intellectual property protection for the product or the process that must be used in order to create the product. Companies active in global markets will naturally prefer new product concepts that can be easily adapted for distribution in foreign markets, although it may begin by concentrating on a single geographic area.

While time and clarity of judgment demands that companies base their screening decisions on the most material factors, it is apparent that not every factor used in the analysis will be of equal importance in a given situation. As a result, companies will often assign “weights” to the score for each factor that will then be used to generate a final score. For example, studies have indicated that the “product characteristics” and “market characteristics” referred to above may be the most significant factors for evaluating the likelihood of new product success. Accordingly, companies may assign greater weight to the scores recorded in these areas. In the same vein, companies may view the score on a specific factor as essential to the decision to proceed, regardless of how well the concept performs in other areas. Thus, for example, a concept that would require development costs in excess of a specified amount may need to be eliminated or, more likely deferred even if the company believes that it would do well in the market.
that case, further time might be devoted to alternative strategies for reducing those costs, such as alliances with other firms.

The screening group should include representatives from throughout the company, including marketing, technical, operations and financing. In addition, new product managers should be heavily involved. It is also important to include other specialists who might have a role in executing a portion of the strategy for developing and marketing the product, including experts from procurement, information technology and public relations. In cases where extensive development work will be required and the company will need to recruit additional scientists or engineers, it may be useful to consult human resource specialists.

There should be a good mix of technical and marketing specialists and it is important for team members to have experience with screening and with the overall goals and resources of the specific company. A manager should be appointed to oversee the scoring process and the manager should be familiar with the traits, tendencies and biases of each of the team members. Companies will often assign greater weight to the opinions of those team members with a demonstrated track record of success in predicting the way in which a new product is likely to perform.

§31 --Financial analysis

While each of the screening processes described herein are important and obviously provide new product managers with essential information regarding the form and the anticipated popularity of a new product, there is no getting around the fact that a concept will not be approved for further development unless it meets the company’s standards for return on investment. Accordingly, one of the last steps to be completed before a decision is made on the new product concept is generation of a comprehensive sales forecast and related financial analysis of the costs and risks associated with developing and launching the new product.

Numerous books and articles have been written on the procedures that should be followed in collecting and evaluating the data that is commonly included in this type of financial analysis. A key point is that this type of exercise will only be useful and relevant if the information used during the course of the analysis is comprehensive and accurate. Among other things, companies must make educated estimates, derived in large part from the other screen tools, of the following variables:

- The life cycle of the product (e.g., six months or five years) and anticipated general economic conditions during that period;
- The size of the target market and the projected growth rate over the anticipated product life cycle;
- Pricing and discount structure, if any, for the product;
- Costs associated with development, manufacturing and marketing of the product, including direct and indirect costs and capital investments;
- Tax and accounting items, including tax rates and depreciation;
Using this information, the company’s financial group should develop a basic forecast of pre-commercialization costs and expenses and anticipated sales and related production and marketing costs during the projected product life cycle. It is also important to describe three or four of the key assumptions that are the foundation for this initial forecast, such as the amount of capital investment required prior to product launch or the initial pricing structure. These assumptions should then be tested using some form of “sensitivity analysis” to determine the impact of unforeseen errors, such as the need to drastically cut prices due to greater than anticipated competition.

While hopefully the financial analysis conducted at this stage will be fairly robust, caution should always be used in interpreting the results. Managers need to remember that they are still working with information that is relatively imperfect and subject to change as the development process moves forward. Accordingly, the projected financial results of the new product concept derived at this stage are anything but absolute predictors of the performance of the product or the company. Instead companies should use this analysis as a tool for achieving one or more of the following:

- The analysis should obviously be used as a tool for identifying new product concepts that fall well below the company’s financial standards or that come with excessively high levels of risk and uncertainty. While the company is often able to manage costs and risks that are identified in advance, as described below, there may be situations where the numbers simply do not add up and the project should be abandoned or sent back for further study.

- The analysis can be used to identify key points in the development and commercialization process where decisions must be made to invest additional resources. In many cases, this information is more valuable than the overall projected revenue or income figures, which remain largely speculative at this point. The analysis can be broken down into stages and the company can monitor performance up to a particular point to determine if the project remains “on track” before proceeding.

- Sensitivity analysis is an important tool in encouraging product managers to investigate alternative strategies for completing stages of the development process. For example, if uncertainty regarding the cost of establishing manufacturing capability is increasing the development risk, consideration might be given to outsourcing manufacturing during the earlier stages of the product life cycle in order to reduce and manage those costs.

Each forecast and financial analysis presents unique challenges and companies must be flexible in their approach to a particular situation. One consistent problem is that there will often be large gaps in the reliability of the data that should be included in the analysis. For example, while the company may have a very good idea of the costs associated with development and production of the product, anticipated sales figures may
be difficult to generate because customer feedback on acceptable pricing levels remains far from complete. In that case, the analysis must simply incorporate a reasonable range of possible prices and further work on pricing should be planned for the marketing members of the team. The importance of this step will also vary from project-to-project. Obviously, forecasting and financial analysis will be crucial when the company is looking at a major development project for a brand new product. On the other hand, development of a minor improvement to an existing and proven product will usually not require detailed analysis, particularly if the company already has commitments from current suppliers and distributors.

§32 --Product definitions and protocols

Once the testing has been completed on the new product concept, and the preliminary financial analysis is underway, the product development team must synthesize its findings into a description of the product and the additional requirements that must be satisfied in order for the company to successfully develop and commercialize the product. This document, sometimes referred to as a “product protocol” or a “product definition,” is the key link between the product concept and development stages and should include the following mix of technical and marketing components:

- A detailed description of the proposed attributes of the new product, including the anticipated uses of the product and the benefits that users are expected to derive from the product;
- A description of the proposed target market for the new product and a preliminary position statement that states how the product will stack up against alternatives available in the target market; and
- A summary of the anticipated marketing requirements, including channel selection and requirements for sale force, advertising and other methods for building product and brand awareness

The product development team should also be prepared to address other ancillary issues, including the amount of time that will be required to develop the product and complete preparations for launch, strategies for manufacturing the product, financing requirements and, if applicable, the need to overcome regulatory approval hurdles. Competitive analysis is an implicit part of answering many of the requirements described above and the product development team should also be mindful of how the product and development project will fit into other anticipated activities of the company. While the development team will certainly be interested in sharing its excitement about a particular concept, it is important to strike and objective tone that is supported by real indications of end user preferences collected during the testing stage. Moreover, while the team has accumulated a substantial amount of information about the product at this point, there will always be areas of uncertainty at this point. Accordingly, the development team must candidly discuss potential risks and glitches in the development process that could cause substantial delays or even require that the project be abandoned.
In addition, once the concept testing stage is complete, the following elements should be in place before the proposed product moves forward to the development stage:

- A formal concept statement and product protocol should be completed and approved by technical and marketing representatives, as well as senior managers;
- Pro-forma financial information, including a tentative budget for the development and launch of the product, should be prepared;
- Members of the development team should be selected and provided with the necessary training and background information to discharge their activities; and
- A tentative development plan should be prepared following input from technical and marketing representatives and the leaders of the development team.

§33 --Final review

After all of the steps described above have been completed it is important for the executives and managers involved in the product development process to take one step back from the details and conduct one final review of the product concept before moving to the development stage, at which point the company is firmly committed to completion of the project and will begin to divert substantial resources to the new product. During the final review process all of the information collected to date should be checked one final time and the product concept should be measured against the following list of various conditions that a number of researchers have identified as “necessary” for successful product development:

- The product must have a demonstrable advantage in the eyes of the customer, such as unique and superior performance or significant cost-benefit advantages.
- The company must have a strong market orientation and solid understanding of the needs, wants and preferences of the customer base. Marketing information must constantly be used in the development of the product concept and in the product design phase.
- The new product launch effort must be carefully orchestrated in all phases, including sales, promotion and distribution.
- The company must have the appropriate technological skills and resources to support the technology platform for the new product.
- The company must have the marketing resources and skills to create and implement the sales, promotion and distribution strategy that is best suited to the new product.
- The new product must be targeted for an attractive market, which generally means a market that is large, high growth and with high long-term potential. In addition, the ideal market will have weak competition and lack intense competitive activity.
- The company must have a reasonable plan in place for developing or otherwise acquiring the technology and other intellectual property rights necessary for commercialization of the product and a plan for adequately protecting the company’s proprietary rights after the product has been launched.

