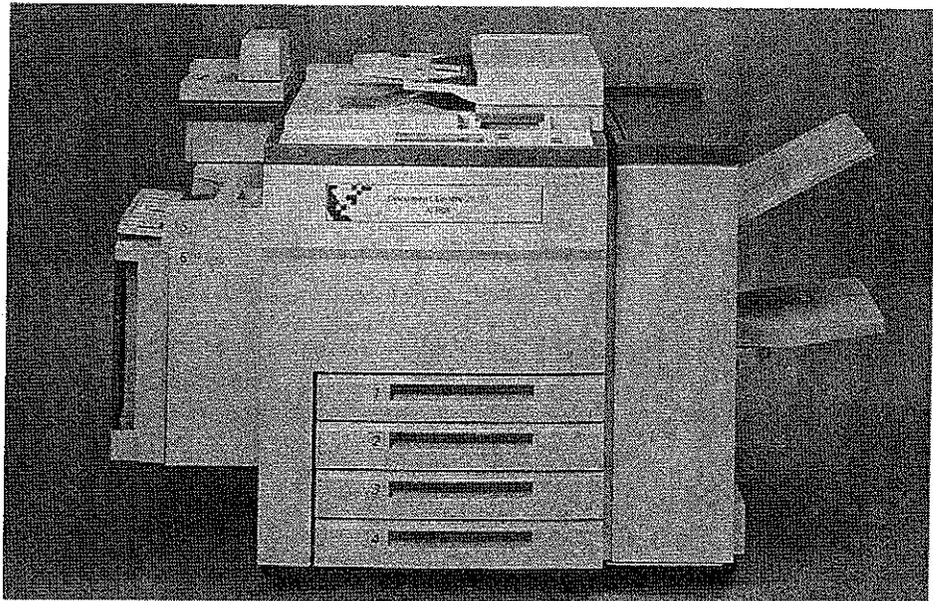

CHAPTER THREE

Product Planning



Courtesy of Xerox

EXHIBIT 3-1

The Lakes project developed a new copier platform, including this new product, the Xerox Document Centre 265.

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Xerox Corporation is a global enterprise offering a wide array of document-related products, services, and business solutions. Its mission is to be the leader in the global document market, providing document solutions that enhance business productivity. A key element of Xerox's competitive strategy is to exploit technological innovation in a rapidly changing market. Pursuing this strategy requires the ability to choose the right set of development projects and to define the scope of these projects in such a way that the projects are complementary. Exhibit 3-1 is a photo of the Xerox Document Centre 265, a product resulting from a Xerox project code-named Lakes.

The *product planning* process takes place before a product development project is formally approved, before substantial resources are applied, and before the larger development team is formed. Product planning is an activity that considers the portfolio of projects that an organization might pursue and determines what subset of these projects will be pursued over what time period. The product planning activity ensures that product development projects support the broader business strategy of the company and addresses these questions:

- What product development projects will be undertaken?
- What mix of fundamentally new products, platforms, and derivative products should be pursued?
- How do the various projects relate to each other as a portfolio?
- What will be the timing and sequence of the projects?

Each of the selected projects is then completed by a product development team. The team needs to know its mission before beginning development. The answers to these critical questions are included in a mission statement for the team:

- What market segments should be considered in designing the product and developing its features?
- What new technologies (if any) should be incorporated into the new product?
- What are the manufacturing and service goals and constraints?
- What are the financial targets for the project?
- What are the budget and time frame for the project?

This chapter explains how an organization can maximize the effectiveness of its product development efforts by first considering the set of potential projects it might pursue, deciding which projects are most desirable, and then launching each project with a focused mission. We present a five-step planning process beginning with the identification of opportunities and resulting in a mission statement for the project team.

The Product Planning Process

The *product plan* identifies the portfolio of products to be developed by the organization and the timing of their introduction to the market. The planning process considers product development opportunities identified by many sources, including suggestions from marketing, research, customers, current product development teams, and benchmarking of competitors. From among these opportunities, a portfolio of projects is chosen, timing of

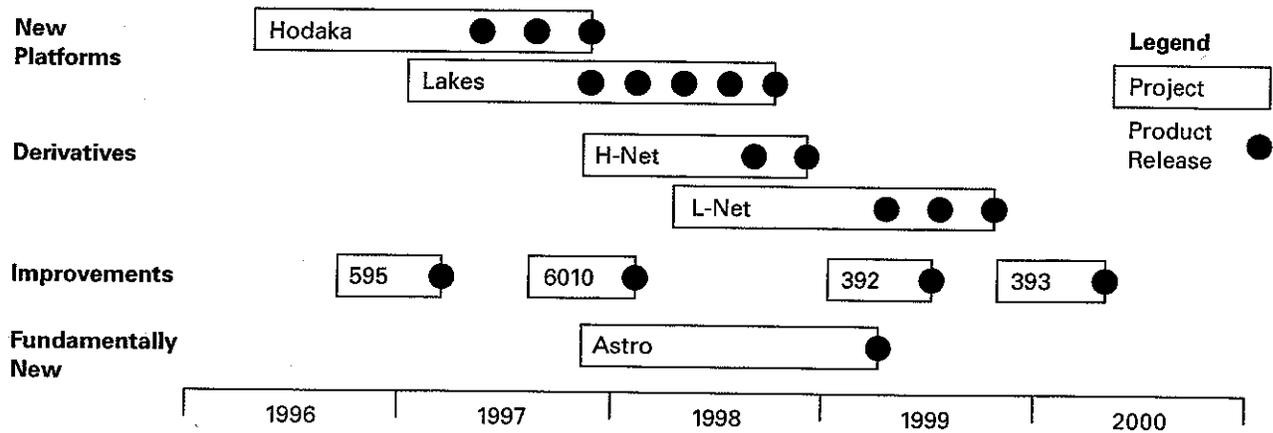


EXHIBIT 3-2 The product plan identifies the portfolio of projects to be pursued by the development organization. This plan divides projects into four categories: new platforms, derivatives of existing platforms, product improvements, and fundamentally new products.

projects is outlined, and resources are allocated. Exhibit 3-2 is an example of a product plan listing products to be developed and indicating the time frame for each.

The product plan is regularly updated to reflect changes in the competitive environment, changes in technology, and information on the success of existing products. Product plans are developed with the company's goals, capabilities, constraints, and competitive environment in mind. Product planning decisions generally involve the senior management of the organization and may take place only annually or a few times each year. Some organizations have a director of planning who manages this process.

