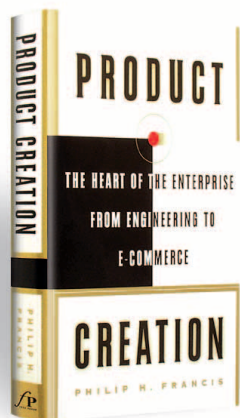


SOUNDVIEW Executive Book Summaries®

FILE: MANUFACTURING



By Philip H. Francis

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The Heart of the Enterprise from Engineering To E-Commerce

PRODUCT CREATION

THE SUMMARY IN BRIEF

Product creation is the fuel that feeds growth. The basis for enterprise success is the continuous stream of new products in the marketplace. All the laudable reasons for being in business — profits and earnings, shareholder returns, service to customers, opportunity and fair treatment of employees, and assistance to the communities in which the company operates — directly depend on the effectiveness of new product creation. To grow your company, you must master new product creation.

But taking a new product from conception to market involves many interconnected steps. It relies on marketing and marketing intelligence, product definition, planning and approval, research and engineering development, process development, product launch, and after sales service. This summary will provide you with a road map for success in the rapidly changing, highly competitive arena of new product creation.

You will learn how to:

- ✓ Come up with new product ideas.
- ✓ Coordinate manufacturing and production processes.
- ✓ Set up effective IT systems.
- ✓ Become a leader rather than a manager.
- ✓ Delight and create loyal customers.
- ✓ Create a quality product or service.
- ✓ Measure and manage operations.
- ✓ Manage your company's intellectual property and liability.
- ✓ Create effective R&D systems.
- ✓ Harness technology now and in the future.



PRODUCT CREATION

by Philip H. Francis

— THE COMPLETE SUMMARY

How to Excel At Product Development

There are two steps to excellence in product creation: creating a steady flow of innovative ideas and putting those ideas through a process that turns them into profitable products.

How do you do this? First, you must mobilize a continuing stream of new product proposals from every corner of your organization. Once the ideas start flowing, you'll need to evaluate them rationally and objectively so you end up selecting the best. Your goal is to choose a portfolio of ideas that together give you the best possible shot at a successful business future.

Your portfolio should include small and large projects, and cover all your business' market areas. Each project must have at least one formal review, and shouldn't be allowed to continue through launch without critical justification. You must also critically review your entire project portfolio, preferably twice a year.

Once the portfolio is in place, the projects must be managed. The process of managing product development projects — the second criteria of excellence in product creation — consists of four steps: business case justification, concept feasibility, product development, and pilot and project startup.

Radical New Product Development at Canon

When Canon was looking for a way to compete with Xerox, it had to come up with an entirely new product. Xerox excelled at service, and Canon stood little chance of developing the kind of infrastructure that its competitor had in place. So instead, Canon developed a copier that didn't need service! Canon put all the parts likely to require service into the toner cartridge. Consumers were already accustomed to replacing the cartridge regularly, so there was little resistance to the concept. The result is that Canon enjoys a much greater market share than Xerox, and customers "repair" their own copiers quickly and easily.

Stage 1: Business Case Justification

Projects that survived your initial review are now ready for the product development process, or PDP. Assign each project to a team, who will prepare the business plan for the project's entire life cycle. This step is crucial. Experienced product and financial planners must lead the effort. They will forecast development costs and their timing and determine the net present value and internal rate of return expected from the project.

In most cases, your product won't be entirely new, but will be a derivative of a current company offering. You therefore already have some history on which to base estimates. The team should ask itself why the market will respond eagerly to the product. What is its value to customers? Decide whether this will be a low cost commodity product or a high value, high prestige one. Generally, products will fare better with tried and true technology, but there may be products that should be cutting edge. Decide which it will be.

Your team must also consider product scope. Can this product line be expanded so that consumers will buy related products or accessories? Good examples of effective product scope broadening include Harley Davidson's sale of riding gear and Disney's introduction of Disney Stores.

When the team begins considering market channels, make sure they pay attention to e-business. This channel offers tremendous economic advantages. Finally, the team must consider product promotion. Will it be media driven, promoted at the point of purchase, or rely on brand-name equity?