§34 Development stage
The so-called “development stage” is a period of intense activity that will involve several different departments and a wide range of tasks and disciplines. Obviously, engineering and other technical personnel must now translate the formal product definition into a living and breathing product. In most cases, this will require completion of most or all of the following steps:

- Design, testing and validation of product prototypes;
- Design and validation of the optimal manufacturing process for the chosen prototype;
- Gradual ramp up of the product process to accommodate necessary volume for initial product testing in the marketplace; and
- Re-tooling of the product to take into account bugs and issues that arise during the testing process; and
- Finalization of specifications for the product and the manufacturing process.

Technical development will be accompanied by corresponding activities in marketing and finance, including the following:

- Preparation and approval of overall marketing plan for the product;
- Establishment of strategies for creation and management of distribution channels;
- Identification and collection of resources for service and ancillary support of the product;
- Preparation of preliminary sales forecasts for the product;
- Preparation of preliminary expense budget for product development and launch; and
- Evaluation of impact of product on existing products and brands.

Obviously there will be substantial overlap among these activities including, for example, the integration of channel decisions into the description of the marketing mix included in the overall marketing plan for the product. Also, certain action items, particularly sales forecasts and estimates of expenses, will need to be continuously revised as information is collected from testing during the development stage.

Before work can begin in earnest during the development stage, certain preliminary matters need to be completed. First and foremost, a product development team needs to be selected and the roles and duties of each of the members need to be determined. Not surprisingly, designation of the team leader is an important step and the leader should be able to act as a general manager of a multi-functional process. In addition, the company must establish procedures for collecting and processing information about the product and functions necessary to manufacture and sell the product. Areas of interest include not only financial analysis, but also feedback from customers and data that relates to the manufacture of the products. Finally, the company must establish the guidelines under which the development project will proceed within the larger company environment. Among other things, the relationship between the development team and each functional department needs to be defined, as well as the methods that will be used to allocate rewards for work that is completed on the product.
Most of the actual development process can be segmented between technical and marketing issues and activities; however, there must be significant communication between the persons primarily involved in just one of those areas. With regard to the technical development of the new product, attention will need to be given to such things as basic research, product design, creation and testing of prototypes, development of product specifications for full-scale manufacturing, preparation of projected cost budgets and finalization of a pilot product that can be used for final testing. Marketing activities will revolve around all aspects of creating the marketing plan, including identification of the target market, generating a proposed marketing mix, and development of sales forecasts and budgets for promotional activities. Technical and marketing activities will both be impacted by the results of ongoing testing of the prototype and pilot products with progressively larger groups of potential end users.

The activities of the technical and marketing development specialists are all important for making plans with respect to a variety of issues that are related to any new product. For example, the design of the product and feedback from end users can be used to determine the optimal strategy for packing the product. Moreover, the value of many products can be significantly enhanced by attractive warranties and customer service offerings. Careful consideration should be given to establishing support for distributors that will be used to promote and sell the product into different channels. As further information is gathered on each of these issues, refinements can be made in the forecasts for sales and costs and the entire team can prepare a comprehensive financial analysis and marketing plan.

Obviously the product development process can be complex and a number of tasks and activities need to be completed in order to improve the chances of success. Ideally the product development team would be able to operate without time pressures and have an opportunity to collect as much information as possible and perform a number of tests before finalizing the product and the associated marketing plan. Unfortunately, the market usually demands that development of new products must proceed with speed and dispatch to avoid the closure of opportunities due to competition or other factors. As a result, new product managers must take steps to accelerate product development. Among the techniques that should be considered are the following:

- The product development team should be small and autonomous and participants must be free from influences from their regular departments. In turn, each department should be instructed to cooperate fully with reasonable requests from product development groups.
- Vendors, resellers and customers should be integrated into the product development process.
- Design procedures should be simplified and accelerated through the use of computer-aided design tools, common components and design features that are easy to test and replicate.
- Manufacturing documentation should be simplified and computerized tools should be used to develop and test large-scale manufacturing processes in advance. If possible, companies should practice “just-in-time” delivery of materials and components.
- Products should be introduced in “rollouts,” rather than delayed with market testing, and companies should budget for aggressive early marketing campaigns to build product awareness and encourage the early trial of the product.

Other best practices that can contribute to enhancing the speed and effectiveness of product development include training for all persons involved in the development process, establishment and maintenance of communications procedures and, perhaps most importantly, rapid decisions. It is also important to always have a “Plan B” and to be flexible as the product moves toward completion. For example, the company should be prepared to rely on several suppliers and those suppliers should be able to adapt quickly to last-minute changes in design requirements.

§35 --Development team management

Many company activities are performed by groups or teams and a substantial volume of literature on team management is available. The product development process, which requires substantial cooperation among persons and departments throughout the company, necessarily requires formation of a development team and successful completion of the development process requires careful management of that team. The management of a development team is extremely challenging given that the process requires input and contribution from many different disciplines and that members of team generally, with limited exceptions described below, have ties and commitments to other groups within the company. In this section, we take a brief look at strategies for organizing product development teams, factors to be considered when making the company decision, and considerations to be taken into account when selecting team members and managing the team.

§36 ----Company structure of development teams

Alternative structures for organizing a product development team can generally be distinguished by the degree of commitment that the company makes to the specific project. The range of possibilities would include the following:

- Low risk development projects, including those based primarily on improvements to existing products, are often handled by an informal group of departmental representatives. In this case, there is little need for intense interaction, since participants have strong prior knowledge of the technology and market.
- The next stop on the continuum is the creation of a specific team with representatives of all of the key departments that would need to have input on the new product. In cases where the proposed product is fairly close to the existing business, important decisions will generally continue to be made by each of the departments, as opposed to the team, and the loyalties of the participants typically will remain with their department.

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44 For further discussion of team management, see “Organizational Design: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).
• New products that would require new information and evaluation of technology and/or market factors may be turned over to a full-fledged “project team.” In this scenario, team members place the needs of the project above those of particular departments. For example, the project team may recommend that a particular function, such as manufacturing, be outsourced if the team does not believe the company’s internal resources in that function will be adequate.

• Companies interested in facilitating radical changes and breakthroughs in innovation and product development may actually launch a new venture staffed by persons who leave their current department entirely and work full-time on the particular project. In many cases, these ventures are actually spun out as new entities and work may sometimes be conducted as a joint venture with collaborators from an outside business partner.

Various characteristics can be used to distinguish each of the alternatives described above, including the independence of the group from existing departments, the amount of time each team member is expected and allowed to contribute to the project, and the authority of project leaders to make decisions. Selection of a company structure depends on a variety of variables and the “project team” or “venture” models are probably the most appropriate when the following conditions apply:

• Development and launch of the new product is time-sensitive, either because the company needs new product revenues or there is a concern about beating the competition to the marketplace;
• The new product is likely to require new manufacturing and/or marketing methods or procedures;
• The new product will require skills and resources not readily availability within the company; and/or
• The new product is not closely related to the company’s existing products.

Other factors that influence the decision regarding company structure include the actual experience of the company with the use of highly focused project teams and new ventures. If the company has been able to deal effectively and fairly with the potential disruption to day-to-day department activities and authority, it is more likely that the company will be willing to embrace these alternatives and find employees who are willing to contribute to the initiative. One structure does not fit all projects, however, and companies will generally use a mix of “functional groups” and “project teams” to carry out all of the new product ideas that may be under consideration at any point in time.

