

Developing customers before products

SUSTAINED PROFITABILITY in today's fast-changing high-tech industrial markets can be elusive. Confident that a new technological breakthrough will have customers clamoring at the door, managers often make major investments only to discover there is no real demand for their product. And even if the new product is a market hit, earnings can be short-lived. Competitors will soon pile in, prices will drop, and eventually the entire market will be wiped out by the next technological breakthrough. Only the earliest movers – both into new markets and out of fading ones – are likely to reap profits.

To increase their sales growth and profitability, some companies are beginning to reassess their priorities. They have discovered that the solution to profitable growth is not solely technological prowess, but the ability to develop customers before products. Adept at identifying and meeting unmet as well as latent demand, these companies can almost guarantee a profitable market prior to making substantial investments in a new product.

The challenge of competing in high-tech industrial markets

Markets for high-tech industrial products such as electronic materials, battery components, and semiconductor manufacturing equipment are growing rapidly. Worldwide, the market for semiconductors grew by more

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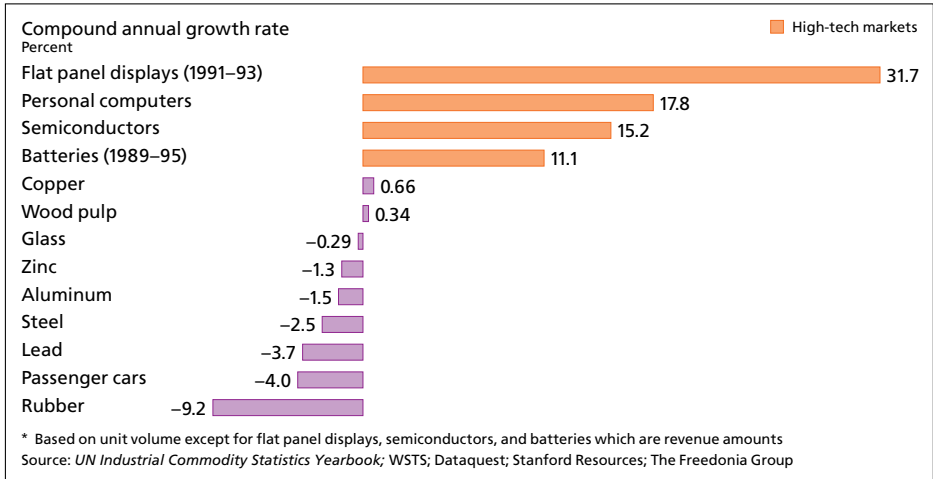
A new strategy for high-tech industrial markets – self-destruction

*Getting **out** early is as important as getting **in** early*

*Wrong: taking samples to old customers
Right: drawing roadmaps with the right ones*

Robert J. Davis ♦ Shinichi Ueyama

Worldwide industry growth rates,* 1990–93



than 15 percent, compared with a fall of 4 percent per year for passenger cars and a fall of 9 percent for rubber (Exhibit 1). But despite rapid growth in high-tech markets, companies supplying them still find it difficult to sustain profitability. Life cycles for intermediate materials and production equipment are short – just like the cycles for finished high-tech products. A new generation of DRAM semiconductors and the materials to manufacture them are introduced, on average, every three to four years. The problems of high-tech industrial suppliers are exacerbated by the relatively small size of their markets. In 1995, the worldwide market for photo resist, a chemical material used in manufacturing semiconductors, was approximately \$500 million. The market for the semiconductors themselves exceeded \$140 billion. Likewise, the flat panel display (FPD) market topped \$5 billion, whereas the market for the plasma material used in FPDs was only \$300 million.

