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GAINING COMPETITIVE ADVANTAGE THROUGH GLOBAL PRODUCT DEVELOPMENT

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I. *Introduction*

"The guns aren't firing now; nevertheless, we are in a mortal contest. We are in a war of ideas and a war of national performance which in many ways is more serious than any open conflict we have known," wrote Thomas J. Watson, Jr. of IBM in 1963. (Watson, p. 105)

The "mortal contest" that Watson wrote about more than 20 years ago has not subsided. If anything, it appears to have intensified in recent years. As a case in point, consider what is going on in the semiconductor and computer industries. A war of national performance is being carried out by the U.S. and Japan, as the following account may illustrate:

> It took years in the United States for the chip to move from 4K-bit random access memory (RAM) to 16K. And it took less than eight months for the Japanese to catch up with the United States. It took two years for the United States to move from 16K to 32K chips and less than three months for Japan to catch up. Then, in 1977, Japan's NEC leapfrogged U.S. suppliers to introduce the 64K microchip. In 1983, the Japanese started sample shipment of the 256K N-MOS dynamic RAM, and early in 1984 they started its commercial production. American firms are lagging behind on average about one year.
>
> The story is much the same in computers. The world dominance of IBM has been increasingly challenged by plug-in-compatible manufacturers [mostly Japanese] that turn out computers that use IBM software as well as those of traditional rivals. In 1979, when IBM introduced its 4300 model, it took competitors five years to catch up. By 1983, when IBM introduced its powerful 308X model, it met competition head on. (Ohmae, 1985, p. 17; parenthesis added by author)

As this account may indicate, the primary focus of the contest centers around developing newer and better products faster than anyone else in the world. The contest is mortal because "if you become complacent, you're dead," as an executive of an office automation company explained. "It's the next product and the next and the next that keep you alive," he added. (Fortune, 1984, p. 38)

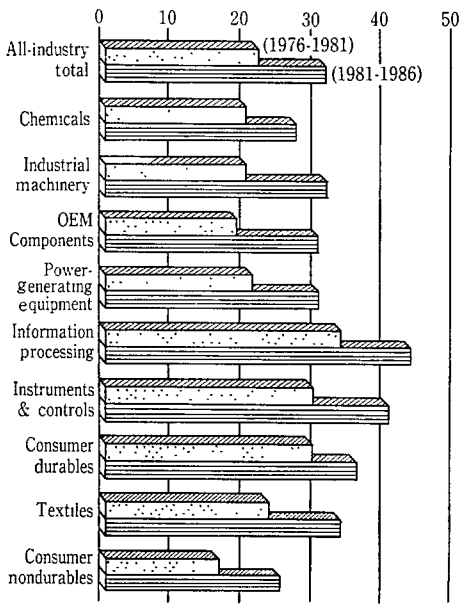
II. *Strategic Importance of New Product Development*

Are new products playing a more important role today than they used to? Although a comparison with Watson's days is not possible, available indicators for the past few years tend to confirm the growing importance executives are attaching to new product development. We examine two indicators, one from Japan and the other from the U.S., in this section.

The first deals with the perceived importance of new product development among Japanese executives. According to a survey of 505 CEOs of Japanese manufacturing companies conducted by the Ministry of International Trade and Industry in 1985, "new product development" was rated by 49% of the respondents as being the No. 1 priority among their list of concerns. (Nihon Keizai Shimbun, 6/18/85) In a similar survey of 99 Japanese CEOs conducted in 1979, 37% of those surveyed rated "new product development" as their No. 1 priority. (Nikkei Business, 9/24/79) Although tentative, these results suggest an upward swing in the perceived importance of new product development among Japanese top executives in the past few years.

The second indicator relates to the contribution of new products to the company's profit stream. According to a survey of 700 U.S. companies conducted by the consulting firm

Fig. 1. THE CONTRIBUTION OF NEW PRODUCTS TO TOTAL COMPANY PROFITS BY INDUSTRY
(Profits as Percentage of Total Company Profits)



Source: Booz Allen & Hamilton (1982).

Booz Allen & Hamilton in 1981, the executives who were surveyed said they expected that nearly one-third of their profits in the 1981–1986 period would come from new products. This represented a 40% increase from the 1976–1981 period, when new products generated slightly over one-fifth of total company profits on an industry-wide basis. In some industries—i.e., the information processing industry and the instruments and controls industry—new products are expected to generate over 40% of total company profits in the 1981–1986 period, as shown below. (Booz Allen & Hamilton, 1982 p. 4)

To support these targets, the companies surveyed by Booz Allen & Hamilton expect to step up their new product introduction efforts. The median number of new products introduced by these companies was only five in the 1976–1981 period. The companies project that in the 1981–1986 period they will introduce twice as many new products. (Ibid., p. 4)

The results of the Booz Allen & Hamilton survey are substantiated by yet another survey of 148 U.S. companies conducted by the Conference Board in 1980. Asked to look into the future, two-thirds of the reporting executives said they expected their companies to have an even greater dependence on new products in 1985 as compared to 1980. (Hopkins, 1980)

Forces Behind This Growing Importance

This trend towards increased development and introduction of new products is supported by a number of underlying environmental forces. We list seven forces below in no particular order of importance. They are by no means exhaustive and are certainly not independent of each other. But taken together, they appear to be reshaping the patterns of new product development throughout the world.