§37 ----Selection of team members

Unfortunately there is no simple recipe that can be applied in all cases to select the best team members for a particular project. Each situation is unique and requires consideration of functional expertise and intangible factors that can contribute to the efficiency of the typical product development process.
Obviously the team must include participants with specialized skills in each of the areas that are essential to development and launch of the new product. In general, these specialists are drawn from functional areas within the company and, as described above, the key issue is whether their loyalties will remain with their departments or be transferred, at least for a limited time, to the development project.

Another factor that must be taken into account is the ability of team members to assume various roles within the group that are normally associated with successful collaboration. For example, it is important for team members to bring the right mix of creativity and strategic vision to the project. In addition, the team should include members who are in a position to serve as a “champion” of the product in other areas of the company and veterans who can objectively evaluate new ideas in light of their substantial prior experience with new product successes and failures. Finally, every team needs a member with a gift for facilitation, moving the process forward and breaking down bottlenecks.

Before, or during, the team selection process, a decision must be made regarding the team leader. Many companies will look to product managers to perform this role, particularly when the projects relates to a new product that will fall within the manager’s existing line. When the link between the new product and the company’s existing products is less clear, or when the project involves an effort to penetrate a totally new market, the team leader may come from senior technology or marketing personnel. Regardless of how the team leader normally fits into the company’s regular company, consideration should be given to the skills necessary to manage the specific project. Accordingly, it should not be forgotten that team leaders must be able to serve as a competent general manager of the project, including the ability to lead and direct the group, set and achieve goals and objectives and build and maintain a sense of trust and cooperation among the members of the team.

§38 ---Team management

Management of any product development team is an extremely demanding task. The team will be responsible for organizing, implementing and evaluating all of the key activities that must be completed during the development stage. In most cases, this will require the use of smaller groups within the team that have the particular skills that are most suited to that activity. For example, team members recruited from the manufacturing and engineering areas will generally take the lead with respect to design issues; however, input from marketing-based participants will be need to ensure that the design corresponds to customer preferences regarding ease of use and handling.

Team managers will need to confront a range of other issues which, if mishandled, can seriously delay the progress of, or even destroy, the team. For example, managers need to be attentive to attempts by one or more team members to assert suggestions that are based on the goals of their department as opposed to what might be best for the particular project. Team managers must also establish an effective system for communications among team members, including meeting schedules. In those cases where members are still working on other projects for their departments, team meetings must be conducted
efficiently and in a way that compels each member to focus on the tasks that need to be completed for the project.

Obviously one of the most sensitive team management issues is compensation of members for their participation. While the company can obviously exert pressure on employees to join product development projects, it is best to create an environment in which team members are ready and willing to leave their regular duties for some period of time to participate in these new projects. In many cases, compensation for team members is set as a combination of their regular base salary and a bonus component that is based on a combination of individual performance and successful completion of the particular project. It is rare for compensation to be based entirely on the performance of the new product, since that may depend on factors that are far removed from the activities of the team. Moreover, there are cases where members may need to take certain risks during the innovation process and the reward criteria should not dissuade members from pushing the envelope to achieve innovative results. When assessing individual performance, it is important to reward team behavior and attention to attaining the procedures goals and objectives of the team. Companies may also look to non-monetary methods for recognizing the work of the team and its members, including prizes, plaques, acknowledgement at company gatherings and permitted use of the facilities and resources of the company (e.g., equipment) by team members for development of some of their own product ideas.

§39 --Design

Design can have several meanings in the context of a product development effort. In general, design encompasses all the activities required to use technology to satisfy customer needs through a product that can be manufactured effectively on a commercial basis. In other words, the product must be useable and be capable to large-scale product sufficient to meet demand on a cost-effective basis. Design involves a wide range of specialists, including members from the manufacturing, marketing and service areas. However, the time and effort are well worth it in the following areas:

- It has been estimated that a significant portion of the manufacturing costs for a product are based on the design of the product. A poorly designed product can result in increased materials expenses and slower production cycles.
- Design obviously impacts the ease of use of a product and ultimately the customer’s satisfaction with the product experience. Customers are more likely to have a positive impression of products that can be used quickly without the need for lengthy instructions or explanations.
- Companies have rapidly embraced the notion of designing for “quality” and including features and functions that enhance performance and durability of their products.
- Properly designed products are easier to install, maintain and repair, thereby easing customer anxiety about using the product and reducing the costs associated with the product over its life cycle.
- Customers appreciate products that are easy to remove from their original packaging and that can be quickly disassembled and moved or disposed. All of these activities
are based in large part on the design of the product, as well as the care and attention given to the packaging.

§40 --Product use testing

In general, product use testing refers to the steps that are taken in order to test the experience that prospective customers have when first exposed to a prototype of the new product under normal operating conditions. Product use testing is the best way for the product development team to evaluate whether or not the product will actually be able to fulfill the customer needs or solve the customer problems that were identified in the earlier stages of the development process.

When dealing with products that will eventually be sold to business users, as opposed to individual consumers, a common form of use testing is referred to as the “beta test.” In general, a beta test involves short-term use and testing of the product at customer sites. The primary goal is to determine whether the product actually works and to identify and material bugs or glitches that need to be addressed before the product moves closer to the full launch. While beta testing is valuable, it does have some obvious shortcomings. For example, since beta testing must generally be conducted within a fairly short timeframe, it is likely that major problems may not come to surface or that the testers will ignore any negative results and blame them on the way that the tester used the products. It has also been observed that beta testing is often done too late in the development process, which means that the developers are reluctant to honestly acknowledge problems that may lead to an extension of the development project. Some companies, particularly those involved in the pharmaceutical and medical instrumentation area, have opted for what is referred to as “gamma testing,” which involves extended use of new products by customers without time constraints to ensure the product performs as expected and conforms to all of the actual needs of the customer.

Regardless of the form of product use testing, the development team needs to make several key decisions in formulating the test procedures and evaluating the results. For example, an obvious issue is the composition of the test group, which can include not only end users but also employees and outside experts. The length of the testing period needs to be determined and consideration should be given to the source of the products that are to be tested (e.g., batch or final production products). Finally, it is important to develop and consistently use a set of questions and measures of satisfaction that will give the company the necessary diagnostic information. There are a number of approaches that can be taken and companies will often rely on independent market research firms for guidance and assistance.

§41 --Marketing plan

One of the most important activities of the product development process is the creation and delivery of a comprehensive marketing plan. The overriding purpose of the marketing plan, regardless of the length or format of the document, is to create a record of the activities that have been undertaken during the product development process and
communicate the goals for the new product and the plans for introducing the new product to, and promoting the product in, the marketplace. Companies should develop a standardized format for the marketing plan for each of its products and a plan development process that ensures that proper attention will be paid to certain key elements—marketing research; strategies with respect to the traditional “Four P’s” of the marketing mix (i.e., product, pricing, place and promotion); post-sale customer service and support and training and education for sales personnel and other employees throughout the company involved in the commercialization of the product. The new product marketing plan should include sales forecasts, budgets for marketing activities and a schedule of marketing events and provision should be made for continuously monitoring the effectiveness of the marketing strategies for the new product.\footnote{Development of the product marketing plan is also an opportunity to create a comprehensive list of all activities that need to be completed during the launch phase. The list should identify the persons that are involved in each activity, guidelines for determining when the activity has been successfully completed and a schedule for completion of each of the activities. For further discussion of preparing a product marketing plan, see “Marketing” in “Product Development and Commercialization: A Library of Resources for Sustainable Entrepreneurs” prepared and distributed by the Sustainable Entrepreneurship Project (www.seproject.org).}

§42 Product launch activities

Once the decision has been made to move forward with sale and marketing of the new product, attention turns to the activities associated with the “launch,” or “commercialization,” stage. While there continue to be a number of technical-based activities at this point, a good deal of the emphasis now switches over to the marketing discipline. In addition, operational personnel begin their duties in earnest as the company gears up for production by actually purchasing or leasing the equipment necessary for manufacturing.