Organizations that do not carefully plan the portfolio of development projects to pursue are often plagued with inefficiencies such as:

- Inadequate coverage of target markets with competitive products.
- Poor timing of market introductions of products.
- Mismatches between aggregate development capacity and the number of projects pursued.
- Poor distribution of resources, with some projects overstaffed and others understaffed.
- Initiation and subsequent cancellation of ill-conceived projects.
- Frequent changes in the directions of projects.

Four Types of Product Development Projects

Product development projects can be classified as four types:

- **New product platforms:** This type of project involves a major development effort to create a new family of products based on a new, common platform. The new product family would address familiar markets and product categories. The Xerox Lakes project, aimed at the development of a new, digital copier platform, is an example of this type of project.
- **Derivatives of existing product platforms:** These projects extend an existing product platform to better address familiar markets with one or more new products. To develop

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a new copier based on an existing light-lens (not digital) product platform would be an example of this type of project.

- **Incremental improvements to existing products:** These projects may only involve adding or modifying some features of existing products in order to keep the product line current and competitive. A slight change to remedy minor flaws in an existing copier product would be an example of this type of project.
- **Fundamentally new products:** These projects involve radically different product or production technologies and may help to address new and unfamiliar markets. Such projects inherently involve more risk; however, the long-term success of the enterprise may depend on what is learned through these important projects. The first digital copier Xerox developed is an example of this type of project.

The Process

Exhibit 3-3 illustrates the steps in the product planning process. First, multiple opportunities are prioritized and a set of promising projects is selected. Resources are allocated to these projects and they are scheduled. These planning activities focus on a *portfolio* of opportunities and potential projects and are sometimes referred to as portfolio management, aggregate product planning, product line planning, or product management. Once projects have been selected and resources allocated, a mission statement is developed for each project. The formulation of a product plan and the development of a mission statement therefore precede the actual product development process.

Although we show the planning process as essentially linear, the activities of selecting promising projects and allocating resources are inherently iterative. The realities of schedules and budgets often force a reassessment of priorities and further refinement and culling of potential projects. The product plan is therefore reevaluated frequently and should be modified based on the latest information from development teams, research laboratories, production, marketing, and service organizations. People involved later in the process are often the first to realize that something about the overall plan or a project's mission is inconsistent, infeasible, or out of date. The ability to adjust the product plan over time is vital to the long-term success of the enterprise.

To develop a product plan and project mission statements, we suggest a five-step process:

1. Identify opportunities.
2. Evaluate and prioritize projects.

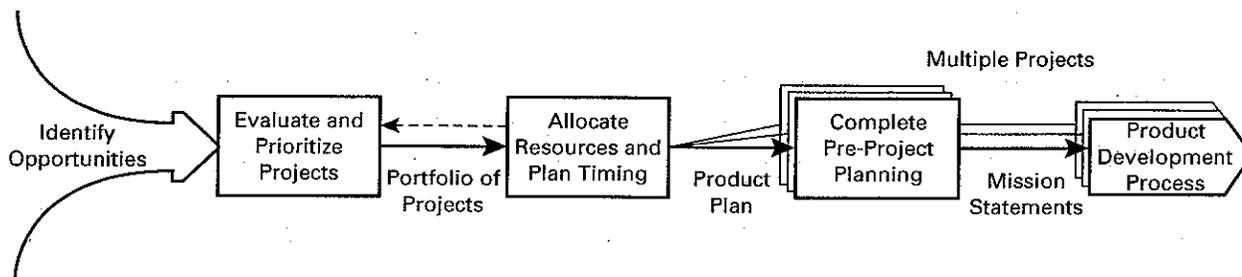


EXHIBIT 3-3 The product planning process. These activities address a portfolio of product development projects, resulting in a product plan and, for each selected project, a mission statement.

3. Allocate resources and plan timing.
4. Complete pre-project planning.
5. Reflect on the results and the process.

Step 1: Identify Opportunities

The planning process begins with the identification of product development opportunities. Such opportunities may involve any of the four types of projects defined above. This step can be thought of as the *opportunity funnel* because it brings together inputs from across the enterprise. Ideas for new products or features of products may come from several sources, including (among others):

- Marketing and sales personnel.
- Research and technology development organizations.
- Current product development teams.
- Manufacturing and operations organizations.
- Current or potential customers.
- Third parties such as suppliers, inventors, and business partners.

Opportunities may be collected passively, but we also recommend that the firm explicitly attempt to generate opportunities. The identification of product development opportunities is closely related to the activity of identifying customer needs. (See Chapter 4.) Some proactive approaches include:

- Document frustrations and complaints that current customers experience with existing products.
- Interview lead users, with attention devoted to innovations by these users and modifications these users may have made to existing products.
- Consider implications of trends in lifestyles, demographics, and technology for existing product categories and for opportunities for new product categories.
- Systematically gather suggestions of current customers, perhaps through the sales force or customer service system.
- Carefully study competitors' products on an ongoing basis (competitive benchmarking).
- Track the status of emerging technologies to facilitate transfer of the appropriate technologies from basic research and technology development into product development.

When employed actively, the opportunity funnel collects ideas continuously, and new product opportunities may arise at any time. As a way of tracking, sorting, and refining these opportunities, we recommend that each promising opportunity be described in a short, coherent statement and that this information be collected in a database. This database can be as simple as a list in a spreadsheet. Some of these opportunities may be expanded, refined, and explored. Often this exploration is done informally by someone who emerges as the "champion" of a particular idea.

At Xerox, many opportunities had been gathered and discussed. Some were simple enhancements to existing products, and others were proposals for products based on entirely

new technologies. Following are some examples of opportunity statements similar to those proposed at Xerox:

- Create a document distribution system in which a networked printing device resides on each office worker's desk and automatically delivers mail and other documents.
- Create document delivery software that allows the digital delivery and storage of most intraorganizational documents via a worker's personal computer.

This opportunity statement eventually became the Lakes project:

- Develop a new black and white (B&W), digital, networkable, document center platform for the office market, including scanning, storage, fax, distribution, and printing capabilities.

Step 2: Evaluate and Prioritize Projects

If managed actively, the opportunity funnel can collect hundreds or even thousands of opportunities during a year. Some of these opportunities do not make sense in the context of the firm's other activities, and in most cases, there are simply too many opportunities for the firm to pursue at once. The second step in the product planning process is therefore to select the most promising projects to pursue. Four basic perspectives are useful in evaluating and prioritizing opportunities for new products in existing product categories: competitive strategy, market segmentation, technological trajectories, and product platforms. After discussing these four perspectives, we then discuss evaluating opportunities for fundamentally new products, and how to balance the portfolio of projects.