1. Globalization

The emergence of globalization has opened up new opportunities for companies to offer new products and brands geared toward the global market. Given the continued trend towards the homogenization of needs among the OECD countires, products can be designed initially for the 600 million people living in these countries rather than concentrating on any one local market. Increased benefits associated with scale economies in R & D, sourcing, production, and marketing could make such developmental efforts attractive to a large number of globally oriented companies. But such efforts require a radically different approach to new product development, as we shall see later.

2. Shorter product life cycles

Products reach the maturity stage much faster today than in the past. To use a mundane example, it has taken only about 10 years for microwave ovens to mature as compared to over 30 years for refrigerators. Product life cycles are becoming shorter for industrial products and high-tech products as well. This trend is being accentuated still further by competitive strategies of many Japanese companies who intentionally accelerate the life cycle to shake out slow-moving competitors. Shorter life cycles mean faster development cycles.

3. Splintering of mass markets

Markets are being splintered into narrower and narrower segments. This is partly due to demographic trends, such as the growth of the single-person household, working women, the so-called golden age segment, the Yuppie market, and others. But it is also the result of intentional competitive strategies on the part of some companies to engage themselves in meticulous targetting. Pushed to the limit, a company will have the opportunity of offering a different product for each segment.

4. Rapidly changing technology

Advances being made in such high-tech industries as electronics, biotechnology, fine chemicals, robotics, and artifical intelligence, to name a few, will open up new windows of opportunities for product development. Advances in both product technology and process technology will help companies to develop "breakthrough" products that may be beyond our wildest imagination.

5. Pervasiveness of new technology [Lorenz, 1986]

New technology does not remain proprietary to one company or country for long. This is partly due to the heightened level of competitive intelligence made possible through improvements in the global communication network as well as to the unprecedented willingness exhibited among competitors to form strategic partnerships in recent years. This pervasiveness will open up opportunities for a large number of companies in different countries to incorporate the latest technology in their products without much loss in time.

6. Increased competition

Competition is intensifying both internationally and domestically. Internationally, competition is coming especially from companies in the newly industrialized countries who are starting to make inroads into the world market not only on the basis of price alone but on quality as well. Domestically, competition is being intensified by (a) Japanese companies who have become more conscientious about defending their market share position in the home market and (b) foreign companies who have taken advantage of favorable exchange rates to establish a foothold in the Japanese market. Intensified competition serves as a trigger for companies to step up their new product development efforts.

7. Reduced government constraints

Efforts on the part of governments to remove quotas, reduce tariffs, promote international cooperation on technical standards, and the like have a positive impact on new product introductions. Reduced government constraints serve to increase the possibilities for global competition, which in turn helps to enhance the development and introduction of new products.

These environmental forces have been in the making for quite some time and are not expected to go away in the near future. Of the forces listed above, the most vulnerable to change is reduced government constraints, which can swing in the opposite direction due to unforeseen political causes. But the rest of the forces will most likely continue along the current direction. This will have a profound impact on how companies should think about and approach new product development. Among other things, companies will be forced, more than ever, to:

(a) treat new product development as an integral part of their corporate strategy
(b) think more globally about new product development
(c) accelerate their development speed

Past Research

How well have these three issues been researched in the past? A review of the literature has revealed only scant evidence that these issues have been examined in depth. With a few exceptions, past research in this field has not addressed the strategy, globalization, and development time issues in any detail, as discussed below.