The key technical activity during the launch stage is building the production capability that will be required to support full-scale manufacturing of the product. The manufacturing team will begin with initial runs to evaluate the efficiency of the production process and the quality levels of the output. Once feedback has been obtained from ongoing testing, the production process will be scaled up and final specifications for the product and process will be developed. At the same time, decisions will be made regarding procurement strategies and plans will be made with suppliers for delivery of materials.

On the marketing side, promotional materials are created, pricing decisions are made and contracts are finalized with various distributors. In addition, time and effort is devoted to training the sales force and providing them with the tools and equipment necessary to effectively contact prospective customers and demonstrate the new product. Marketing personnel also take the lead in creating an actual launch plan; however, the details regarding timing cannot be finalized without input from the technical side.

The launch stage also includes ongoing testing of the new product. Marketing personnel arranges for “beta” and “gamma” testing of the product by potential customers.
of these tests is to see how the product performs in conditions that are comparable to those that would apply once the product is put into regular day-to-day use. Feedback from these tests will be used by the technical team to make additional refinements to the product and retool the production process to address common glitches. Testing can also be used to verify the marketing plan or suggest changes in service and support offerings. Another type of testing at this stage is so-called “market testing” which, in effect, is the introduction of the product to a small portion of the market, such as a neighborhood or city. Also, if necessary, the product will be put through the paces necessary to obtain any legal or regulatory approvals for actual marketing and sale.

§43 --Launch planning

When developing the marketing and overall product launch plan for any new product, consideration should always be given to the following general factors:

- Companies often have overriding policies, goals or constraints that will need to be respected in the course of creating and implementing the plan. For example, every new product may be required to meet specified minimum gross margin requirements. In other cases, the CEO’s taste with respect to pricing and/or advertising policies will need to be respected in order for the plan to be approved.
- The planning team should carefully reassess each of the specific goals and objectives that may have been set at the time the new product concept was first created. For example, assumptions regarding market share, revenue and the time required in order for the product to reach “break even” may need to be changed in light of information collected during the testing and screening process.
- The planning team will need to make decisions regarding the projected life cycle of the product and the entry strategy. For example, the company may decide the new product will become a permanent part of its product line, even if performance is less than expected, or it may decide the life cycle will be driven by the ability of product to attain certain objective milestones within a specified period. The entry strategy refers to a choice between aggressively promoting the new product from the outset as opposed to a more cautious rollout.
- A final decision should be made regarding the targeted source of demand for the new product. In most cases, the choice is generally between seeking market share from existing products in a fixed size market as opposed to expanding the overall size of the market by bringing in new customers.
- The planning team should clearly evaluate the impact that the new product is expected to have on existing company products. In some cases, the company will completely drop an old product when the new product is launched. Alternatively, the two products may be continued with the expectation that users will switch from the old product to the new product based on certain assumption regarding timing. Still another possibility is that the two products will co-exist as solutions for different markets or user types.
- Information obtained during the testing and screening processes should be used to refine the description of the proposed target market for the new product. Markets can be classified in a variety of ways, including end use, demographic characteristics or
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location (i.e., geographic markets). In other cases, the company may establish an initial target market that includes those prospects that are most likely to provide a trial for the new product.

§44 --Launch management

One of the keys to successful launch management is taking the time in advance to identify potential problems that might arise during the launch process and then to develop contingency plans for those situations that can and must be controlled. Problems can come from a variety of sources, including poor execution of marketing strategy by the company, manufacturing glitches or unanticipated reactions from competitors. Obviously not all problems can be predicted, nor is it possible to develop plans for dealing with every problem. The key is to select those problems that are most likely to occur and which carry the largest potential for damage to the success of the launch.

Contingency planning is only worthwhile if the launch team has developed and implemented a system for rapidly collecting and analyzing data about the launch so that the team knows if a problem may be arising. The system should be designed by reference to the key problems. For example, if there is a concern about how quickly and effectively the internal sales force will be able to contact potential customers, the team should establish a way to monitor the weekly call reports of all salespersons. If it turns out that the volume of calls is not meeting a specified minimum level, remedial steps may be required. Another potential problem is that the initial sales presentations are not leading to a satisfactory level of trial orders. The effectiveness of the sales pitch can be tracked through follow-up calls to determine if prospects actually understand the features of the new product. At the same time, a second attempt can be made to convince those prospects that do understand the product to actually place an order.

The contingency plan for a potential problem must be an “affirmative step” that can be taken immediately. For example, if the tracking system reveals that the volume of sales calls is unsatisfactory, a meeting of all sales representatives should be called to discuss the situation and perhaps implement an incentive plan. In the case of disappointing rates of trial orders, the company should be prepared to offer substantial discounts as a way to get customers to actually try the product. Introduction of a similar product by a competitor may call for more drastic action, such as intense direct sales and advertising activities and large discounts. In each case, however, the company is taking an action designed to quickly influence the situation that led to the problem. Addressing the apparent disinterest of the sales force in pushing the new product by simply deciding to study the possibility of a new compensation plan will not be sufficient given the speed of developments during the launch stage.

Obviously there are limits to the amount of contingency planning that can be effectively accomplished. For example, companies can certainly track the percentage of customers that continue to order the product after they have completed their initial trial. If the percentage of repeat customers falls below the target set out in the original sales forecasts, the company clearly has a potential problem. However, the correct response
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may be difficult to formulate until the launch team has an opportunity to collect more information on the reasons that customers are not making repeat orders. In that case, the initial remediation would be design of survey procedures, such as calls to larger accounts, to diagnose the problem. Once that is completed, an action plan can be developed, including additional customer support and training or even changes to the actual design of the product.

§45 --Activities and schedules

The launch plan should include a list or table that describes the activities that will need to be completed during the launch phases and the specific persons who will be primarily responsible for each activity. If the activity requires cooperation among a number of persons, one person should be designated to be sure that all the work gets done and that the required finished product is delivered in a timely fashion. The activities are generally broad in scope and may involve a number of different departments within the company. For example, the sales training department needs to prepare instructional materials for the internal sales force and for outside distribution channel partners. Copy writers, editors and printers will need to coordinate their activities to prepare the necessary marketing collateral. In situations where the product will actually be introduced in several countries, attention will need to be paid to translating marketing materials and modifying them as necessary to suit each local market.

The launch plan should also include a detailed schedule that identifies the required completion date for each critical task during the launch phase. A number of project management software packages can be used for this purpose and they can be used to effectively coordinate the start and end dates for each of the tasks so that the process flows smoothly and one group is not delayed waiting for another group to finish something that the second group needs in order to complete its own activities. Project management programs can identify points in the launch plan where resources are particularly stretched and managers may opt to change the timetable to provide some room for error.

§46 --Product announcement strategies

What is generally understood to be the formal launch of the new product, the time when the product is released to the initial market and the initiatives in the communications plan for the new product commence, is triggered by a formal new product announcement. While the company will certainly plan on some form of formal announcement of the new product, a good deal of effort will be spent on various pre-announcements designed as a way to condition the market for commencement of actual sales and full-scale promotion. For example, the company may issue press releases and position statements that describe problems or needs that the company is looking to address, including business alliances that may have been forged during the development process. Additional information may be provided to key opinion leaders, including research analysts, and some may be given a pre-release version of the product for testing and review. Finally, as the actual date for
the release of the product is finalized, the company may disseminate promotional pieces that signal the announcement date.

§47 --Reseller motivation strategies

Many companies rely on distributors and other resellers to push their products out into the marketplace. A reseller network can provide substantial economies of scale and relieve the economic pressures associated with the building and maintaining a dedicated internal sales force. However, strong reliance on resellers can create an additional challenge during the new product launch phase, since the distribution channel must be primed to accept and aggressively market the new product. Since, in many cases, distributors may need to shift its existing resources to support a new product, new product developers must be prepared to offer various incentives to its distributors to persuade them to include the product in their lines. Beyond the obvious strategy of offering a superior product, companies might consider the following ideas:

- Using advertising, public relations and trade show appearances to promote the product and the resellers involved in distribution of the product;
- Granting exclusive rights to a reseller in a specified territory or market;
- Providing merchandising assistance, including co-op advertising, in-store demonstrations and “events,” displays, training and repair and service clinics;
- Increasing the basic margin and/or offering special discounts and allowances; and
- Providing extraordinary service and support.