Competitive Strategy

An organization's *competitive strategy* defines a basic approach to markets and products with respect to competitors. The choice of which opportunities to pursue can be guided by this strategy. Most firms devote much discussion at senior management levels to their strategic competencies and the ways in which they aim to compete. Several strategies are possible, such as:

- **Technology leadership:** To implement this strategy, the firm places great emphasis on basic research and development of new technologies and on the deployment of these technologies through product development.
- **Cost leadership:** This strategy requires the firm to compete on production efficiency, either through economies of scale, use of superior manufacturing methods, low-cost labor, or better management of the production system. Design for manufacturing methods (see Chapter 11) are therefore emphasized in the product (and process) development activities under this strategy.
- **Customer focus:** To follow this strategy, the firm works closely with new and existing customers to assess their changing needs and preferences. Carefully designed product platforms facilitate the rapid development of derivative products with new features or functions of interest to customers. This strategy may result in a broad product line featuring high product variety in order to address the needs of heterogeneous customer segments.

- Imitative:** This strategy involves closely following trends in the market, allowing competitors to explore which new products are successful for each segment. When viable opportunities have been identified, the firm quickly launches new products to imitate the successful competitors. A fast development process is essential to effectively implement this strategy.

At Xerox, strategic discussions centered around how the company would participate in the digital revolution of the office associated with growth of the Internet. Xerox believed that the Internet would enable a paradigm shift in business practices from one of “print and then distribute” to one of “distribute and then print.” The Lakes project would need to support this corporate vision.

Market Segmentation

Customers can be usefully thought of as belonging to distinct market segments. Dividing a market into segments allows the firm to consider the actions of competitors and the strength of the firm’s existing products with respect to each well-defined group of customers. By mapping competitors’ products and the firm’s own products onto segments, the firm can assess which product opportunities best address weaknesses in its own product line and which exploit weaknesses in the offerings of competitors. Exhibit 3-4 shows a *product segment map* of this type for some Xerox products in which markets are segmented according to the number of users sharing office equipment.

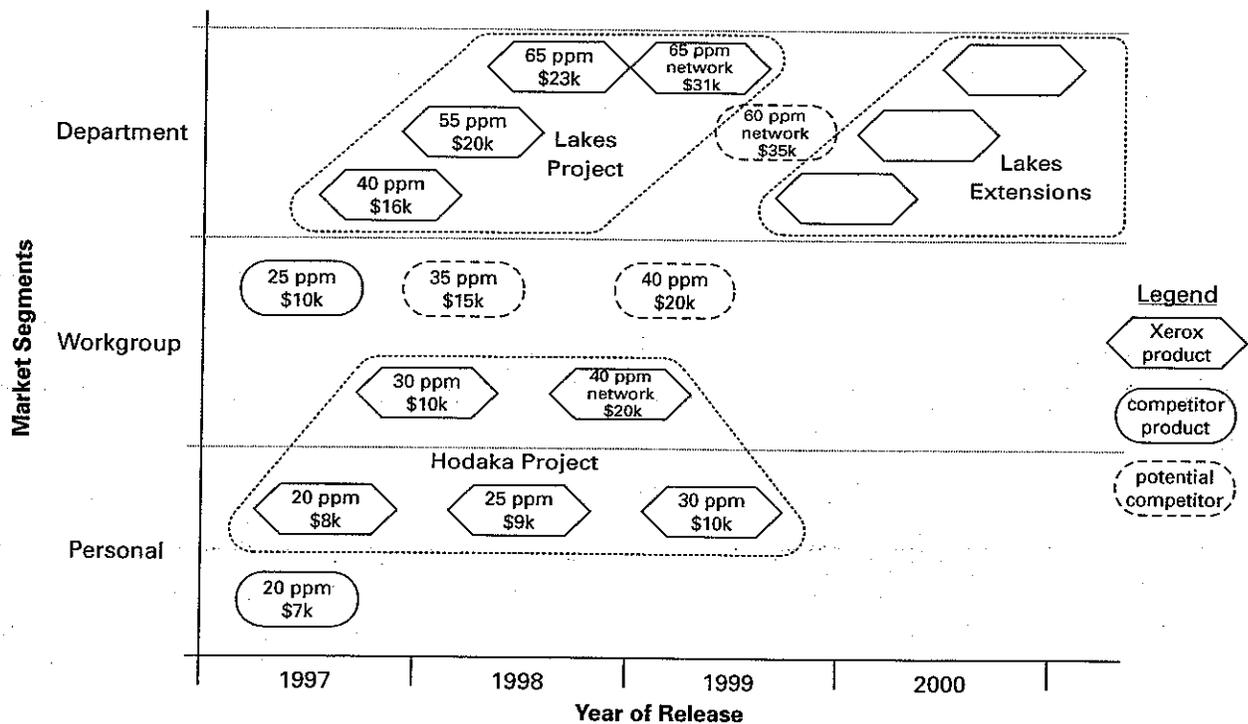


EXHIBIT 3-4 Product segment map showing Xerox B&W digital products and the competition in three market segments: personal, workgroup, and department machines. Key performance dimensions (pages per minute, networking capability) and price point are listed for each product in the map, along with the time of its market introduction.

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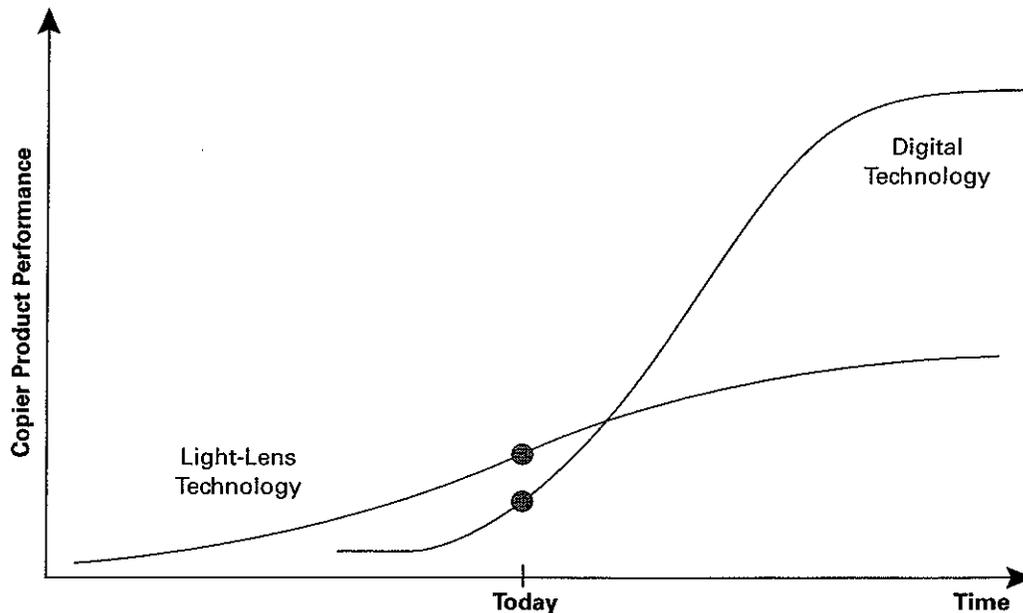