The rise and fall of the photo resist market over the past 20 years illustrates just how difficult it is for companies to sustain profitability in these markets. Initial returns on sales were high: 30 percent for the leader, Tokyo Ohka Kogyo, and 15 percent for Shipley, another major player, in 1980. The few players able to first develop the technologically sophisticated photo resist material, an enabling technology, were able to command price premiums of more than 100 percent. However, once other companies developed similar technology and made strong plays for the market, profitability soon dropped. From 1975 to 1988, the number of competitors grew from four to 20. In 1988, these 20 players (many of which were multinationals such as Ciba-Geigy, GE, and BASF) were battling over a worldwide market worth \$500 million.

Dramatically decreasing returns eventually forced many of these companies out of the market, and most were acquired by remaining players: KTI

acquired Kodak, Olin acquired AT&T, and Hoechst acquired Dynachem. As a result, between 1988 and 1994 the number of players dropped from 20 to 14. However, the damage to industry profitability had already been done: heavy investments in manufacturing facilities had created excess capacity and fierce competition had driven down prices.

The experience of companies in this sector reveals a stark lesson. Investing too heavily in R&D facilities to create economies of scale in a small and fast-changing market is a recipe for failure, however attractive the market initially appears. Market conditions dictate that any new product needs to win a high share of the global market if it is to justify even small investments. Moreover, because these markets will often disappear quickly, companies need to develop the capability to constantly identify new markets, and the flexibility to be able to rapidly enter, then exit, those markets.

Market conditions dictate that new products need to win a high share of the global market to justify even small investments

These are difficult challenges. Many companies, particularly those that have entered the market from traditional businesses like non-ferrous metal, steel, and basic chemicals where the product cycle is long and new materials seldom emerge, often remain tied to exclusive customer relationships that preclude them from chasing wider market opportunities. In addition, these newcomers to the world of high-tech have difficulty adapting to a fast-paced market, where customers prefer open, flexible relationships and the accent is often on value rather than price.

Because they are focused on internal technological developments as sources of growth, many companies also fail to spot real customer needs and identify new business areas. There is no point toiling to develop a still stronger polymer if you don't know what it will be used for. Breakthrough technology has value only to the degree that it meets customer needs. And besides, total reliance on time-consuming, internal technology development is likely to be too slow and costly in small markets with such short life cycles.

Furthermore, in the mistaken belief that large-scale, leading-edge manufacturing facilities will lead to superior product quality and lower costs, many companies overinvest. This investment increases their tendency to commit to individual business areas long after the markets have ceased to be profitable. One leading photo resist manufacturer, for example, has photo resist-related R&D facilities, manufacturing facilities, distribution, and technical support capabilities in the US, Europe, Japan, and Asia. However, the company's annual revenues from this heavy investment are less than \$50 million worldwide. In the lithium ion battery market, Sony and Sanyo have

recently announced investments in battery cell manufacturing facilities of \$30 million and \$40 million respectively in a market worth around \$400 million in 1995.

The race to build capacity and frighten off potential entrants often results only in excess industry capacity when demand falls off faster than investment. Profitability then suffers as each company battles to utilize excess manufacturing capacity by lowering prices.

A winning formula

High-tech industrial companies that enjoy sustained profitability have abandoned their singular focus on technology. Though technological capabilities and development remain important, their businesses are now driven by a determination to capture latent and unmet consumer demand. This new business model is based on two principles.

1. Develop customers before products

Identify and develop hot spots. Building relationships with the right customers before developing products is crucial to success in high-tech industrial markets. Many high-tech companies try to expand their sales through developing breakthrough technologies as extensions to existing technological capabilities. Often, R&D is performed in utmost secrecy with little input from customers.

By working more closely with customers to uncover development opportunities, or “hot spots,” however, a company can ensure that customer need exists before embarking upon costly product development. Hot spots share three characteristics: customer demand for the product is likely to emerge soon – within one to two years; the market will be quite large, as several customers have already been identified; and the profit potential is high.