In addition, reseller motivation and involvement can be enhanced through personal selling efforts, including presentations by the company’s internal sales and marketing personnel and communications between senior managers of both parties. If possible, key resellers should be invited to participate in the early assessment of the initial product concept and opportunities should be created for resellers to provide feedback regarding customer interest in, and acceptance of, the new product. Resellers can also be motivated through less collaborative methods, including sanctions that might be imposed in the event that resellers fail to achieve specified sales objectives.

§48 --Market testing

Once the company has finished the development of a completed product that includes all the features contemplated by the new product protocol, it is important to put the product in front of actual users to evaluate the performance of the product and its functionality in satisfying actual needs in the market. While there is little argument that market testing of some type can provide valuable information, it is often a tough decision to knowingly delay the formal launch of the product for testing, particularly when it seems that the marketing plan is finalized and ready for execution. However, the benefits of testing, in whatever form, generally outweigh the risks of delay. For example, market testing provides an opportunity to see how the manufacture process handles production of an increasing volume of products. Market testing also facilitates evaluation of resellers, service and support and the willingness of customers to actually purchase and use the
product. Risks associated with market testing include the costs associated with the process, including fees for market research experts, production and selling expenses and deferred revenues as a result of delaying the formal launch, and the possibility that competitors may use information that came to light during the testing to develop retaliatory strategies.

The following commonly-used market testing methods are available to companies at this stage:

- Several methods measure customer interest without an actual sales transaction, including queries to customers to determine whether they would buy the product if it were offered and observation of customers in a false buying situation to measure their reaction to availability of the product.
- Controlled sale methods involve an actual purchase by the customer and are based on making the product available on a limited basis through personal sales, direct marketing or in restricted markets.
- A “full scale” market test actually replicates all elements of a complete launch in a significant portion of the total projected market for the product.

Companies may also integrate elements of market testing and full product launch through “rollout” strategies that are essentially staged introductions of the products to progressively large portions of the total market. For example, the rollout may progress through various geographic markets or may be launched through catalog sales before the product is placed into “bricks and mortar” outlets. Some companies prefer to begin the rollout in markets where it is anticipated that the response will be positive; however, other companies opt to tackle more difficult markets to really see if the product has a chance to achieve the success necessary to justify the projected marketing expenses. The later strategy is likely to uncover problems and may require changes to the product and the marketing plan, but these issues may be tolerable if the process results in clearer definition of the product and the related message.

§49 --Internal marketing activities

One aspect of the product development process that should not be overlooked is the need to conduct “internal marketing” activities that educate employees about the new product and the underlying goals and objectives of the company with respect to the development and launch of the product. Employees, particularly those directly involved in the production and sale of the product, need to understand how the new product fits into the company’s overall competitive strategy. It also essential that employees have a good idea of how the new product is to be positioned and the factors that have been taken into account in establishing the pricing and support strategies for the product. Internal marketing can be accomplished by electronic communications and through training sessions that are conducted throughout the development and launch process. Additional tools and materials will need to be created, including sales kits, datasheets and white papers including industry and competitive information, pricing guides and summaries of relevant portions of the marketing plan and position statement for the new product.
§50 Product development problems

The discussion above has focused on strategies and procedures for effective product development and the goal is always to improve the process to the point where the company can consistently identify, develop and launch new products and services that assure growth and survival. However, it is likely, if not inevitable, that problems will arise at some point in the product development process and the persons involved in the development activities need to anticipate issues and be prepared to address them quickly and efficiently. Sometimes things proceed too slowly and the product launch date needs to be pushed back. In other cases the company pushes forward too quickly resulting in the launch of a product before it is ready for the competitive rigors of the marketplace. Development problems are also more likely to occur when companies attempt to follow an accelerated development schedule.

§51 --Delayed product development

One of leading causes of failure among new companies is their inability manage the product development effort in a way that avoids delays. New products may be delayed for a number of reasons, including insufficient resources dedicated to the development project, inadequate attention from senior managers who become too busy with marketing and administrative matters, and the unwillingness of scientists and engineers involved in the project to ask for, and accept, assistance when it is clear that the project schedule is slipping. Whatever the reason, the consequences can be dire, if not terminal for the business. At one extreme, the product is never completed or is ready to launch well after others have already entered the market. More commonly, the founders are forced to raise additional equity capital to keep the business going until the product is ready, thereby diluting their stake in future profits and increasing the likelihood that they will ultimately need to surrender control over the business.

§52 --Premature product launch

The flip side of problems created by delays in product development is the decision of launch a new product before it is really ready. Many companies, eager to generate revenues and reacting to rumors that rivals are ready to enter the market, will introduce a new product before it has been fully tested and important flaws have been identified and rectified. While there are limited cases where customers are so excited about the product that they are willing to tolerate the initial bugs, the more likely scenario is that customers will lose patience and elect not to devote the time and effort necessary to both learn how to use a new product and work through the changes necessary for the product to meet its stated performance objectives. A flawed premature product launch will have several bad consequences for the company. First, all the resources expended on the initial marketing campaign will be wasted and even more effort will be needed to repair the firm’s reputation and re-build trust and interest among the customers once the product is fixed and ready to be re-launched. Second, needed further development work may be delayed because limited technical resources will be diverted to addressing the immediate
problems of the initial customers. Finally, the company’s competitive advantage from being a first-mover will be dissipated potential competitors will have an opportunity to examine the product and learn from the mistakes made by the company during the premature launch.

A related problem in this area is a promise to a key customer to meet an unrealistic delivery date. In many cases, pressure from customers and competitive factors cause companies to agree that new products will be ready for installation before the company has an opportunity to fully complete the development phase and adequately test the products. The result is generally disappointment for the customer and a loss of credibility in the marketplace. This dilemma often arises in cases where there has been a breakdown in communication between the marketing and technical functions.

§53 --Accelerated product development schedules

Realizing the risks associated with premature product launch, successful companies nonetheless push the envelope as to the time required to complete development of new products. Accelerated product development means that the company establishes an expectation of continuous innovation and places pressure on competitors to deal with constant reductions in product life cycles. In order to mitigate some of the risks associated with this strategy, company should engage in careful planning before the actual development effort commences. One method that is common used is the creation of a multi-functional product definition team that includes representatives from all areas of the firm that will be involved in the product launch, such as engineering, manufacturing, marketing, sales and finance. This team can provide direction for the product development activities by establishing, in advance, the key parameters and expectations with regard to features, performance and pricing of the product.

§54 Product development for global markets

More and more companies have come to realize that product development must be undertaken with a focus on more than just the domestic market. While there a number of complex issues that must be taken into account when development products for global markets, notice should be taken of some of the following general strategies:

- Some companies make no special attempt to develop products for a particular foreign market and rely solely on global export of its domestic products. This strategy makes sense when market conditions are relatively similar around the world.
- Companies may retain the basic design and features of the domestic product and invest in modifications that might make the product more suitable for use in attractive foreign markets.
- Companies may retain a centralized product development process in the home office and rely on managers in foreign countries to feed ideas that can be developed for primary use in those foreign markets.
- Companies with a large presence in a foreign country may elect to provide senior managers in that country with funds to create and operate their own localized product
development group, including engineering, manufacturing and marketing personnel and resources.

Obviously many companies can adopt a mix of the aforementioned strategies depending on the particular line of product or the size of their key foreign markets. For example, it may be cost-effective to rely on global export of certain types of products while funding localized product development efforts of other types of products in key markets. In some cases, a foreign office may actually become the focal point of innovation in some areas and may take on the principal responsibility for engineering and manufacturing of products that can thereafter be introduced into the company’s original domestic market.46

§55 Development of new services

Most of the discussion in this Part pertains to the development of new tangible goods; however, generation of new ideas is also an important element of business strategy for companies engaged wholly or partly in the provision of services. The role of services in the product portfolio of any company will vary depending on the circumstances. For example, law and accounting firms are generally “pure service” businesses that offer no tangible goods to their customers. An insurance company is primarily a service firm although the actual policies should be seen as goods. Automobile manufacturers are principally providers of goods; however, there is also a good deal of service offered in the form of repairs and warranty policies. Finally, a company that develops and distributes food products is best seen as a “pure goods” business.