EXHIBIT 3-5 This technology S-curve illustrates that Xerox believed digital copier technologies were just emerging and would improve product performance in the coming years. Xerox believed that it could develop a full-featured digital copier in the near future with performance exceeding that of light-lens copiers.

Technological Trajectories

In technology-intensive businesses, a key product planning decision is when to adopt a new basic technology in a product line. For example, in the document business, the key technological issue at the turn of the century is the shift to digital image processing and printing. The product planning decision was when to develop digital products, as opposed to developing another product based on light-lens technology. *Technology S-curves* are a conceptual tool to help think about such decisions.

The technology S-curve displays the performance of the products in a product category over time, usually with respect to a single performance variable such as resolution, speed, or reliability. The S-curve illustrates a basic but important concept: Technologies evolve from initial emergence when performance is relatively low, through rapid growth in performance based on experience, and finally approach maturity where some natural technological limit is reached and the technology may become obsolete. The S-shaped trajectory captures this general dynamic, as shown in Exhibit 3-5. The horizontal axis may be cumulative research and development effort or time; the vertical axis may be a performance/cost ratio or any important performance dimension. While S-curves characterize technological change remarkably well in a wide variety of industries, it is often difficult to predict the future trajectory of the performance curve (how near or far is the ultimate performance limit).

Product Platform Planning

The product platform is the set of assets shared across a set of products. Components and subassemblies are often the most important of these assets. An effective platform can allow a variety of derivative products to be created more rapidly and easily, with each

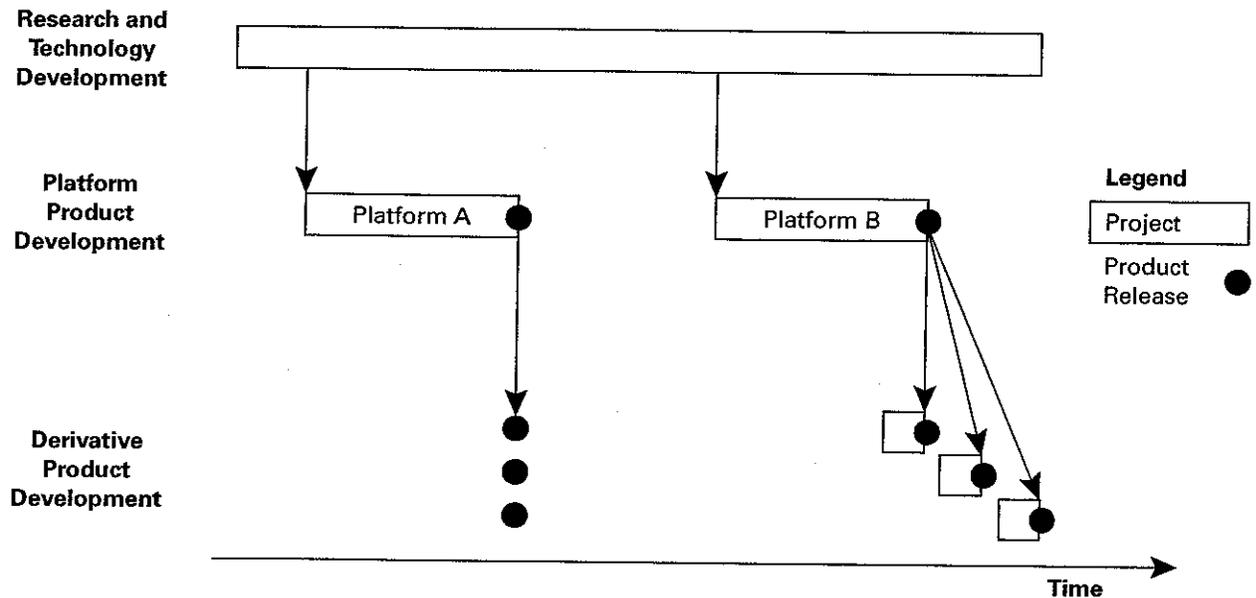


EXHIBIT 3-6 A platform development project creates the architecture of a family of products. Derivative products may be included in the initial platform development effort (Platform A) or derivative products may follow thereafter (Platform B).

product providing the features and functions desired by a particular market segment. See Chapter 9, Product Architecture, for more discussion of the underlying architecture enabling the product platform and for a platform planning method.

Since platform development projects can take from 2 to 10 times as much time and money as derivative product development projects, a firm cannot afford to make every project a new platform. Exhibit 3-6 illustrates the leverage of an effective product platform. The critical strategic decision at this stage is whether a project will develop a derivative product from an existing platform or develop an entirely new platform. Decisions about product platforms are very closely related to the technology development efforts of the firm and to decisions about which technologies to employ in new products.

One technique for coordinating technology development with product planning is the *technology roadmap*. A technology roadmap is a way to represent the expected availability and future use of various technologies relevant to the product being considered. This method has been used by Motorola, Philips, Xerox, and other leaders in fast-moving high-technology industries. The method is particularly useful for planning products in which the critical functional elements are well known in advance.

To create a technology roadmap, multiple generations of technologies are labeled and arranged along a time line, as shown in Exhibit 3-7. The technology roadmap can be augmented with the timing of projects and projects that would utilize these technological developments. (This is sometimes then called a *product-technology roadmap*.) The result is a diagram showing a product's key functional elements and the sequence of technologies expected to implement these elements over a given period of time. Technology roadmapping can serve as a planning tool to create a joint strategy between technology development and product development.