A Japanese chemical company’s success in the FPD materials industry demonstrates the value of the hot spot development process. Believing that an opportunity for a new FPD material existed, the company formed a core marketing team of R&D, technical support, and sales people to visit prospective customers and discuss their needs. Where no customer relationship existed, the team simply used the yellow pages and went through switchboards and secretaries to identify the key people with whom to initiate a dialogue regarding potential customer product needs and their own capabilities. The team’s efforts resulted in a series of discussions with a leading-edge customer, and the discovery that a new FPD material was indeed needed. The company was subsequently able to develop a new material that is now becoming a major screen technology.

Target leading-edge customers first. Most companies develop products with existing customers. However, in high-tech industrial markets, companies need to develop products with leading-edge customers, even where no relationship exists, if they are to maximize their market share. Leading-edge customers – the most sophisticated, demanding, fast-moving companies – adopt new technology first; less sophisticated companies follow their lead after six months or more. Suppliers able to cultivate industry leaders as their customers can therefore create a waterfall effect whereby their new product becomes an industry standard. Moreover, leading customers often agree to “sponsor” their selected suppliers, meaning that they agree to joint development and guarantee a certain sales volume for a product.

Shinko, a Japanese semiconductor packaging manufacturer, used Intel, the world’s leading MPU chip producer, as a sponsor company. By working closely with Intel, Shinko was able to meet Intel’s packaging design requirements for various chip

forms, and became its supplier of choice. When “downstream” customers such as IBM and Texas Instruments adopted similar technology to Intel’s, Shinko was able to provide them with leading-edge materials and capabilities (Exhibit 2). As a result, Shinko increased sales from \$68 million in 1980 to \$726 million in 1994 – a compound annual growth rate of 18 percent.

Likewise, Hashimoto Chemical attained a 90 percent market share by establishing a de facto standard in electrolyte-related materials for lithium ion batteries, having first targeted leading customer Sony. And Tanaka Chemical gained an 80 percent share of the Nickel-Cadmium and Nickel Metal Hydride battery cathode active materials market through first working with Matsushita.

Use road maps rather than product samples. Instead of investing in development to produce samples with which to entice customers, successful companies use “road maps” to establish a dialogue with potential customers, uncover their needs, and explore ways in which the supplier could meet those needs.

Three different types of road map are used together: a product road map, a technology road map, and a capability road map. The product road map

Exhibit 2

The waterfall effect

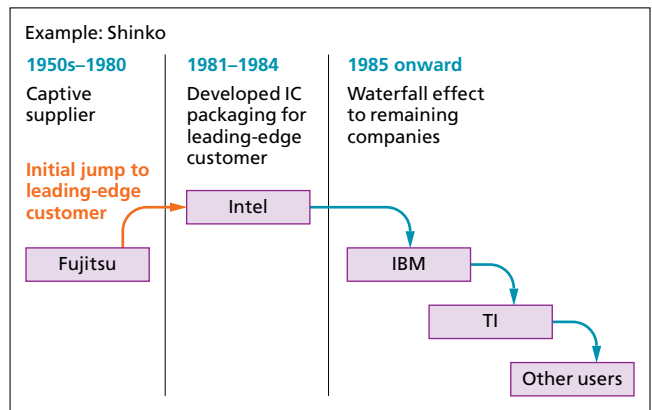
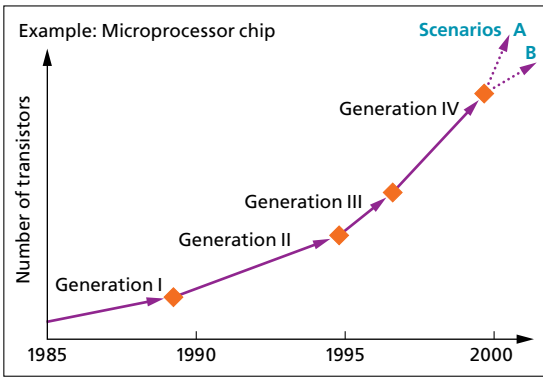


Exhibit 3

Product road map



shows the timing of product functionality required by customers. The technology road map shows the precise specifications for materials and manufacturing equipment required to develop those products. The capability road map lays out a strategy to ensure a fit between other companies' designs and the new technology.