Stage 2: Concept Feasibility

Now it's time to forge ahead. Involve customers, who are your ears in the marketplace, in your development

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Product Creation — SUMMARY

How to Excel At Product Development

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plans early. Next, involve your manufacturing operations directly to know if your new product is feasible. Concurrent engineering is the key. You must coordinate production design with the manufacturing process. A good rule of thumb is that within the first 20 percent of the product's development schedule, 80 percent of the total production costs are locked in.

Stage 3: Product Development

This is where reality hits. Now the focus is on developing a specific product design, along with the process, equipment and layout needed to meet production goals. Design is also very important and should be considered early on. Design — style and uniqueness — is becoming more and more important in the marketplace. Customers no longer make choices based solely on function and price. They also want eye appeal. Also look carefully for design and process patent opportunities. This is the time to lay the groundwork for intellectual property protection.

All design, engineering, materials and production planning must be completed at this stage. You must deliver the final product design and specifications and finalize your go-to-market plan.

Stage 4: Pilot and Production Startup

The final phase is launch. If your product is just an extension of an older line, this will be easy. But if the product is entirely new, a pilot production is necessary. ■

Manufacturing Strategy: The Other Half of Concurrent Engineering

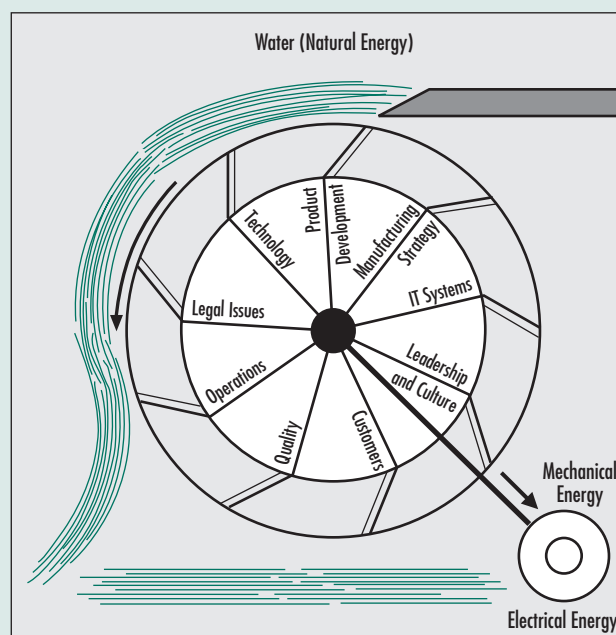
New product creation — and all that supports it — demands a sound manufacturing strategy. The strategy is your blueprint for fighting a good competitive fight. It should lay out your principles of what and where you produce, the nature of your design and production processes, your goals for competitive advantage, your key technologies, your supply and distribution tactics, and just how you intend to delight your customers. Most important, your manufacturing strategy must support your company's business strategy and be a living, valuable presence.

Your supply chain is your lifeline. The companies that provide the materials and components you need for production are partners. They may carry your inventory or perform other functions you once performed in-house

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The New Product Creation Wheel

The engine for creating the products and services you need to win in today's highly competitive environment is a good product development process, or PDP. PDP is best represented by the image of a waterwheel. A simple waterwheel turns on a horizontal axis by the action of running water. As it turns, the wheel delivers useful work, such as the mechanical action for milling and grinding or for driving an electrical generator. It transforms naturally existing energy and delivers power used in making agricultural and other products.



Like the waterwheel, the New Product Creation Wheel draws resources from the energy in the marketplace. The organization focuses its energies through efficient processes to supply markets with products. The nine spokes of the wheel (see above) are bound together at the hub and provide the strength, cooperation and discipline of the enterprise. The spokes are:

- ✓ Product Development
- ✓ Manufacturing Strategy
- ✓ Information Technology Systems
- ✓ Leadership and Culture
- ✓ Customers
- ✓ Quality
- ✓ Operations
- ✓ Legal Issues
- ✓ R&D and Emerging Technologies

Supply Chain Quality Control At John Deere

In 1998, John Deere announced a new company-wide supplier-rating process. The company trains and monitors 500 suppliers monthly by tracking their quality, on-time deliveries and cost improvements. The rating system is strategically vital. Suppliers are no longer rated strictly on price, and John Deere benefits from cost reductions without a loss of product quality.