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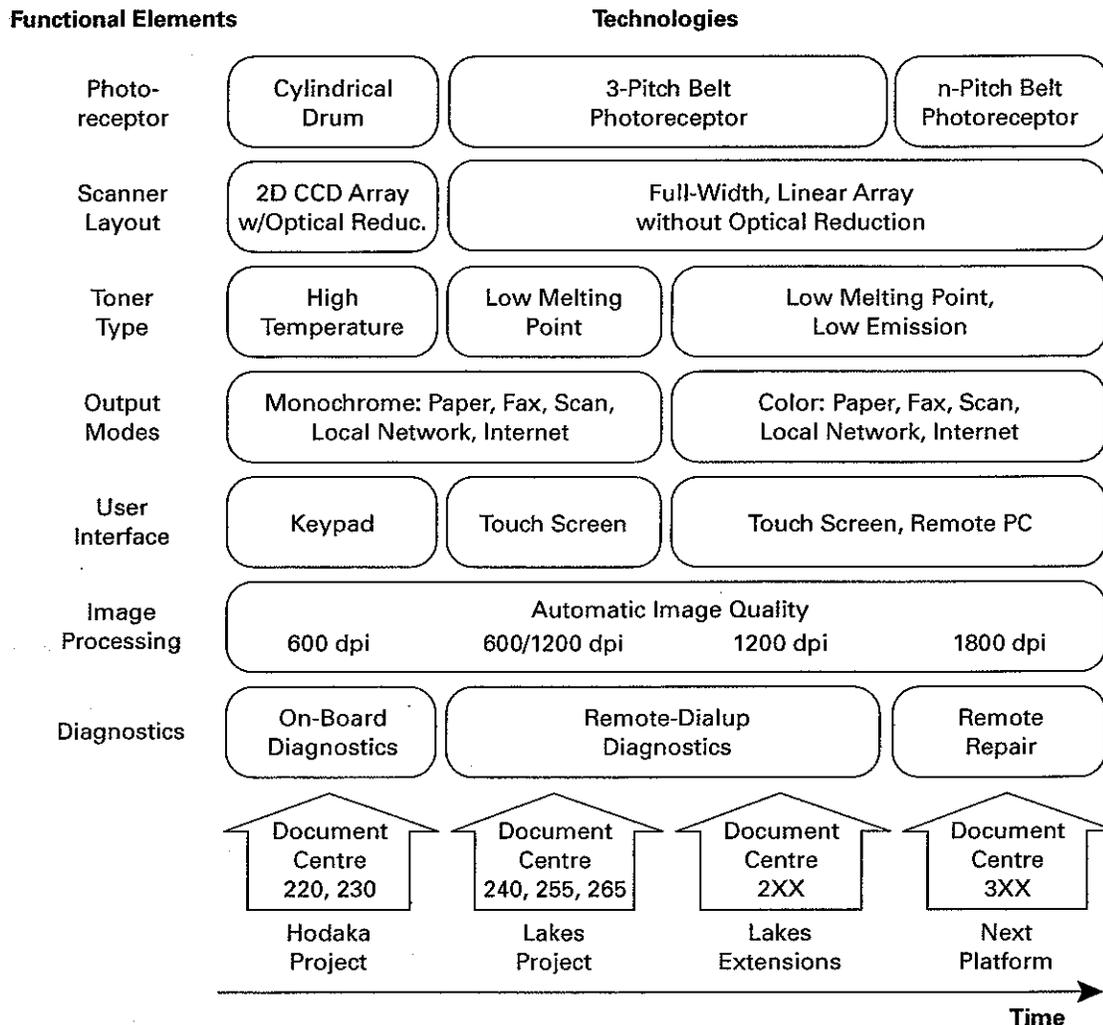


EXHIBIT 3-7 This technology roadmap shows the life cycles of several digital photocopying technologies and identifies which technologies would be used in each product. For the Lakes platform, Xerox selected technologies for critical functions which could be extended to the higher speeds and color capability required of its derivative products.

Evaluating Fundamentally New Product Opportunities

In addition to new versions of products in existing product categories, the firm faces many opportunities in either new markets or fundamentally new technologies. While investing scarce resources in the development of products using new technologies or for new markets is quite risky, some such investments are necessary to periodically rejuvenate the product portfolio (Christensen, 1997). Some criteria for evaluating fundamentally new product opportunities include:

- Market size (units/year × average price).
- Market growth rate (percent per year).
- Competitive intensity (number of competitors and their strengths).
- Depth of the firm's existing knowledge of the market.

- Depth of the firm's existing knowledge of the technology.
- Fit with the firm's other products.
- Fit with the firm's capabilities.
- Potential for patents, trade secrets, or other barriers to competition.
- Existence of a product champion within the firm.

While these criteria are particularly useful in evaluating fundamentally new product opportunities, they also apply generally to evaluating any product opportunity. These criteria can be used in a simple screening matrix to evaluate the overall attractiveness and types of risk for any given opportunity. Chapter 7, Concept Selection, describes screening matrices for selecting product concepts, but this method is directly applicable to selecting product opportunities as well.