Consider as an example a semiconductor manufacturer. Suppliers looking for new growth markets would have to consider what sort of semiconductor the manufacturer will be producing in future years. The semiconductor manufacturer's product road map might show the millions of transistors per chip needed to meet increasingly demanding end-user requirements. By ascertaining the type of end-user applications that will be used for multimedia games, for example, the corresponding software and hardware requirements can be determined. These requirements, combined with speed and space demands, can then be used to calculate the number of transistors needed per chip (Exhibit 3).

The supplier can then turn its attention to how these specifications can be met. The supplier of wafer-testing equipment may realize that testing a more advanced chip will require equipment which can handle a 12-inch wafer rather than today's 8-inch wafer.

This requirement can mean a development opportunity for the equipment supplier. The technology road map is used to focus on the enabling technology – the technology not currently held, but needed to manufacture the target product. In other words, the technology road map points to hot spots.

Exhibit 4

Technology road map

Example: Semiconductor manufacturer		
Manufacturing step	Required technology	Example technology development approach
Front-end manufacturing process		
Wafer test	12" wafer test equipment	Joint development with Company X
Photolithography	0.25 micron photoresist	Open evaluation of photoresist makers: begin testing samples in third quarter
Deposition	12" wafer extrusion capability	Test new deposition equipment of Company Y
Back-end manufacturing process		
Die attach	85 micron pitch etching	Test existing equipment
Packaging	Manufacture bare chip, outsource packaging	Alliance partner Company Z developing new package
Probe and test	85 micron pitch, 180° heat resistance	Wire makers currently unable to meet requirements, consider alternative technology

Designing road maps is an interactive process between suppliers and customers. Exhibit 4 shows the semicon-

ductor manufacturer’s own technological road map. It outlines the technological requirements for each step of the manufacturing process, as well as ways in which the manufacturer might acquire the enabling technologies. By discussing their technological road map with suppliers, manufacturers can help those suppliers develop their own product road maps, which in turn will help their suppliers. It is when suppliers and customers come together to start discussing product needs and supplier capabilities that the most effective, timely solutions emerge.

The capability road map (Exhibit 5) shows three types of information: the key layers in the “solution set,” dominant players within these layers, and how to work with those players. The solution set within a personal computer comprises the various layers of technology that have to work together in the final product. By specifically designing and manufacturing various components of the set to work together – as Intel and Microsoft are doing with MPU chips and operating systems software – suppliers improve performance and therefore broaden acceptance. Some manufacturers have gone further still, including the end user in the solution set in order to create demand for their product. While computer buyers can’t see the Intel chip in a product they buy, the “Intel Inside” marketing campaign has raised the manufacturer’s profile with consumers.

2. Manage resources flexibly

Shift resources to growing businesses. Shifting resources from existing businesses to emerging, unproven ones, is counterintuitive to many managers, even when existing businesses are not performing well. Again, this is a legacy of the management methods of older industries, where products enjoyed long life cycles and investments were made with a long-term perspective. But in such short-lived markets, returns from existing businesses have to be used to fund investments in nascent ones. Otherwise, once existing businesses begin to falter, as they inevitably will, those returns might not cover future investment costs and growth will stall.