(1) Linking new product development to corporate strategy

A number of researchers have pointed out the desirability for a firm's product development activities to be driven by its strategy, either at the corporate level or at the divisional level [see Urban and Hauser (1980), Crawford (1980), Roberts (1980), Wind (1982), and Booz Allen & Hamilton (1982), among others]. Most of them adapt the basic approach utilized in strategic planning and outline a systematic and analytical process for tying new product development activities with the firm's overall objectives, the external environment, company strengths and weaknesses, and the company's resource allocation process. Booz Allen & Hamilton, for example, describes the process as follows:

> In the analytical process, industries are evaluated to determine the growth potential of existing markets, and the external environment is scrutinized to identify emerging product opportunities. Internal capabilities are assessed to identify relevant company strengths and weaknesses, and existing management style and new product experience are evaluated to determine their impact on the new product effort.
>
> The outcome of this analysis is a set of strategic roles used . . . to help identify markets for which new products will be developed. In addition, strategic roles provide guidelines for new product performance measurement criteria. (p. 22)

This stream of research that emerged out of the strategic planning framework has several characteristics. First, it is a relatively recent phenomenon. Although the work of Ansoff (1965) goes back over 20 years, he made "product policy" the major strategic focus of the firm and not new products in particular. New products began to be treated as a major strategic focus in the 1980s, as evidenced by the dates of the publications listed above. To illustrate this point, consider the fact that Booz Allen & Hamilton added the section on new product development strategy for the first time in 1982, more than 25 years after it began the research on this topic.

Second, most of the researchers present a step-by-step framework on how to go about including new product development as an integral part of the planning process. Flow charts

(Booz Allen & Hamilton, Wind), checklists (Urban and Hauser), charters (Crawford), and tree diagrams (O'Shaughnessy) are used for this purpose. As useful as they are in thinking about the process involved, these techniques do not adequately link new product development to the strategic options open to the firm. To be more specific, they do not show how the various options of competitive strategy available to the firm can affect new product development activities and vice versa.

Third, the strategic planning framework mentioned above has been developed with the domestic market in mind. International concerns have so far been largely neglected within this framework.

(2) Thinking globally

This is not to say that an international perspective has been totally lacking within the literature. It does exist within a different context. The literature on the international product life cycle theory and the diffusion of innovation theory, to some extent, traces the stages of product innovation and diffusion internationally. See Vernon (1966, 1977), Rogers (1966, 1976), Keegan (1969), Wells (1972), and Davidson et al. (1977).

Implicit in the international product life cycle theory is the assumption that the product is (a) designed in the home market and for the home market and (b) produced and introduced in the home market. Domestic innovations are then exported as the level of economic development of other industrialized countries reaches that of the home market. As the market size of the developed countries becomes large enough to justify production there, the firm transfers production to those countries. At the same time, the product is introduced in developing countries as well. The location of production is finally moved to the developing countries where the labor cost is lower.

As with the diffusion of innovation literature, the international product life cycle theory views the product innovation introduction process as a sequential one. Such a view, however, does not apply to products that are designed and/or introduced simultaneously in more than one national market. A more globally oriented perspective is needed to come to grips with such a "simultaneous" process.

The proponents of the global approach recognize that assumptions that used to work no longer apply. Levitt (1983), for example, says the following:

> Gone are accustomed differences in national and regional preference. Gone are the days when a company could sell last year's models—or lesser versions of advanced products—in less-developed world. And gone are the days when prices, margins, and profits abroad were generally higher than at home . . .
>
> A thousand suggestive ways attest to the ubiquity of the desire for the most advanced things that the world makes and sells—goods of the best quality and reliability at the lowest price. The world's needs and desires have been irrevocably homogenized.

Levitt and others [Buzzell (1968), Alymer (1970), Sorenson and Weichmann (1975), Gluck (1983)] espouse the benefits of standardizing product design across multiple national markets. But they do not explicitly address the product development issues and, as a result, do not dwell on the complex, dynamic process involved in designing, developing, and introducing new products in the global market.

(3) Speeding up the development cycle

A large number of researchers have suggested organizational mechanisms that can be used to manage the new product development process more effectively. Some of the major factors that they identified include the following: (a) more interfunctional coordination, (b) formation of task forces, venture teams, or project teams, (c) improved communication among project members, (d) emergence of corporate "champions," (e) physical proximity of people involved in development, and (f) clearcut incentive systems. See Lawrence and Lorsch (1969), Rothwell et al. (1974), Hopkins (1974), Benson and Chasin (1976), Souder (1977), Roberts (1977), Fast (1978), Cooper (1978), Maidique (1980), Finkin (1982), Warren (1982), Heany and Vinson (1982), and Booz Allen & Hamilton (1982).

A review of this literature has led us to make the following three observations. First, the evidence regarding the effectiveness of various organizational arrangements is inconclusive. Few applicable generalizations or normative guidelines can be drawn.

Second, the research on organizational arrangements has not addressed international issues. The international dimension adds another level of complexity to the new product development process since firms have to be concerned with coordination across national markets when developing new products. To be more precise, firms have to achieve coordination across national markets for each stage of the new product development process, which involves at least the following sequence even in its simplest form:

(a) idea generation/search: generation of product ideas from multiple sources and technical search
(b) screening: evaluation of product ideas in terms of technological feasibility and market acceptance
(c) product development: physical development of the product
(d) testing: estimation and assessment of market potential, costs, and likely customer response
(e) introduction: commercialization and launching of the new product

Third, only a handful of researchers [Reinertsen (1983), Imai et al. (1985), Takeuchi and Nonaka (1986)] have actually focused their attention on the question of how the speed with which new product development proceeds can be curtailed. This is somewhat surprising, given the realization in recent years on the strategic importance of having to stay one step ahead of competitors in this fast-changing environment.