Balancing the Portfolio

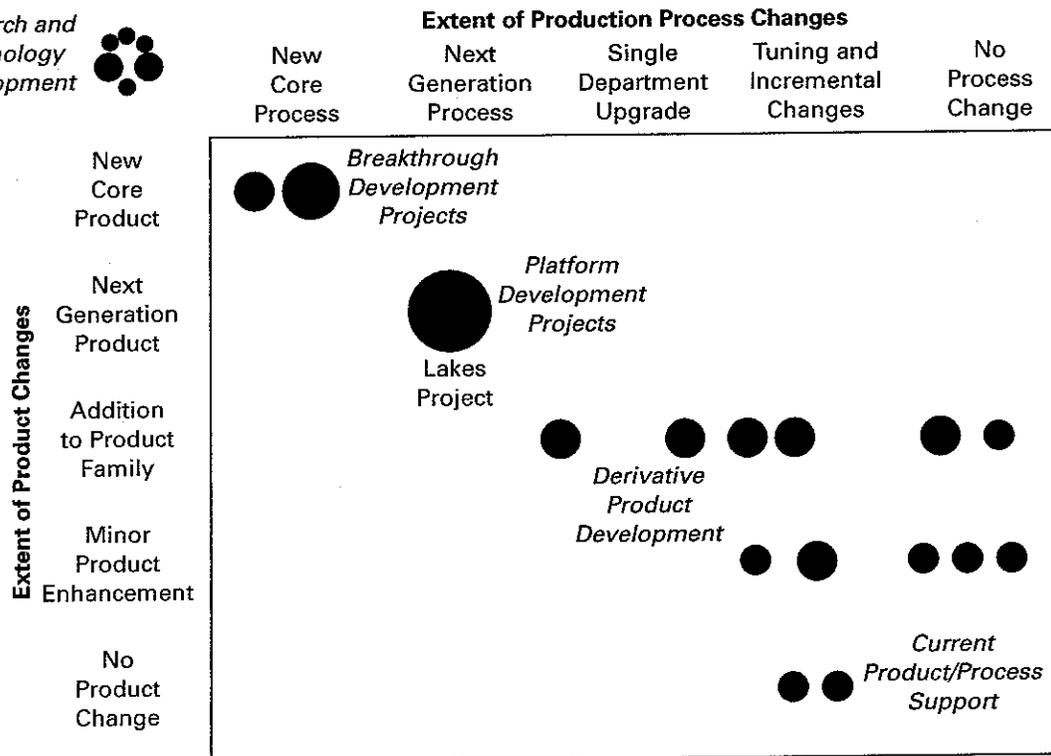
There are many methods to help managers balance an organization's portfolio of development projects. Several of these methods involve mapping the portfolio along useful dimensions so that managers may consider the strategic implications of their planning decisions. Cooper et al. (2001) describe numerous mapping approaches involving dimensions such as technical risk, financial return, market attractiveness, and the like. One particularly useful mapping, suggested by Wheelwright and Clark (1992), plots the portfolio of projects along two specific dimensions: the extent to which the project involves a change in the product line and the extent to which the project involves a change in production processes. Exhibit 3-8 illustrates this mapping, called a *product-process change matrix*. This perspective can be useful to illuminate imbalances in the portfolio of projects under consideration and in assessing the consistency between a portfolio of projects and the competitive strategy. For example, a firm may discover that it has identified essentially no breakthrough opportunities or that it has no projects aimed at incremental improvements to existing products.

Although there are no general procedures for deciding exactly what the portfolio should look like, in most cases a firm benefits from a diverse set of projects, just as an investment portfolio benefits from diversification. Furthermore, the firm's choice of competitive strategy should affect the shape of the product development portfolio. For example, a firm pursuing a low-cost strategy would expect the portfolio to contain more production process improvement projects. Firms following a strategy requiring high product variety would need to develop many derivative products based upon existing platforms. Firms implementing a strategy based on technological superiority may need to have a portfolio including more technology development and breakthrough projects in anticipation that not all of these risky projects will result in marketable new products. Note that planning research and technology development activities is closely coupled to, but generally outside the purview of, the product planning process.

Step 3: Allocate Resources and Plan Timing

It is likely that the firm cannot afford to invest in every product development opportunity in its desired balanced portfolio of projects. As timing and resource allocation are determined for the most promising projects, too many projects will invariably compete for too few resources. As a result, the attempt to assign resources and plan timing almost always

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Research and
Technology
Development

Adapted from Wheelright and Clark, 1992

EXHIBIT 3-8 Product-process change matrix. The size of the circles indicates the relative cost of the development projects.

results in a return to the prior evaluation and prioritization step to prune the set of projects to be pursued.

Resource Allocation

Many organizations take on too many projects without regard for the limited availability of development resources. As a result, skilled engineers and managers are assigned to more and more projects, productivity drops off dramatically, projects take longer to complete, products become late to the market, and profits are lower. *Aggregate planning* helps an organization make efficient use of its resources by pursuing only those projects that can reasonably be completed with the budgeted resources.

The Lakes project was only one of many projects proposed at Xerox. However, since Lakes involved the development of an entirely new platform, this project was substantially larger than the other projects being considered at the time. Any feasible portfolio of projects would be dominated by the resource demands of the Lakes platform development effort. In fact, for the managers at Xerox to find the resources necessary to execute Lakes, many other projects had to be eliminated or postponed until engineers were finished working on Lakes.

Estimating the resources required for each of the projects in the plan by month, quarter, or year forces the organization to face the realities of finite resources. In most cases, the primary resource to be managed is the effort of the development staff, usually expressed

in person-hours or person-months. Other critical resources may also require careful planning, such as model shop facilities, rapid prototyping equipment, pilot production lines, testing facilities, and so on. Estimates of required resources in each period can be compared with available resources to compute an overall capacity utilization ratio (demand/capacity) as well as utilizations by resource types, as shown in Exhibit 3-9. Where utilization exceeds 100 percent, there are not sufficient resources to execute all of the projects in the plan on schedule. In fact, to allow for contingencies and to enable responsiveness, planned capacity utilization may be below 100 percent.

In the aggregate planning process, an organization may find that it is in danger of overcommitting resources (often by as much as 100 percent or more, according to Wheelwright and Clark, 1992). Therefore the organization must decide in the planning stage which projects are most important to the success of the firm, and pursue those with adequate resources. Other projects may need to be eliminated from the plan or shifted in time.

Project Timing

Determining the timing and sequence of projects, sometimes called *pipeline management*, must consider a number of factors, including:

- **Timing of product introductions:** Generally the sooner a product is brought to market the better. However, launching a product before it is of adequate quality can damage the reputation of the firm.
- **Technology readiness:** The robustness of the underlying technologies plays a critical role in the planning process. A proven, robust technology can be integrated into products much more quickly and reliably.
- **Market readiness:** The sequence of product introductions determines whether early adopters buy the low-end product and may trade up or whether they buy the high-end product offered at a high initial price. Releasing improvements too quickly can frustrate customers who want to keep up; on the other hand, releasing new products too slowly risks lagging behind competitors.
- **Competition:** The anticipated release of competing products may accelerate the timing of development projects.

The Product Plan

The set of projects approved by the planning process, sequenced in time, becomes the *product plan*, as shown earlier in Exhibit 3-2. The plan may include a mix of fundamentally new products, platform projects, and derivative projects of varying size. Product plans are updated on a periodic basis, perhaps quarterly or annually, as part of the firm's strategic planning activity.

Step 4: Complete Pre-Project Planning

Once the project has been approved, but before substantial resources are applied, a pre-project planning activity takes place. This activity involves a small, cross-functional team of people, often known as the *core team*. The Lakes core team consisted of approximately 30 people representing a wide range of technical expertise, marketing, manufacturing, and service functions.