Manufacturing Strategy: The Other Half of Concurrent Engineering

(continued from page 3)

but which partners can deliver better and cheaper. Paying close attention to your supply chain pays real dividends. Outsourcing parts of the manufacturing process is becoming an important dimension of the relationship with supply chains. Just be sure that your suppliers meet your quality standards.

Mass Customization

Companies must become agile as they offer new products and services quickly. They must learn to provide mass customization without the traditional delays and high cost associated with creating custom work. With a minimum of retooling, products and services can be customized for individual consumers. Examples of companies successfully mass customizing include Panasonic National Bicycle Company, a company that can produce a custom bike in one day, and Motorola, which can produce custom pagers in two hours. ■

Systems: Making Information Technology Work

At the heart of waterwheel technology is a simple hub and spoke design. The arrangement provides sturdy support to the outer rim and to the vanes that catch the water and turn the wheel.

This same hub and spoke architecture is seen today in information management. The heart of the network is a server — a computer that warehouses information and makes it easy to locate and deliver a piece of information anywhere in the system. The hub is the server, which dispatches data along a spoke, around the wheel's perimeter, and back again. These information pathways work together because they are linked together by their common access to the server. If one spoke fails, the

information can be redistributed among the remaining spokes, and work can continue uninterrupted.

Enterprise Resource Planning

Information systems are your key to business excellence. Today, Enterprise Resource Planning (ERP) systems orchestrate much of a company's IT infrastructure.

The heart of the ERP system is the planning and control module. This piece manages all internal operations from sales and customer service information, through inventory control and capacity planning, down to the details of shop floor management, all in real time.

Flanking the planning and control module are the financial and human resource management support modules. They interact

If you expect to leverage the power of ERP to best advantage, invest in close, executive-level oversight.

for administrative updates. This allows payroll, ledger, accounts receivable and payable, and other administrative functions to be readily accessible. Also included in many packages is a supply chain management system.

To implement an ERP, you will need a dedicated internal team representing internal users, the finance department, and IT professionals. If you expect to leverage the power of ERP to best advantage, invest in close, executive-level oversight. This key individual must have a clear vision of the company's future and be able to manage the time and cost requirements.

Next on the Horizon: Knowledge Management

The sheer volume of knowledge being acquired compounds year after year. The trick is to use that knowledge. This is knowledge management, or KM. KM is vital because the business world is knowledge intensive. Harnessing that knowledge can create a powerful competitive advantage as it captures vital information about customers' needs and preferences.

There are four steps to harnessing knowledge effectively. First, you must identify an area of your business that you believe most needs improvement and that you believe could become more effective and serve as a differential advantage over the competition. Next, come up with answers to "what if" questions about possible improvements. Next, figure out what knowledge is needed by whom to fix the problem. Finally, figure out how to capture that information, and come up with a plan that does that, whether that involves creating new systems for capturing data or mining the data you already have. ■

Leadership: Form Follows Culture

A form of the waterwheel has been used for centuries to produce water for drinking and irrigation. It works like this. Water is captured at the bottom of the wheel, which in this configuration is called a noria, and carried up as the wheel turns. It's emptied for irrigation or drinking water. This simple device has transformed entire societies.

It takes teamwork to build a noria. It requires a vision of water flow, how to direct it, and what crops can be cultivated with it. There had to be a project leader who had the vision to see how it would work and the leadership skills to direct a team to build the structure. It's the same for a company.

A key objective of your company ought to be to create real teamwork and a culture of shared knowledge to facilitate the creation of new products. But first you must understand the prevailing culture. Teamwork starts with culture and is enabled by leadership. No new products, regardless of how much money you throw at them, can ever be effectively and efficiently launched without a culture that supports your company's goals.

Being a leader isn't synonymous with being a manager. In fact, it's very different. Some leaders are wretched managers. They excel as visionaries and as change agents but lack attention to day-to-day details. Good managers excel at process, good leaders excel at creating new prospects; legendary leaders excel at both. Good leaders who aren't great with details need to surround themselves with competent, trusted managers.

Measuring Your Leadership Quotient

Here's a short test to determine your Leadership Quotient, or LQ. Give yourself one point for every yes, 0 for neutral, and subtract 1 for no. If you score 5 or more, rate yourself as a strong leader. Score 0 or less, and you need to strengthen your leadership skills.