In Part III, we develop a conceptual framework for thinking about global new product development strategy. Hopefully, the proposed framework will shed additional light on the first two issues discussed above, namely (a) linking new product development to corporate strategy, and (b) thinking globally about it. In Part IV, we devise an analytical framework for achieving shorter development time.

III. *Global Strategy and New Product Development*

More and more multinational companies in a number of important industries are "going global" as a means of combatting their competitors. IBM is certainly doing so in the com-

puter business and so are L.M. Ericsson in telecommunications, Honda in automobiles, NEC in semiconductors, Siemens in medical equipment, Boeing in commercial aircraft, Fanuc in robots, and so on. Articles and books extolling the virtues of "going global" have also begun to proliferate in recent years.[1]

Globalization and Its Impact on International Strategy

Companies competing internationally should start out by examining whether or not the industry that they are in favor globalization. For example, a company manufacturing jet engines—with its high economies of scale, few multinational competitors, and high investment needs—is a more likely candidate for "going global" than one manufacturing toothpaste, which much satisfy the needs of a variety of consumer segments in different countries and faces competition from many national firms. In other words, they should start out by making the distinction between global and multidomestic industries.[2]

In purely multidomestic industries, competition in each country is essentially independent of competition in other countries. Thus, international competition is much the same as domestic competition with the added complexities of doing business abroad. In global industries, competition in one country is strongly influenced by competition in other countries. International competition must consider the interdependency across multiple countries.

Not all companies can become a global competitor because their industries may not be equipped with the right global characteristics. Among other things, economies of scale—in sourcing, R & D, production, or marketing—may be too modest or product requirements may differ significantly across countries as we pointed out above. In such industries, it may be counter-productive to pursue a global strategy.

Having determined the nature of industry structure, the next task facing firms competing internationally is to decide whether to pursue a "country-centered" strategy or a "global" strategy. The distinction between the two lies in the need and opportunity for integrating various activities (including new product development) across countries. Integration is used here to refer to configuration (i.e., *where* to perform an activity) and coordination (i.e., *how* to perform an activity).[3]

In multidomestic industries, a firm should pursue a country-centered strategy. Under this strategy, activities are highly decentralized and international coordination is quite limited. Competitive success or failure is largely determined by the firm's ability to respond sensitively to local differences on a country-by-country basis.

In global industries, a firm has the option of pursuing either a global strategy or a focus strategy. Under a global strategy, a firm gains competitive advantage by centralizing and coordinating its worldwide activities. Competitive advantage takes the form of lowered cost or increased differentiation relative to domestic or country-centered competitors.

Under a focus strategy, a firm can select a country or group of countries and tailor its strategy to serving them to the exclusion of others. Competitive advantage vis-a-vis broadly

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[1] See Hout, Porter, Rudden (1982), Davidson (1982), Levitt (1983), Gluck (1983), Takeuchi (1985, 1986), Porter (1986). Yet companies trying to decide whether a global strategy towards new product development really makes sense for them are often at a loss where to start.

[2] See Hout, Porter, Rudden (1982) for a more detailed description of the differences between the two.

[3] See Porter (1986) for a more detailed description of configuration and coordination.

targeted competitors can be achieved in one of two ways. These broadly targeted competitors may be *overperforming* to meet the needs of a country (e.g., overspecification of performance standards so as to satisfy differing worldwide demands), which opens the opportunity for cost focus to be present. Broadly targeted competitors may also be *underperforming* in meeting the needs of a particular country (e.g., buyers of disposable diapers in Japan may be far more quality-conscious than buyers from other countries), which opens the possibility for differentiation focus.

Three Approaches to New Product Development

The choice of one of the three strategic options mentioned above—i.e., country-centered, focus, or global—determines, to a large extent, the approach a firm will take toward international new product development. A firm pursuing a country-centered strategy will most likely adhere to a "local market" approach to new product development. And a firm pursuing a focus strategy will be inclined to take a "lead market" approach. Finally, a firm pursuing a global strategy will most likely utilize a "global market" approach.[4] Each of these three approaches is described below.

(1) Local market approach

In the local market approach, the product is designed *for* the local market, with all the features desired by customers in that particular country. All product development activities —i.e., idea generation, screening, product development, testing, and introduction—take place *in* the local market as well.