One thing that is apparent from the range of categories is that all but the first group have a significant element of “goods” in their product offerings to customers and, as such, can be expected to have in place most of the product development processes that have been discussed herein. Moreover, even law and accounting firms use tangible items in the course of promoting and delivering their services, including advertising materials and publications. Accordingly, those service-based companies must adopt strategies that relate to design, production and distribution of these items.

Services do not require development of physical prototypes; however, consideration should always be given to the creation of reliable systems and procedures for delivery of services. In order to develop these systems and procedures, reliance must often be placed on teams that perform many of the same activities that occur when the goods companies tackle new products. For example, law firms are aggregating specialists from different practice areas to device cross-disciplinary solutions for their clients and create ways for the firm to expand its relationships with existing clients into new areas.

Studies have indicated that a new services offering is more likely to be successful if it is new to the market, compatible with the perceived needs of the consumer and delivered by trained expert personnel. In order to satisfy each of these factors, service businesses must

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adapt many of the techniques discussed in this Part. For example, concept testing, albeit without a physical prototype, is an important step in determining whether a proposed service will adequately address a need or problem that is recognized by the target market. Also, employees must be trained in the methods that will be used to continuously deliver the new service at the same level of quality and performance. In addition, advertising and promotional materials will need to be developed to explain the new service and its benefits.

§56 Product discontinuation

While the new product development process is obviously focused on achieving the desired level of commercial success for the product, the members of the new product development team must also be prepared to weigh in on whether the product should be discontinued in the event that the forecasted goals and objectives for the product are not being attained. Obviously this will be a difficult situation for the team members, many of whom will have invested substantial time and professional capital during the entire process; however, they must make the effort to be objective in their assessment and bring their own substantial body of knowledge regarding the product and market into the decision making process. In fact, the new product development team should be in the best position to understand the reasons for any apparent failure of the product since part of their original assignment was to identify the potential pitfalls and risks associated with the development and launch process.

There are a number of reasons for discontinuing a product, including situations that may actually have been identified as possibilities during the product development process. In some cases, the product itself is to blame or the marketing plan was not as effective as it may have looked during the planning process. Also, external factors can play a part in the demise of a product, including technological advances, regulatory changes or actions that are taken by competitors. Discontinuation does not necessary mean that a product was a failure and is often a natural part of the product life cycle.

Common reasons for discontinuation of a product include the following:

- Demand for the product is reduced by technological advances or introduction of a new generation of products with numerous new features;
- Customers develop a preference for alternative solutions to the problems and needs that are addressed by the product;
- Price reductions triggered by competition and/or increases in operational costs lead to shrinking margins for the product;
- Senior management determines that the product and/or the product line in which the product is placed no longer fits the overall strategic objectives of the company;
- Manufacture of the product becomes too difficult due to supplier problems;
- Product support becomes too expensive due to increased labor costs or obsolescence of technology need to fulfill the support obligations; and/or
- Funding required for continued support of the product is diverted to other uses, including development of new products in the same or different areas.
The company should develop a tracking system to monitor the performance of the product against the objective goals established in the marketing plan. When it is clear that the performance of the product is declining, the company needs to decide whether steps should and can be taken to re-invigorate the product. This decision involves many of the same factors that must be taken into account when evaluating a new product concept, including an assessment of whether the return on any proposed investment will exceed the return that might be available on alternative projects. In some cases, the product may be temporarily pulled from the market pending study of possible design or marketing changes. If the changes are successful, the product may be re-launched at some point in the future.

Once the decision has been made to discontinue the product, the product manager must proceed with an orderly winding down. The required steps will depend on a number of factors, including the type of product, the customer base, and the human and tangible resources that have already been committed to supporting the product. Issues that need to be considered include the following:

- Managers and employees involved in manufacturing and selling the product will need to be re-assigned to other projects. This can be a sensitive issue, particularly when re-assignment is not possible or work on the product has distanced an employee from others in his or her functional department. In many ways, this process is akin to an outright change of jobs.
- Notice needs to be given to customers, suppliers and distributors and arrangements need to be made for various types of ongoing support. For example, the company may be required to purchase products that remain in distributors’ inventory. Also, arrangements must be made to continue to support repairs of the product throughout all remaining warranty periods and service contracts.
- Contracts with other outside vendors, such as market research firms or advertising agencies, will need to be terminated. This may sometimes result in termination fees; however, the company may be able to negotiate credits that can be used for similar work on new products.
- Tangible and intangible assets used in connection with the discontinued project may be sold, leased or licensed to third parties, thereby generating some limited amount of additional revenue. For example, unused manufacturing space may be leased to another firm or rights to the entire product or elements of the intellectual property associated with the product may be sold or licensed.

Finally, the company should consider how discontinuation of the product will be “announced” to the marketplace, which includes the trade press, competitors and prospective business partners. In some cases, the product is simply allowed to “disappear” without formal word from the company. Discontinuation of other products may be accompanied a final promotional campaign that affords customers “one last chance” to purchase the product. This approach is generally limited to those products that have developed their own unique brand identity. If the discontinuation is
accompanied by a sale of assets, as described above, the company may use it as an opportunity to announce and explain a projected change in strategic goals.

§57 Evaluation of the product development program

Since product development is an ongoing activity that involves representatives from each of the functional departments within the company, it is sometimes difficult to get an assessment of how well the company is performing in this important area. One can get a general idea by looking at the number of new products that the company brings to the marketplace over a given period and the success associated with those products; however, one of the issues that arises when focusing solely on “new” products is that innovation in the product development area often takes the form of improvements and modifications to existing products that may be needed in order to address an identified change in the requirements of customers in an market or to allow an existing product to be successfully introduced into a new market (e.g., a foreign market that requires changes to the design of an existing product in order to satisfy local tastes and/or regulatory requirements). It is also possible to compare new product introductions and revenues with competitors of the company. While the above-mentioned metrics are useful, the best way to really measure the effectiveness of the product development program is to conduct comprehensive formal evaluations on a regular basis which:

- Analyze revenues from, and the profitability of, the company’s past new products;
- Identify and evaluate the causes of success and failure for past new products;
- Compare the actual performance of past new products to the projections included in the original marketing plan;
- Critically evaluate the utility and accuracy of the company’s screening and testing procedures for new products;
- Analyze and categorize the different types of expenses associated with new products, including development costs, capital investment, salaries and overhead, launch costs;
- Identify institutional strengths and competitive advantages that can be leveraged in future product development projects;
- Identify institutional shortcomings and problems that need to be overcome in order for future product development to be more successful;
- Evaluate the commitment of senior managers to innovation and product development and identify the impact of that commitment on the activities of employees involved in the development process; and
- Assess the performance of the company in relation to the recognized “success factors” for healthy product development activities.

A number of different methods can be used to conduct an evaluation of a product development program. In most cases, the easiest approach is to use an extensive questionnaire that examines company attitudes toward, and procedures for, product development. The evaluation can be conducted by an outside consultant through observation and interviews with company personnel or the questionnaire can be circulated to managers and employees for completion on their own. Possible questions, which should be responded to by a “Yes” or “No” answer, include the following:
• Has the senior management of the company, including outside directors, made a commitment to product innovation and effectively communicated that priority throughout the company?
• Do managers at all levels believe that the company has a formal process for developing new products and can they identify those persons within the company that have specific responsibility for identifying and/or receiving ideas for new products or processes?
• Are contributions to product innovation part of the assessment and reward system of the company?
• Are product development projects organized and managed in a manner that encourages and facilitates cooperation among representatives of all functional groups within the company?
• Are the majority of new product concepts based on feedback obtained from current customers and suppliers?
• Has a system been established for objectively and regularly evaluating the performance of the company's product development procedures and programs?
• Is there a positive working relationship between members of the technical and marketing groups?
• Does the company have a comprehensive system in place for consistently and thoroughly evaluating new product concepts?
• Does the company make a regular practice of testing new products with prospective end users and soliciting feedback from suppliers and potential distributors?
• Does the company illicit feedback from all personnel involved in the development and launch effort before finalizing the marketing plan for each new product?
• Do launch teams consistently develop contingency plans that anticipate problems that may arise during the launch and include remediation plans that can be implemented in a timely fashion?