1. Do you have a clear vision for the future, and a set of goals you share with your team?
2. Do all team members understand your goals and visions and do they translate them into their personal agendas?
3. Do you invest a third or more of your time coaching and teaching your vision and goals to customers and team members?
4. Does your leadership style align closely with company culture?
5. Are you a better leader than manager?
6. Do team members easily and frequently confide in you and feel comfortable doing so?
7. Do you encourage and support risk-taking by your

team members and are you tolerant of risks that turn into mistakes?

8. Do you accept and handle ambiguity well?

9. Do you personally "take the heat" when serious problems arise?

10. Do you believe the ends are never justified by unfair or immoral means? ■

Long Live the Customer!

All the spokes of the waterwheel are essential, but none is more vital than the "customer" spoke. This spoke represents the distribution of goods and services that customers want, and is the conduit that feeds information from customers to product developers.

There was a time when customers didn't matter as much as they do now. Manufacturers couldn't produce enough goods for a hungry nation, and customers bought what was available. But beginning after World War II, customers became more demanding. Today, companies compete for buyer attention. Customers are now tightly in the product creation loop.

Meeting or exceeding customers' desires is a fundamental obligation of any business. After all, 70 percent of all new products are driven by markets, not by new technological concepts. The process is about customer pull, not technology push.

How to Grow Your Customer Base

Growing your customer base comes down to mastering just two basic elements. On the cost side, you can cut costs, and you can streamline your supply and distribution channels. On the revenue side, you can grow your profits by offering more attractive and valuable products and services. You have three levers at your disposal for profitable growth:

1. Sell more goods or services to your current customers. The goal is to realize more revenue and profit from existing customers. You can do this by selling at higher price points or reducing your product production costs. Or you can sell more to existing customers. For example, push to sell a new car to each customer every two years rather than every three. Push for upgrades or accessories.

2. Increase your customer base. Find and court new customers, either exploring new markets or asking for referrals. Use customer relationship management tools to really get to know your customers and others like them.

3. Reduce defections (increase retention) of your customer base. Keep existing customers by focusing on the basics — superior products and services. The cost

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Long Live the Customer!

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of attracting a new customer is much higher than keeping an old one.

Remember that to please your customers, you must train employees to understand and deliver “customer delight.” Use customer information software to get closer to your customers. Use the Web effectively as a sales and information channel, but remember that your customers can gather information about your competition easily. That’s why creating “delight” is more important than ever.

There is an added benefit to using the Web to communicate and perhaps sell directly to your customer. Disintermediation — eliminating some of the middlemen — can cut costs and create real value for both customers and sellers. A likely result is better, less-filtered information about what customers really want.

Customer Intimacy

Your goal is staunch loyalty from your customers. Loyalty increases sales, grows you base and strengthens retention. How do you get there? By focusing on customer intimacy. Intimacy means building mutually dependent relationships that create measurable value. You don’t just make your customer feel good about you, you take on responsibility for your customer’s success. There are three avenues to becoming a customer intimate company.

The first avenue is problem-solving. Work with the customer as a consultant, create a solution and deliver it. Your next goal is to define and implement specific and total solutions that add real value. Your customer may not see the real problem, but you may. Solve it. Finally, partner with your customer financially, sharing the risks and rewards. ■

Quality Really Counts!

Master builders understood that they had to create a quality waterwheel. That hasn’t changed. Quality pays, especially in new product development. To realize quality rewards, you must relentlessly pursue quantitative goals so that everyone knows what to shoot for.

Quality means different things to different folks. But when you boil it down, three distinctive measures of quality stand out: reducing defects, reducing cycle time and fostering customer contentment. Total quality exists in all three dimensions.

Quality Tools

There are many tools available to help you deliver quality, including benchmarking, six sigma, the learning

Lost Customers Are Expensive

If you need more convincing that keeping customers is better than seeking out new ones, here are a few facts:

- 1. It costs ten times as much to bring in a new customer as to keep an existing one.**
- 2. For every customer who complains, 25 are silent.**
- 3. Ninety percent of dissatisfied customers won’t buy from you again.**
- 4. A loyal customer generates a 40 percent compound rate of profit over a five-year period.**

curve and quality function deployment.