Under such an approach, a multinational corporation pursing a country-centered strategy does not necessarily have to centralize nor coordinate its new product development activities. The local subsidary of a multinational corporation has, in theory, the autonomy to develop whatever product that meets the needs of that particular country. In an extreme case, a firm competing in the worldwide toothpaste market may opt to develop a different toothpaste for each country under the local market approach. Although such an option allows the firm to gain a competitive advantage due to differentiation, most multinationals would not elect to do so in practice. Letting each subsidiary develop a new product on a decentralized basis is not practically feasible since the costs associated with implementing such a program would be prohibitively high.

In practice, most multinational corporations pursuing country-centered strategies adopt a sequential approach to new product development. In the sequential approach, the product is designed initially *for* the home market, with all the features desired by customers in the home market. All product development activities from idea generation up until introduction also take place *in* the home market. If the firm decides to expand into foreign markets, some of the features may be modified and the modified product may be subsequently introduced in other countries.

A sequential approach works best if the experience and competitive advantages gained in a single home market can be readily transferred to foreign markets. Country differences and legal restrictions can be a major obstacle to a firm utilizing a sequential approach, though. Ohtsuka Seiyaku, for one, found this out when it tried to transfer its successful Pocari Sweat

[4] The basic framework utilized here is similar to the categorization used by Ishikura (1985).

isotonic drink over to the U.S. market. The product, which was initially developed for and in the Japanese home market, had to be modified (e.g., the name was changed to Pocari in the U.S.) and had to undergo an extensive market testing before being introduced in the U.S. After introduction, the company underwent an extended legal battle with Coca-Cola & Company over whether or not Pocari's package design, which was similar to the one used on Coke, infringed on Coca-Cola's trademark. The competitive cost advantage that Ohtsuka enjoyed in the home market was not readily transferrable as a result of added costs incurred on product modification, marketing intelligence, and legal battle.

Timing can also become an obstacle for a multinational firm utilizing a sequential approach to new product development. The time lag that is usually associated with transferring a product from the home market to foreign markets opens up the possibility for an aggressive competitor to enter foreign markets with a "knock-off" product faster than even the firm that originated the product. This situation is not uncommon in the high-tech industries, where "first-mover" advantages are substantial.

Time lag can also be a problem in the low-tech industries as well. Consider the case, for example, of BIC, which introduced its ballpoint pen in the French home market and successfully rolled it out to the European countries as well as the U.S. But by the time BIC tried to enter the Japanese market, several local competitors already had ballpoint pens with similar features out on the market. In Japan, BIC could not enjoy the differentiation advantage that it enjoyed in the home market as well as in other foreign markets.

(2) Lead market approach

In the lead market approach, the product is designed *for* more than one national market, but with the features required by a single lead market in mind. All product development activities from idea generation up until introduction take place *in* the lead market. The product is introduced initially in one single country, but subsequent introductions into a few selected countries are planned from the start.

As mentioned earlier, the lead market approach to new product development has the best fit with a multinational firm pursuing a focus strategy. Under a focus strategy, a firm selects a country or a group of countries and tailors its strategy to serving them to the exclusion of others.

Identifying which country should be designated as the lead market is not all that easy. For one thing, the lead market may change over time, as in the case of disposable diapers. The U.S. market served as the lead market through the 1970s, but was replaced by Japan in the 1980s. Procter & Gamble of the U.S. pioneered the product, which was made of paper pulp, but Japan's Uni-Charm introduced a revolutionary product, which was made of highly absorbent, granulated polymer, in 1981. To illustrate the shift in the lead market, consider the fact that Japan was selected as the site of the test market when Procter & Gamble introduced its new, improved Pampers in 1984.

Second, different lead markets may exist for different product segments within the same industry. The U.S. may be the lead market for pharmaceutical products in general, but Japan is recognized as the lead market for antibiotics. Similarly, the lead market for motorcycles over 700 cc belongs to the U.S., but China may be a strong contender to become the lead market for motorcycles under 50 cc.

Third, different lead markets may exist for different firms, depending on the competitive

advantage being sought by the firm. A firm seeking low cost leadership will define a lead market as one having the largest size or growth potential. A firm seeking differentiation will define a lead market as one having the most advanced technology or the most sophisticated users. Taking motorcycles as an example, a firm seeking low cost leadership may designate China as the lead market but a firm seeking differentiation may select Japan.

The above discussion sheds some light on how a firm should go about identifying a lead market. A lead market can be identified using the following four criteria:

1. Technological leadership
2. User requirements
3. Market size and potential
4. Intense competition

Each of these four criteria is examined below.