Obviously, further specificity can be obtained by revising the questions as statements of fact (e.g., “launch teams consistently develop contingency plans”) and asking respondents to provide measurements on a scale that runs from “Strongly Agree” across to “Strong Disagree.”

Once the questionnaires are collected, a meeting of all respondents should be held to discuss disagreements and identify those areas that might be best suited for remedial action. When there is no clear consensus on a particular question, it is important to identify specific reasons for the apparent confusion. For example, if the respondents are evenly split on the question of whether or not the company has an overall process for the development of new products, it may indicate that senior management is not properly communicating its strategies in this area throughout the company. In fact, a product development process may well be in place; however, the details may only be known by a small group of managers. While such a result does not mean that the process itself is flawed; however, it can raise concerns about morale and ability of the company to persuade larger groups of managers and employees to support new products.
In addition to the questionnaire, the evaluation should focus on objective measures of performance that can provide significant clues about the product development system and the underlying culture for innovation within the company. For example, it has been suggested that the "failure rate" of new products can be used to assess the company's commitment to creating innovative new products, as well as the skills of company personnel in managing the product development process. If the company has a very low failure rate, perhaps less than 10%, it may be that the company is failing to undertake relatively risky projects that could eventually lead to more opportunities and revenues in new markets and/or product areas. On the other hand, a high failure rate in excess of 20% or 25% should raise warning signs about the ways in which the product development teams perform their tasks.

Ettlie et al. compared the ratio of product life cycle to development period ("PLC/DP") among durable goods manufacturers in five dispersed countries—the US, Sweden, Germany, Hungary and Japan—as one potential measure of the efficiency of their development processes. The firm from the US was the clear leader on this measure, returning 9.33 years of product life for every year invested in new product development (i.e., seven years average product life divided by 0.75 years product development period = 9.33 years). Efficiency within the US firm was accompanied by the highest percentage annual revenues from new products among the survey participants (100%). The US firm was second among the survey participants, behind the Japanese firm, in the percentage of revenues invested in research and development (4.1%). Ettlie et al. commented: "It seems clear that the strategy of the American plastics equipment firm is to emphasize R&D supported products." The PLC/DP measures for the firms in other countries were much lower than the US: 2.5 for the German and Swedish firms, 1.4 for Hungary and 0.33 for Japan. The results for the Japanese firm were complicated by the fact that its reported development period was much longer because it was defined as the period running from basic research and development through business launch and Ettlie et al. noted that the firm, which spent about 5% of its revenues on research and development, was perhaps taking steps to improve its PLC/DP by increasing its product life cycle by two years.

Another method for improving the product development process is to conduct thorough assessments of a small group of specific development projects. This process should focus on how the teams handled each of the activities normally required during the evaluation, development and launch phases as well as the management skills of the particular project leaders. Team participants should be interviewed separately to gauge their personal feelings about their involvement in the project. For example, this is a good way to measure the effectiveness of the company's compensation and reward systems. If participants express reluctance to work on new projects, or feel that they will be penalized for failures that are made in "good faith" during such a project, then there are significant management issues that need to be addressed.

48 Id. at 147.
The group should prepare a report and plan of action that can be presented to senior management for review and endorsement. The report should summarize the results of the evaluation, including explanations of apparent disagreements, and then identify areas in which improvement should be pursued. The report should include a description of the specific activities that will be undertaken, such as programs to inform managers and employees about the product development process and invite their participation. The group should also specify the tools that will be used to measure whether the plan of action is successful. This can be a challenging task, particularly when the group is seeking attitudinal changes that often can be difficult to measure. For example, if the company is seeking clearer leadership of development teams, attainment of the goal will depend both on the personal characteristics of the chosen leaders and the degree of trust and respect that team members have in their leaders. Moreover, strong leadership does not always lead to the best results in the development process.

Senior management should encourage, if not demand, regular and consistent evaluations of the product development process. As time goes by, senior management should assess the impact of suggested remedial actions and develop a framework for objectively evaluating the performance of the company in this area. It is important to remember that product development can have far reaching consequences for the company. Of course, there are the obvious financial benefits from consistently introducing successful new products. In addition, however, a reputation of strength in the product development area can assist the company in its efforts to recruit talented engineers and marketing experts. Also, a company’s ability continuously launch new and innovative products will make it popular investors, thereby reducing the company’s cost of capital and enhancing the value of equity compensation arrangements.

Another part of the evaluation process is a careful “post mortem” of each specific launch plan. Before the launch team disbands, it should meet and identify the good and bad points of the particular launch process. A formal report should be prepared with recommendations as to how company policies and procedures can be improved in the future. This information should be integrated into a “master document” that serves as a blueprint for future launch management teams. The document should, of course, be customized to each new situation; however, it will serve as a starting point and allow launch teams to get up and running more quickly and identify the issues that need to be resolved early in the process.

In some cases, the company should consider creating a formal launch company that focuses primarily on assisting launch teams with creating and implementing their plans. The group would be composed of representatives from each of the groups typically involved in launch process, each of whom can provide the new product manager with guidance the anticipated costs and completion time of each activity. The group can store “institutional knowledge” on product launches and create and maintain a master schedule that identifies projected launches that are planned for the near future. A schedule of this type can be useful for ensuring that scarce resources are not overburdened when several launches are under way at the same time.
§58 Causes of successful and failed product innovation

One of the practical goals of researchers studying product innovation and new product development activities is identifying universal causes of success and failure. While, as described elsewhere in this Part, conditions for product innovation vary depending on external and internal factors such as the rate of technological change and the size and available resources of the firm there are various lessons that can be applied to many companies and which provide benchmarks that can be used as a basis for comparison to other companies.

While the product development process varies among companies and industries, the following elements consistently appear at companies that have a track record of success in this area:

- The overall strategic plan of the company should describe and recognize the role of new products as a source of growth.
- The company should develop a formal strategic plan for new product identification and development, including financial goals and other performance milestones, criteria to be used for screening new product ideas and the types of products and markets the company is seeking to develop.
- The company should institutionalize the practice of creating cross-functional teams that can bring technical, financial and marketing resources to bear in the product development process from the very beginning.
- The company should develop and consistently apply a formal set of procedures for executing each stage of the product development process.
- The company should allocate sufficient resources to the collection and analysis of relevant market, competitive and customer information that can be used to identify and evaluate new product concepts.
- The company should establish procedures for consulting with customers and suppliers during the product development process.
- The company should establish a tracking system for measuring the progress and performance of new products in relation to the original objectives established in the marketing plan and identifying competitive responses.
- Persons with authority for creating and administering the company’s product development strategies and procedures should be identified and their roles should be clearly identified. Ideally these persons should have proven experience in managing innovation processes and development and launch of products targeted for exceptional rates of sales growth.
- The company should develop a clear company structure for its product development that facilitates cooperation among, and communications between, all of the functional departments typically involved in the creation and launch of new products.
- The company should establish compensation and other reward and recognition programs that create appropriate incentives for managers and employees to engage in the activities required to meet the goals and objectives of the company with respect to development of new products.
• The company should recruit and maintain an experienced team of new product managers that can provide continuity for execution of the company’s strategies.
• Senior management should actively support product development efforts and allocate sufficient resources to execute the company’s strategies in this area.