To ensure that resources are allocated effectively, each business opportunity generated in the hot spot development process should be carefully evaluated to determine the likely market size, profit potential, and required

Exhibit 5

Capability road map

Example: Semiconductor manufacturer			
Component layers needed for business	Target	Dominant players	Example approach
(User)	✓	User	End user advertising campaign
Application software	✓	Novell Microsoft Lotus	Joint development with Company X
Operating system	✓	Microsoft IBM Apple	Partner with all major players
BIOS (Basic input/output system)			
MPU (Microprocessing unit)		Intel AMD Toshiba NEC	
Silicon/raw materials	✓	MMC Walker Shinetsu	Ongoing sharing of road maps with current suppliers

investment. Priorities should then be set among new and existing businesses based on the probable returns on investment. Option value analysis can help managers decide where to place their bets. By multiplying the potential return by the probability of each possible option, the “value” of each option can be calculated. Option analysis is already commonly used by pharmaceuticals companies deciding future investments, such as whether to

develop a drug with small profit potential but a high probability of success, or a drug with a large profit potential but a lower probability of success.

Entering a high-tech industrial market with a four-year life cycle after one year could mean a 25 percent reduction in earnings

Shifting resources in slow-paced industries can take several years. But in high-tech industries, even waiting until the next annual budget review can be too long. Entering a high-tech industrial market that has a four-year life cycle after one year could mean a 25 percent reduction in earnings potential. Therefore, resources should be allocated as soon as a leading sponsor customer has been identified. Successful high-tech industrial manufacturers can reallocate resources in a matter of months once a hot spot has been identified.

Use external resources. Identifying hot spots will automatically create a pull of resources away from existing businesses to new, growing ones. Once a company becomes adept at identifying hot spots, the demand for financial, R&D, and management resources to develop them can outstrip supply. At that stage it will be the lack of resources, rather than profitable opportunities, that is the bottleneck to growth.

Successful companies, therefore, use external resources in order to minimize fixed investment and shift resources out of existing markets into new ones. They might, for example, buy a required technology rather than develop it internally, or outsource manufacturing to a company with excess capacity (Exhibit 6).

Since many costs are sunk, it is not usually possible to redesign the economics of current businesses by using external resources. But a new business area might only yield target profitability with the help of external resources. The first areas to consider are those that represent the largest portions of the cost structure, such as heavy up-front R&D or manufacturing equipment investment.

Cirrus Logic, a peripheral chip manufacturer, has chosen to buy specific technologies rather than develop everything internally. For example, when the company decided to enter the data fax modem chip market it acquired Crystal Semiconductor to obtain the required integrated design expertise.

Opportunities for utilizing external resources

Hot spot identification	R&D	Sourcing	Manufacturing	Sales	Distribution
Opportunity					
Gather information through external networks	Joint R&D Strategic product technology acquisitions	Consolidation of strategic materials purchase Purchase critical suppliers	Consolidation of manufacturing Outsourcing	Direct for strategic key accounts Shared direct salesforces Sales agents	Distribution network piggy backing Third-party distribution
External resource					
Venture capital firms Universities Independent research labs	Customers Related equipment and material makers Competitors	Suppliers	Competitors Small (start-up) companies Outsourcing	Joint ventures Subsidiary sales company	Related equipment/material makers Independent distributors
Example					
International Fundamental Research Center for Battery and Display Information	Toshiba-IBM-Siemens joint 256mb DRAM research Cirrus Logic technology purchase		Cirrus Logic fabless semiconductor manufacturer	FSI International's creation of Motron semiconductor joint sales company	