Technological leadership A national market having the most advanced technology can qualify as a lead market. Japan, for example, fits this criterion in such product categories as antibiotics, robots, ceramic casings, cameras, and video cassette recorders, to name a few.[5]

Technological leadership can be achieved in a number of different areas besides product technology and process technology. Of particular relevance to new product development are technologies such as storage and preservation technology, packaging technology, software technology, and information system technology.[6]

A national market attains technological leadership in a number of different ways. The government can pump research money into selected projects, as was the case with the VLSI project and the Fifth Generation computer project in Japan, or provide a tax credit to companies putting money into basic research. Companies can also invest money into research. Hitachi, for example, increased its R & D budget almost four-fold in the last 10 years. Universities can invest money into research as well, as in the case of a consortium of Japanese universities which recently announced plans to build the world's largest optical telescope in Hawaii to study the origin of stars. In addition, universities play a critical role of providing a steady flow of competent scientists and engineers. The availability of these scientists and engineers serves as a necessary condition for a country to become a technological leader.

User requirements A national market having the most demanding users can be identified as a lead market. Japan is often cited as the lead market for products ranging from diapers to robots, since buyers for such products are known to be the most demanding with regard to quality and features. The U.S. is recognized as the lead market with the most demanding quality requirements for medical supplies and pharmaceuticals.[7]

Market size and potential A very large or rapidly growing national market can qualify as a lead market. The U.S. market, for example, is considered the lead market for commerical aircrafts for this very reason. No other country in the world has as many airlines as the U.S. and the number of airlines is increasing as a result of recent deregulations. The U.S. also serves as the lead market for career women's clothing since the pool of such women is by far the largest in the world and growing rapidly as well.

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[5] See Westney and Sakakibara (1985) and Takeuchi (1986) for a more detailed discussion on the role of Japan as a technological leader.

[6] For a more detailed list of the different technologies available see Porter (1985) Chapter 5.

[7] See von Hippel (1978, 1986) for the importance of lead users as sources of innovation.

Intense competition A lead market can be identified based on the intensity of competition that exists within the country. Japan has come to be recognized as the lead market in consumer electronics largely as a result of the intense competition that exists between such multinationals as Sony, Matsushita, Sanyo, Hitachi, Toshiba, Mitsubishi, Pioneer, JVC, and others. To survive and prosper in this fiercely competitive market, 580 or so manufacturers that make up the Japanese consumer electronics industry must continuously turn out products with innovative features, outstanding quality, and exceptionally low prices.

If the lead market can be identified accurately, a multinational firm utilizing the lead market approach to new product development can enjoy several advantages. Relative to the local or sequential approach, the lead market approach allows the firm to (a) be more responsive to the common underlying needs of the few selected target countries, (b) realize lower costs due to economies of scale, (c) increase the chances of gaining first-mover advantages in the most advanced market, (d) mitigate the time lag problem somewhat, and (e) develop a more systematic and planned approach toward international new product development.

A multinational firm, however, must be mindful of several potential disadvantages. These include (a) the risks—e.g., natural disaster, political turmoil, government regulation—attendant on carrying out all development activities in one single market, (b) the likelihood of the lead market shifting from one country to another, and (c) the possibility of a competitor diminishing the potential first-mover advantage in the target markets other than the lead market.

(3) Global market approach

In the global market approach, the product is designed *for* more than one national market in mind, with all the features required by as many national markets as possible. Product development activities up until introduction take place *in* one or more national markets. The product is introduced throughout the world almost simultaneously.

A multinational firm pursuing a global strategy will most likely find the global market approach most attractive. Under a global strategy, a firm gains competitive advantage by integrating its worldwide activities. It will centralize its activities wherever possible in order to realize a low cost position. It will also coordinate its activities as much as possible in order to differentiate itself as the firm "offering a world product for worldwide customers."

What clearly distinguishes the global market approach from the two earlier approaches is the fact that the product is designed with the world in mind and not simply for one national market. Designing a new product for the world market can proceed in one of two ways. The first is to include all the features required in all the countries. The second is to include the most important features that meet the needs of a particular segment in many countries. Since the first process is seldom used in practice—due largely to cost and time delay considerations—we will examine the second process in more detail below, using Canon's Personal Coper (PC) series as an example.[8]

Canon's PC series was designed for customers around the world who needed an easy-to-use, compact, and inexpensive copier for personal use at home, in the office, or in a shop. Having determined the target segment, the product incorporated a unique combination of

[8] For a full description of how Canon's PC was developed, see Ishikura (1985).

important features desired across many national markets. The most basic feature was the use of a disposable cartridge, which reduced the need for preventive maintenance at user locations in different countries. The PC series did not accomodate a large paper size, which was one feature that only the Japanese home market had requested. By dropping this feature, Canon had to sacrifice almost half of the copier market in Japan, which was also the lead market for low-end copiers. But it did add another feature which was only desired in Japan, namely the ability to copy small-sized name cards, because the incremental cost of adding this feature was insignificant. As this example illustrates, Canon's PC did not fully meet the needs of any single market perfectly. But it did respond to the core requirements of a segment across many countries.