Benchmarking involves observing what others are doing and learning what the best practices are. The process requires that you measure your performance today. This is your baseline. Next, you must identify prospective benchmarking partners, especially those who are recognized as the best in your business. Once you observe the best practices, it’s time to apply the lessons to your own organization.

Six sigma is shorthand for a statistical method that allows very few errors in the manufacturing process. Essentially, a company practicing six sigma will not tolerate more than 0.002 parts per million produced to be defective. The standard is extremely tough, but pushing toward it will yield far fewer defects and thus greater quality.

The learning curve is another measure of quality. The learning curve looks at improving quality through continued human experience, volume or production. Its usefulness is greatest in process improvement (doing things better) and cost improvement (doing things more effectively.)

Finally, quality function deployment is a method that links functionality with design. Assume, for example, you want to design a new product such as a handheld calculator. You begin by examining the current product and the competition. Then you develop a concept based on the features customers want and expect. Turn next to the technical design. Your engineers determine the attributes most important in addressing customer needs: total weight of the unit, rate of battery drain, etc. Then play the customer requirements off against the technical attributes by means of a matrix. The correlations you get will reveal where you need to focus and whether there are tradeoffs between customer-desired features and design realities. ■

Operations: You Can't Manage What You Can't Measure

Waterwheel station-masters were among the first operating engineers. For centuries, they were responsible for keeping their villages going. We now turn our attention to the operations spoke of our Product Creation Wheel. This spoke concerns industrial processes.

Improving manufacturing processes requires managers to have a basic understanding of cost accounting. The accounting basis for traditional production process operations is the simple notion that costs are made up of fixed and variable components. Fixed costs are those incurred regardless of production levels, and include indirect salaries, space, depreciation and equipment. Variable costs, on the other hand, are directly proportional to volume produced, and include labor and material costs. Adding fixed and variable costs determines the total cost of a production unit. The weakness of traditional cost accounting is that it may not accurately reflect the actual costs. Costs associated with an infrequently produced item, for example, may end up lost to overhead.

The solution is activity-based costing, or ABC. ABC tracks all activities that permit products to be designed, produced, distributed, sold and serviced, and thus creates a more complete picture of the real cost. ABC requires that you identify the activities that go into a product, identify the cost drivers, define the points at which costs attach to those activities, and then attach those costs to the product.

Don't Sell A \$300 Product for \$45

ABC, or activity-based costing, gives a much clearer picture of the real cost of production. Consider what happened when a hardware component manufacturer turned to ABC. Before ABC, the company provided the electrical utilities it served with out-of-stock components. One particular component sold only 500 units per year, and the company typically arranged one or two runs of the product to cover anticipated orders. Using standard cost accounting, the cost per unit was \$30, and the selling price was set at \$45.

A consultant reviewed the company's overall cost accounting methods, and found that every time the component went into production, two people were taken off their regular duties while they found the right tools, molds and fixtures. These costs had previously been assigned to overhead, and the cost spread over all components produced by the facility. Once the costs were identified, they were assigned to the components. The cost now approached \$300 per unit. The selling price was adjusted accordingly.

Measuring Your Processes

You also need to measure key internal processes like R&D and new product development. These are the drivers of business improvement. Research and development is an investment, representing between 2 and 10 percent of your total sales. Like any investment, it should be measured and managed.

R&D measurements should be simple and objective. Some measures to consider are:

R&D Multiple: annual investment in R&D/total sales, which is a measure of your R&D intensity.

Relative R&D Multiple: the ratio of your company's R&D multiple to that of your strongest competitor's.

R&D Effectiveness Index: profit from new products in relation to the investment made in new product development.

Patent Coverage: percentage of current sales that are protected by patents or trade secrets, compared to three to five years ago.

New product development processes can be measured as follows:

Process Throughput: number of new or improved products commercialized per year.

Impact of Technology: The ratio of company-owned patents to all comparable patents owned by competitors.

New Products' Impact on Sales and New Sales Ratio: sales in dollars and percentage from new or improved products released in the prior year and from the prior three years. ■

Caveat Venditor: Beware Their Lawyers

Now we've come to the most overlooked spoke of our waterwheel — the legal issues spoke. It must be durable, otherwise it can ruin your company as easily as inattention can bring down a water station.