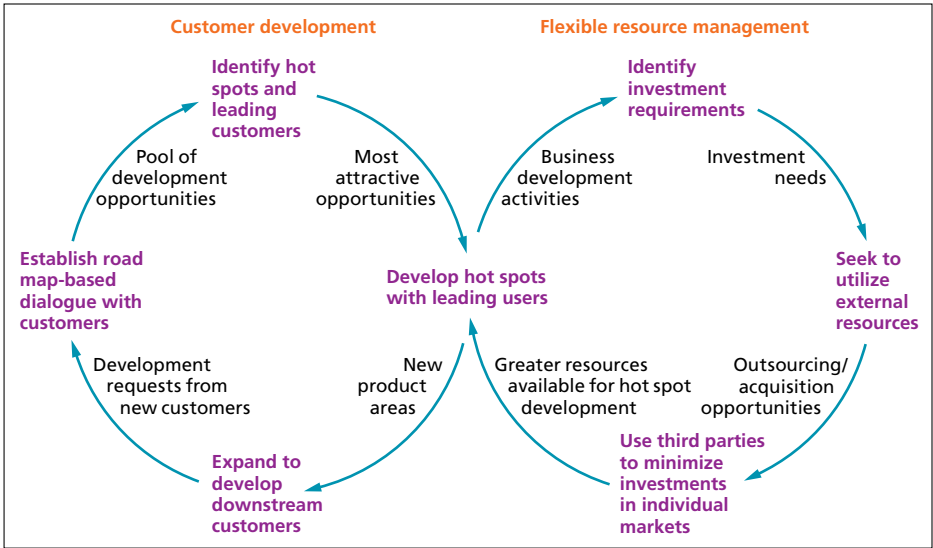
And to quickly access the full motion video multimedia market it bought Pixel Semiconductor.

Cirrus also outsources its wafer production by utilizing excess semiconductor manufacturing capacity of companies like IBM. Many managers wouldn't dream of such an option, arguing that semiconductor manufacturing is proprietary and too technologically sophisticated. However, Cirrus is happy to outsource wafer production while retaining the critical design and quality control functions, which require relatively less capital investment.

The net result of Cirrus' strategy is lower initial investment in new businesses, shorter time to market, and higher earnings, all of which add up to greater cash flow to develop new growth areas. Since embarking on the strategy back in 1989, Cirrus has increased its sales from \$37 million to nearly \$600 million in 1994 – a growth rate of more than 60 percent per year. In 1994, it attained an ROA of 13 percent and applied for 79 patents – five times the number it applied for between 1985 to 1989.

The better a company becomes at identifying hot spots, the more important it will be to manage resources flexibly. For the less a company invests in each development opportunity, the more hot spots it can develop and the higher its sales and earnings growth (Exhibit 7). A company which fails to manage resources flexibly simply won't be able to develop the hot spots identified.

The new business model



Getting started

The success with which companies develop customers before products depends on the ability of top managers to understand the distinct characteristics of high-tech markets and commit to the new way of doing business. Companies that generated huge revenues but scant profits in basic materials industries thought that the high-tech markets for value-added materials would be their salvation. The dream often failed to materialize. Caught up in the ways of the past, many of these companies have been unable to adapt their organizations. They still believe in the virtue of building the largest scale plants and keeping all R&D in-house and under wraps. And despite their large investments of time and money, they still fail to sustain profitability.

Top managers who do attempt to shift to the new business model are likely to encounter resistance from those who don't see why change is needed, or from those in the company who lack the skills and the confidence to adopt a radically new approach to market development. The resistance is likely to be particularly fierce in companies with limited cash flow and other resources, and that feel current investments might still pay off if they persist long enough. However, resistance can be overcome by taking a low-risk, step-by-step approach that does not require corporate restructuring or million dollar investments.

By visiting leading companies, even those with whom no customer-supplier relationship exists, a company can quickly uncover new product needs and identify inappropriate R&D spending. The only investment required to

prove the value of the new approach is the establishment of a core marketing team, a few phone calls to set up customer visits, and the cost of the visits themselves. A single customer visit can mean a million dollars of better spent R&D.

Perhaps the greatest barrier to change is the company's lack of confidence in its ability to excel at anything other than technological development. However, once people in the organization begin to feel a sense of urgency to change and take the first reluctant steps, they will start to build skills in obtaining appointments with potential customers, developing road maps, and identifying customers' needs. In the space of one or two years, a company can transform itself into a nimble organization that understands how to identify and enter new high-tech markets profitably. More importantly, the company will know just when to exit those markets and move on. Technology alone will no longer deliver. In today's fast-changing markets, identifying and developing leading-edge customers *before* developing samples is key to sustained, profitable growth. 