What also differentiates the global market approach is the high level of coordination that takes place across various national markets during the product development process. As mentioned earlier, new product development activities can be carried out in one national market or in more than one national market. Canon opted to carry out all its new product development activities excluding introduction (the product was introduced simultaneously throughout the world) in Japan. This meant that a very high level of information flow between Japan and the other national markets took place. Graphically, the flow of information can be represented by a "star" form, as shown below.

If new product development activities are carried out in more than one national market, the need for coordination increases exponentially. Not only is coordination required across various geographically dispersed locations, but it is also required at each stage of the new product development process—i.e., idea generation, screening, product development, testing, and introduction. The flow of information will take place in a far more complex fashion. Graphically, it can be represented by a "network" form, as shown below.

FIG. 2 "STAR" FORM OF INFORMATION FLOW

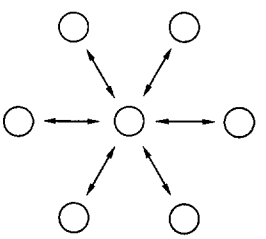
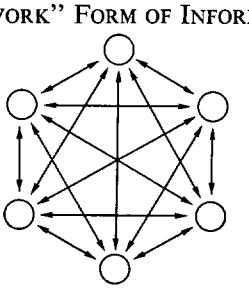


FIG. 3 "NETWORK" FORM OF INFORMATION FLOW



A firm utilizing the global market approach to new product development can gain two major advantages. First, it can realize a low cost position due to economies of scale. Take the Canon PC as a case in point. Because the features were standardized from the start, the product facilitated large volume production in one location, which in turn led to economies of scale in production. And because the product could be sold "off the shelf," thus requiring minimal support from the local sales and service people, it was able to achieve economies of scale in marketing.

Second, the global market approach can help a firm attain advantages arising from differentiation. By introducing the first personal copier throughout the world and by protecting its proprietary technologies around the world through licensing arrangements, Canon was able to create a high brand awareness and reputation for proprietary technology. Canon also gained a global differentiation advantage by creating a captive market for its disposable cartridges, which increased the switching costs for customers who had already bought the PC.

The global market approach, however, can lead to several disadvantages as well. First of all, a "common denominator" product—i.e., a product that satisfies the common needs of many countries but not the specific needs of individual countries—may not necessarily satisfy the unique requirements of the home or lead market, thus increasing the risk of market acceptability in a single key market. Second, the common denominator product is subject to several iterations of compromises and trade-offs, the end result of which may be a "washed down" product with no unique selling proposition. Third, a common denominator product may necessarily raise the cost of the product since a large number of features is likely to be included. Fourth, the cost associated with developing such a product is high due to the complex task of having to coordinate inputs from various countries at each stage of the product development process. And fifth, the time required for coordination may result in a longer development time under this approach.

Conceptual Framework

A framework that will hopefully help us think about international new product development in a more systematic manner is developed in this section. As shown in Exhibit 4, we start out, first of all, by listing the three approaches to new product development—local market, lead market, and global market—on the very left. Second, we identify the three basic options of international strategy from which each of the three approaches is derived. The three basic options consist of country-centered, focus, and global strategies. Third, the three approaches are defined on the basis of the number of target markets the firm has in mind when developing the new product. The local market approach has only one country in mind, while the global market approach has many countries in mind, with the lead market somewhere in between. Fourth, we point out that each approach requires a different level of integration, both with respect to configuration (where) and coordination (how).

Configuration can be conceptualized along two dimensions—where the product is designed/developed and where the new product is introduced initially. The product is designed/developed and introduced in one country for both the local market and lead market approaches. In the global market approach, the product is designed/developed in one or more countries but introduced simultaneously in many countries.

In general, the degree of coordination required increases as one moves from top to

FIG. 4 CONCEPTUAL FRAMEWORK FOR INTERNATIONAL NEW PRODUCT DEVELOPMENT

	Based international strategy	Number of target market(s)	Integration				
			Configuration		Coordination		
			Where designed/ developed	Where introduced initially	(1)	(2)	(3)
Local market approach	Country-centered	One country	One country	One country	Low		
Lead market approach	Focus	One country	One country	One country	Medium		
Global market approach	Global	One or more countries	One or more countries	Many countries	High		

FIG. 5 SUB-DIMENSIONS OF COORDINATION

	Coordination		
	(1) Degree of product standardization	(2) Flow of information across countries	(3) Participation of overseas subsidiaries
Local market approach	Low	Low	None
Lead market approach	Medium	Medium	Seldom
Global market approach	High	High	Moderate/ frequent

bottom. That is to say, the degree of coordination required is lowest for the local market approach and highest for the global market approach, with the lead market approach somewhere in between.