	Year 1				Year 2				Year 3						
	Mechanical Design	Electrical Engineering	Manufacturing Engineering	Software/Firmware	Industrial Design	Mechanical Design	Electrical Engineering	Manufacturing Engineering	Software/Firmware	Industrial Design	Mechanical Design	Electrical Engineering	Manufacturing Engineering	Software/Firmware	Industrial Design
Lakes Project	155	160	105	75	7	210	160	140	80	4	125	140	160	90	2
6010 Project	30	25	10	5	1	25	20	5	6						
595 Project	60	24	25	25	2	20	15	15					5		
Astro Project	55	60	44	25	2	75	65	50	40	2	45	40	60	20	
Resource Demand	300	269	184	105	10	330	260	210	126	6	170	180	225	110	2
Resource Capacity	250	250	200	100	8	250	250	200	100	8	250	250	200	100	8
Capacity Utilization	120%	108%	92%	105%	128%	132%	104%	105%	126%	75%	68%	72%	113%	110%	25%

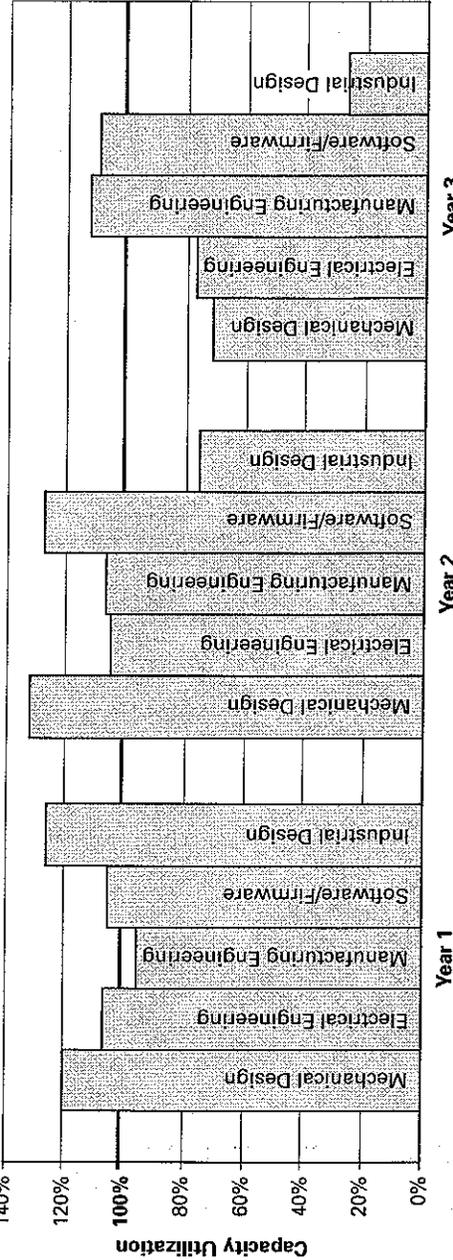


EXHIBIT 3-9 Aggregate resource planning can be achieved using a simple spreadsheet method based on estimates of resource demands over time. This example spreadsheet uses units of person-years, although smaller time units (quarters or months) are commonly used in practice. The associated chart highlights where capacity is insufficient to handle all of the projects.

EXHIBIT 3-10

Mission statement for the Lakes project. This document summarizes the direction to be followed by the product development team. Many more details are appended to this mission statement, including the environmental goals, service objectives, and specific technologies identified for use in the Lakes platform.

Mission Statement: Multifunctional Office Document Machine	
Product Description	<ul style="list-style-type: none"> • Networkable, digital machine with copy, print, fax, and scan functions
Benefit Proposition	<ul style="list-style-type: none"> • Multiple document processing functions in one machine • Connected to office computer network
Key Business Goals	<ul style="list-style-type: none"> • Support Xerox strategy of leadership in digital office equipment • Serve as platform for all future B&W digital products and solutions
Primary Market	<ul style="list-style-type: none"> • Capture 50% of digital product sales in primary market • Environmentally friendly • First product introduction 4th Q 1997 • Office departments, mid-volume (40–65 ppm, above 42,000 avg. copies/mo.)
Secondary Markets	<ul style="list-style-type: none"> • Quick-print market • Small "satellite" operations
Assumptions and Constraints	<ul style="list-style-type: none"> • New product platform • Digital imaging technology • Compatible with CentreWare software • Input devices manufactured in Canada • Output devices manufactured in Brazil • Image processing engine manufactured in both the United States and Europe
Stakeholders	<ul style="list-style-type: none"> • Purchasers and users • Manufacturing operations • Service operations • Distributors and resellers

At this point, the earlier opportunity statement may be rewritten as a *product vision statement*. The Lakes concept team began with the following product vision statement:

Develop a networked, mid-range, digital platform for imaging, marking, and finishing.

The objective defined by a product vision statement may be very general. It may not say which specific new technologies should be used, nor does it necessarily specify the goals and constraints of functions such as production and service operations. In order to provide clear guidance for the product development organization, generally the team formulates a more detailed definition of the target market and of the assumptions under which the development team will operate. These decisions are captured in a *mission statement*, a summary of which is illustrated in Exhibit 3-10.

Mission Statements

The mission statement may include some or all of the following information:

- **Brief (one-sentence) description of the product:** This description identifies the basic function of the product but avoids implying a specific product concept. It may, in fact, be the product vision statement.

- **Benefit proposition:** This element of the mission statement articulates the critical few reasons a customer would buy the product. To some extent this is a hypothesis, which will be validated during the concept development process.
- **Key business goals:** In addition to the project goals which support the corporate strategy, these goals generally include goals for time, cost, and quality (e.g., timing of the product introduction, desired financial performance, market share targets).
- **Target market(s) for the product:** There may be several target markets for the product. This part of the mission statement identifies the primary market as well as any secondary markets that should be considered in the development effort.
- **Assumptions and constraints that guide the development effort:** Assumptions must be made carefully; although they restrict the range of possible product concepts, they help to maintain a manageable project scope. Information may be attached to the mission statement to document decisions about assumptions and constraints.
- **Stakeholders:** One way to ensure that many of the subtle development issues are addressed is to explicitly list all of the product's stakeholders, that is, all of the groups of people who are affected by the product's success or failure. The stakeholder list begins with the end user (the ultimate external customer) and the external customer who makes the buying decision about the product. Stakeholders also include the customers of the product who reside within the firm, such as the sales force, the service organization, and the production departments. The list of stakeholders serves as a reminder for the team to consider the needs of everyone who will be influenced by the product.