Many organizations are ignorant of the importance of patents, trademarks and other intellectual property tools. Intellectual property lawyers are crucial to new product creation. Your intellectual property (patents, trademarks, trade secrets and copyrights) are valuable assets and must be managed and protected.

Litigation may be necessary to protect these assets. Consider a recent example. Wal-Mart accused Amazon.com of deliberately stealing away 14 key IT professionals, who could provide Amazon.com with valuable information about the retailer's distribution, logistics, merchandising and data warehousing systems. Wal-Mart considers the information to be trade secrets.

What can you do with patents, trademarks and copy-

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Caveat Venditor: Beware Their Lawyers

(continued from page 7)

rights? One option is to license the right to use them to others. Another is to simply keep the competition from using them, and thus maintain any competitive advantage they provide you.

Product Liability

Companies face increasing liability for the use or misuse of their products. Liability arises in two ways. First, the Uniform Commercial Code governs the warranties and commercial damages for breach of those warranties. In addition, individual state laws cover negligence arising out of the design or sale of defective products or the failure to warn of potential dangers associated with products.

Product liability awards, whether based on warranties or negligence, can run into the millions. Courts subscribe to the deep pocket theory that manufacturers and retailers are best able to bear the costs associated with a defective product. Liability insurance is a must.

The best way to protect your company from liability is to create fault-free products. All product design needs to:

- Incorporate best practices into the design.
- Anticipate problems that might arise through reasonable use or foreseeable misuse of the product. For example, is it foreseeable that a handyman might attempt to repair the product or a child might pick it up and be injured. If so, design the product to protect consumers from themselves.
- Comply with all standards imposed or suggested by professional trade groups or regulatory entities.
- Submit a prototype to an independent testing laboratory. ■

Harnessing your R&D and Emerging Technologies

Now we have come to the final spoke in our water-wheel — technology. You must harness your R&D and learn to identify emerging technologies. Research and development is essential to any company whose destiny depends on offering better products or services. R&D must drive innovation throughout the organization. R&D must be chartered, effectively led and efficiently executed if it is to be an engine for growth. Two issues should guide your research and development investments: what projects you should pursue and how you manage the R&D your company needs.

R&D may be basic, focusing on discovery, or applied, focusing on application of known technology to new products or processes. Basic R&D is usually left to universities and consortiums, while applied R&D belongs

to business.

How do you go about improving your R&D operations? As a manager, you must manage R&D along nine parameters. These are:

- **Portfolio Management:** Make sure you have a disciplined and competitive process for initiating R&D projects and estimating the expected payback and risk. These projects then make up your portfolio.
- **Corporate R&D:** Sometimes the best place for R&D is the corporate lab, where high-risk, high-reward projects can be pursued in secret.
- **Boosterism:** R&D must be aligned with corporate strategy, and needs an advocate who communicates the challenges and successes to all company constituencies.
- **Outside Partnering:** Look outside corporate walls for other sources of R&D expertise. For example, universities may be a good source.
- **Project Funding:** Projects should have to compete for funds, and should justify their needs with clear, precise and measurable objectives.

- **Board of Advisors:** Consider creating an oversight function with an external board of advisors.

- **Customer Face-Time:** Put R&D people in front of your customers so they truly discover what customers want and need.

- **Organization:** Make sure R&D units communicate with one another, and are rewarded appropriately for successes as well as career advancement opportunities.

- **Project Management:** The strength of R&D depends on everyone's project management skills. Train all participants in project management.

Emerging Technologies to Watch

There are a number of emerging technologies companies need to monitor. These include:

- **Advanced materials,** such as thin-film deposition technologies and superconductivity as well as polymers.
- **Communications,** such as high capacity wireless data transmission technologies, fiber optics and interactive speech recognition.
- **Management support tools,** such as knowledge management, modeling and business simulation processes.
- **Micro/Nano technologies,** such as miniscule transistors and robots.
- **Advanced computing,** such as supercomputers, optical and copper wire, storage systems and artificial intelligence.

The challenge will be to turn technological advances into product concepts. You must track broad technology trends and make sure your people are current on potential opportunities and threats. ■