While each factor is important in its own right, particular emphasis should be placed on establishing clear objectives for identifying and launching new products, developing a clear plan of action to achieve those objectives, and forming a multi-functional team of committed and properly motivated managers to execute the plan.

Pina e Cunha used his study of product innovation practices and performances in the Portuguese financial sector to identify several possible “best practices for managing new product innovation” including the following:\textsuperscript{49}:

• Stable and difficult-to-manage organizational factors that are usually associated with a lack of innovation, such as the size and/or age of the organization, may not actually be barriers to innovation and caution was recommended before companies eliminated some of the benefits associated with “bigness” such as slack, professionals and a certain healthy amount of redundancy that may be needed for innovation to occur. Age also brings stronger and more open communications with customers and suppliers, each of whom provide important inputs during the product development process.
• A strong technological orientation increases the likelihood that a company will be able to achieve superior product innovation performance. Technology is not only important as an ingredient within new products but also as a tool for collecting, analyzing and storing the information about customers that decision makers must have to identify customer needs and transform opportunities into viable and successful new products.
• A strong marketing orientation increases the likelihood that a company will be able to achieve superior product innovation performance. The strong technological orientation referred to above should be combined, and balanced, with a market orientation that builds and maintains the capacity to collect and absorb information from customers.
• New product performance will be enhanced by introducing and maintaining high levels of rigor in the product development process. Specifically, companies are advised to implement a systematic product development process and seek out expertise in the “product development game”; however, rigor does mean rigid and a balance must be struck between analysis and the need to be proactive and respond to rapidly changing environments and accelerate the development process.
• Product innovation performance is positively related to the number and newness of new products launched by a company and a continuous flow of product innovations is essential for maintaining customer happiness and satisfaction, increasing understanding of customer needs and forging long-term relationships with customers.

that become the basis for collecting information that can be cycled into product innovation activities.

Based on the results of their survey of 161 large manufacturing firms in all industry categories Kono and Lynn acknowledged that different new product development processes should be deployed depending on whether the new product is technology intensive, market intensive where consumer preferences are stable or market intensive where consumer preferences are highly dynamic; however, they are argued that certain groups of key new product success factors appeared to be generally applicable including the following:\textsuperscript{50}:

\begin{itemize}
  \item Decision-making and support from top management including strong leadership with long-term vision and clear goals;
  \item Core competencies in areas such as R&D capability; creativity, cooperation and enthusiasm among members of the new product development team and strong leadership of that team; good fit with product technologies, facilities and marketing abilities; and strong sales channels;
  \item Access to information to support decision-making about new product development including marketing research to identify hidden needs of customers and information that allows product development efforts to fit the needs of customers;
  \item Cooperation between R&D, production and marketing in conducting concurrent development activities and cooperation with potential customers; and
  \item Attractive product characteristics and strong launch capabilities including unique and clearly differentiated products, high quality and credibility, attractive pricing, proper segmentation based on analysis of rival products, fast development and strong advertising and sales promotion.
\end{itemize}

In turn, their same survey led Kono and Lynn to identify several key factors leading to new product failures including the following:\textsuperscript{51}:

\begin{itemize}
  \item Top management problems including a lack of a “product champion” at the top of the organizational hierarchy and a top management group that is unsupportive and/or arbitrary with regard to support of new products;
  \item Inability to muster critical core competencies in areas such as R&D capability, production technology, marketing capability and/or sales channels/cooperation;
  \item Poor “decision-making” for a variety of reasons including insufficient market research, selection of markets that were too small, selection of new product designs that were a poor fit with consumer needs, too much orientation on technology, no series of products groups, lack of persistence in development and defective development processes;
\end{itemize}

\textsuperscript{50} T. Kono and L. Lynn, Strategic New Product Development for the Global Economy (2007), 224-233. For further information on surveyed companies see Id. at 14.

\textsuperscript{51} T. Kono and L. Lynn, Strategic New Product Development for the Global Economy (2007), 19-45. For further information on surveyed companies see Id. at 14.
• Poor internal cooperation particularly a lack of cooperation between R&D, production and marketing departments and insufficient investment in R&D and advertising; and
• Insufficient follow-up and product differentiation with particular problems relating to setting prices too high, a lack of product uniqueness, emergence of competing products, poor quality (i.e., insufficient quality and unsatisfactory evaluation) and bad timing of new product release (i.e., last stage of product cycle, imitation product and slow development).

For their part, Haake et al. argued that research had uncovered several general determinants of successful product development including the ability to read the market, namely identify consumer needs, and incorporate these into the development process; the ability to incorporate technological information into the development process in a way that was matched to the need of consumers; the ability to incorporate the concerns of manufacturing and suppliers into the development process; the ability to maintain and improve product development abilities through a process of learning, which in turn requires the consistency over time between the new product activities of the company and its strategic goals and direction; and the ability to implement organizational processes for new product development in ways that minimize costs while maximizing speed and achieving adherence to planned targets.\(^{52}\)

Another factor that impacts the success of product development efforts and how development projects are chosen and conducted is the tolerance for risk in the culture of the company. In fact, one of the most popular topics with respect to company culture in recent years has been finding ways to make companies more comfortable with risk-taking. Obviously company culture influences the way that companies see the world and the manner in which they seek new opportunities and how they deal with those opportunities once they appear on the doorstep. While much time and angst is devoted to decisions made by senior management that did not turn out as planned, consideration should also be given to the consequences of failing to pursue opportunities that may have been a good fit for the company’s core competencies.

Senior management is not likely to be criticized for sins of omission since it is obviously more difficult to pinpoint when and if a company was too conservative in striking out into new areas. Nonetheless, a company should attempt to institutionalize a mindset that is open to new ideas regardless of how crazy they might seem at the beginning. One way to do this is for senior management to make a practice of greeting each opportunity that it sees by asking “Why not?” rather than by challenging advocates with “Why would we want to do that?”. This is a good way to build in a cultural bias toward risk taking, rather than staying the course, that is more likely to encourage managers and employees to search far and wide for opportunities to innovate. Of course, this doesn’t necessarily mean that companies will or should go down every path; however, it does force an evaluation of how the risk/return ratio on new ideas compares to the current deployment of resources. At the end of the day the company may decide that while the new idea has

\(^{52}\) S. Haake, C. Moore and N. Oliver, Recipes for Success—Product Development Benchmarks in the UK and German Food Industries (2000).
promise it just does not make sense to pursue given current resources and/or the existing projects that the company has already launched and must still be closely managed to see if previous investments have been worthwhile.

Obviously one of the risks of expanding the notion of what might be doable for the company is that too many new product concepts will be accepted and the company will soon find itself overwhelmed with projects. In order to temper this approach and make sure that sound resource allocation decisions can be made senior management should work on finding ways to engage in “intelligent experimentation” that allows the company to efficiently test as many proposals as possible to gather more information before a decision must be made about whether a major investment of resources will need to be made. In many cases it is impossible to really tell whether a new concept has promise until certain key assumptions have been tested. If companies can find a way to conduct these tests quickly and accurately then senior management can place a large number of small bets based on the instincts and gut feelings of those most closely involved with a particular market or technology. If something doesn’t work out the cost is limited to the testing stage; however, the chances of identifying a breakthrough are substantially increased and the higher number of “winners” will more than offset the resources that will need to be diverted to the experimentation teams.53

References and Resources

The Sustainable Entrepreneurship Project’s Library of Resources for Sustainable Entrepreneurs relating to Product Development and Commercialization is available at https://seproject.org/product-development-and-commercialization/ and includes materials relating to the subject matters of this Guide including various Project publications such as handbooks, guides, briefings, articles, checklists, forms, forms, videos and audio works and other resources; management tools such as checklists and questionnaires, forms and training materials; books; chapters or articles in books; articles in journals, newspapers and magazines; theses and dissertations; papers; government and other public domain publications; online articles and databases; blogs; websites; and webinars and podcasts. Changes to the Library are made on a continuous basis and notifications of changes, as well as new versions of this Guide, will be provided to readers that enter their names on the Project mailing list by following the procedures on the Project’s website.

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