Assumptions and Constraints

In creating the mission statement, the team considers the strategies of several functional areas within the firm. Of the many possible functional strategies to consider, the manufacturing, service, and environmental strategies had the largest influence on the Lakes project. In fact, these strategies guided the core technical developments of the product.

One could reasonably ask why manufacturing, service, and environmental strategies (for example) should be part of the mission statement for a new product. An alternative view is that decisions about these issues should arise from the customer needs for the new product and should not be determined in advance. First, for extremely complex projects, like Lakes, the design of the manufacturing system is a project of similar magnitude to the design of the product itself. As a result, the manufacturing facilities involved in the product need to be identified very early in the process. Second, some product requirements may not be derived strictly from customer needs. For example, most customers will not directly express a need for low environmental impact. However, Xerox chose to adopt a corporate policy of environmentally responsible design. In such cases, the mission statement should reflect such corporate objectives and constraints.

Following are some of the issues that Xerox considered in establishing assumptions and constraints for the Lakes project.

- **Manufacturing:** Even at this very preliminary stage, it is important to consider the capabilities, capacities, and constraints of the manufacturing operations. A broad array of questions may be relevant, including: Which internal production facilities might be used to manufacture and assemble the product? What key suppliers should be involved in the development, and when? Are the existing production systems capable

of producing the new technologies which have been identified for the product? For Lakes, Xerox assumed that input devices would be manufactured at production sites in Canada, output devices in Brazil, and the digital image processing engine in both the United States and Europe.

- **Service:** In a business where customer service and service revenue are critical to the success of the firm, it is necessary to also state strategic goals for levels of service quality. Efforts to improve service include a strategic commitment to designing products that contain few parts, which can be serviced quickly. For Lakes, serviceability goals included reducing both the number of field-replaceable modules required to fully service the machine and the time to install them by an order of magnitude.
- **Environment:** Many corporations today are developing new products with environmental sustainability in mind. The Lakes concept team adopted Xerox's first "zero to landfill" policy, an aggressive goal even for a leader in environmental design practices such as Xerox. The stated goal was that no components from a Lakes product should ever go to a landfill. All components would be either remanufacturable or recyclable, or both. No parts should be disposed of by customers. The Lakes environmental design strategy also included an energy efficiency goal to be the "most efficient machine in its class."

Staffing and Other Pre-Project Planning Activities

The pre-project planning activity also generally addresses project staffing and leadership. This may involve getting key members of the development staff to "sign up" for a new project, that is, to agree to commit to leading the development of the product or of a critical element of the product. Budgets are also generally established during pre-project planning.

For fundamentally new products, budgets and staffing plans will be for the concept development phase of development only. This is because the details of the project are highly uncertain until the basic concept for the new product has been established. More detailed planning will occur when and if the concept is developed further.

Step 5: Reflect on the Results and the Process

In this final step of the planning and strategy process, the team should ask several questions to assess the quality of both the process and the results. Some suggested questions are:

- Is the opportunity funnel collecting an exciting and diverse set of product opportunities?
- Does the product plan support the competitive strategy of the firm?
- Does the product plan address the most important current opportunities facing the firm?
- Are the total resources allocated to product development sufficient to pursue the firm's competitive strategy?
- Have creative ways of leveraging finite resources been considered, such as the use of product platforms, joint ventures, and partnerships with suppliers?
- Does the core team accept the challenges of the resulting mission statement?
- Are the elements of the mission statement consistent?

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- Are the assumptions listed in the mission statement really necessary or is the project overconstrained? Will the development team have the freedom to develop the best possible product?
- How can the product planning process be improved?

Because the mission statement is the handoff to the development team, a “reality check” must be performed before proceeding with the development process. This early stage is the time to remedy known flaws, lest they become more severe and expensive as the development process progresses.

This chapter explains the product planning method as a stepwise process, largely for simplicity of the presentation. However, reflection and criticism of consistency and fit should be an ongoing process. Steps in the process can and should be executed simultaneously to make sure that the many plans and decisions are consistent with one another and with the goals, capabilities, and constraints of the firm.

Summary

- Product planning is a periodic process that considers the portfolio of product development projects to be executed.
- Product planning involves a five-step process:
 1. Identify opportunities.
 2. Evaluate and prioritize projects.
 3. Allocate resources and plan timing.
 4. Complete pre-project planning.
 5. Reflect on the results and the process.
- The opportunity funnel collects possibilities for new product platforms, enhancements, and fundamentally new products from several sources within and outside the firm.
- Potential product development projects are evaluated based on the organization’s competitive strategy, technological trajectories, and product platform plans.
- A balanced portfolio of development projects may include investments in breakthrough products, new platforms, derivatives, and current product support.
- Aggregate planning ensures that selected projects have adequate resources for successful completion.
- A mission statement for each product development project documents the product description, benefit proposition, business goals, target markets, critical assumptions, and the product’s stakeholders.

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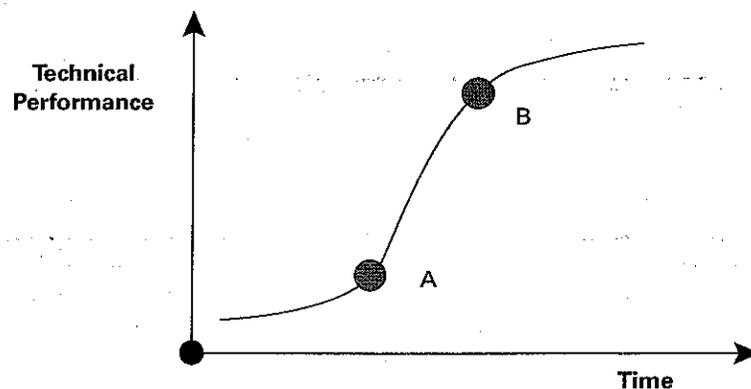
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Exercises

1. Conduct a search using the Internet or published corporate annual reports to identify the corporate strategy of a company in which you might be interested in investing. Learn about the firm's product lines and its newest products. How do these products support the corporate strategy? What types of projects would you expect to see in the product plan?
2. Create a product-technology roadmap illustrating the availability of technologies for a class of products you understand well, such as personal computers.

Thought Questions

1. How might a portfolio of development projects differ if the firm believes a particular product technology is currently at position A or B on the technology S-curve shown below?



2. How might Xerox be able to address the shortage of mechanical design engineers identified by the aggregate project planning analysis shown in Exhibit 3-9? List five ways Xerox could increase the capacity and five ways to reduce the demand for mechanical design engineers.