To gain a better understanding of the coordination dimension, we break up the dimension into three sub-dimensions, as shown in Fig. 5. The three sub-dimensions consist of the following:

1. Degree of product standardization across countries
2. Flow of information across countries
3. Participation of overseas subsidiaries in the new product development process

The degree of coordination required increases as one moves from top to bottom, as indicated below:

Survey Results

The results of a survey that I conducted in 1984 are presented here to examine the validity of the conceptual framework developed in the previous section. A written questionnaire, which contained a section on new product development, was sent to managers in seven Japanese multinational corporations. Responses were obtained from managers responsible for 46 products ranging from color TVs to machining centers. A list of all 46 products is provided in Appendix 1. They have been grouped under the following eight headings:

1. Raw materials (2)
2. Components (7)
3. Machine tools (7)
4. Industrial products (5)
5. Medical products (2)
6. Office products (7)
7. Durable consumer goods (7)
8. Personal durable consumer goods (9)

The number in the parenthesis represents the number of products under each heading. Six major findings of the pilot survey are described below.

(1) High acceptance of the global market approach

In the survey, product managers were asked whether the product was developed initially with the domestic market in mind or with the global market in mind. The results, which are shown below, indicate that 76% of the products were developed initially with the global market in mind:

1. Developed initially with the domestic market in mind	11%	(5)
2. Developed initially with specific overseas markets in mind	13%	(6)
3. Developed initially with the global market in mind	76%	(35)
Total		(46)

These results suggest the strong acceptance of the global market approach among multinational firms in Japan. But they do not necessarily mean that multinational firms in other countries will accept the global market approach as aggressively as in Japan. The U.S., which has a very large and technologically advanced home market, is expected to be less inclined to adopt the global market approach. Multinational firms in European countries with small home markets (e.g., Switzerland and the Netherlands) are expected to adopt the global market approach just as aggressively as Japanese multinational firms.

(2) Most products are designed/developed in one country

The survey results show that of the 35 products developed initially with the global market in mind, 32 (91%) were developed in only one country and three were developed in more than one country. Of the 32 products designed/developed in one country, 26 were developed in Japan, five in the U.S. (crystallized cellulose, floppy disk drive, monitor display, personal computer, and off-road tricycle), and one in the Middle East (video cassette recorder). Three products were designed/developed jointly in Japan and the U.S. They consisted of semi-

conductors, terminal printers, and industrial sewing machines.

(3) Almost half of the products are introduced in multiple markets within a year

Of the 35 products developed initially with the global market in mind, 17 (49%) were introduced in more than one country within one year. Ten products (29%) were introduced in multiple markets almost simultaneously (i.e., within four months) and seven (20%) between five to 12 months since the initial introduction. All of the 10 products that were introduced almost simultaneously across multiple markets were either office products, consumer durable goods, or personal consumer durable goods. They included a small-sized PPC copier, medium-sized PPC copier, print-out calculator, dot-matrix printer, desk-top personal computer, generator, small-sized tractor for home use, camera, hand-held personal computer, and printer for personal computer.

(4) High degree of product standardization

Of the 35 products developed initially with the global market in mind, 30 (86%) of them were rated as having a high degree of product standardization. Asked to rate how similar or different the product was (in terms of shape, size, specification, and other hardware-related factors) across worldwide markets, the product managers responded as follows:

1.	Completely similar throughout the world	29%	(10)
2.	Highly similar throughout the world	57	(20)
3.	Somewhat similar throughout the world	11	(4)
4.	Not that similar throughout the world	3	(1)
5.	Different from country to country	0	(0)

(5) High incidence of information flow from overseas

Of the 35 products being examined, managers for 34 products (97%) had acquired market information from overseas during the new product development process. The sources of information included the following (multiple answers):

1.	Overseas subsidiaries	51%	(18)
2.	Research/consulting companies	23	(8)
3.	Sending employees/direct contacts	23	(8)
4.	Published materials	23	(8)
5.	Trade association/conferences	17	(6)
6.	Users/customers	17	(6)
7.	Trade shows	17	(6)
8.	Dealers/reps	9	(3)
9.	Competitors	6	(2)
10.	Joint-venture partners	6	(2)
11.	Trading companies	3	(1)

As shown above, the home market relied most heavily on its overseas subsidiaries to transmit market information from overseas when developing new products.

(6) Moderate participation of overseas subsidiaries in the new product development process

Of the 35 products developed initially with the global market in mind, 16 (46%) of them had its overseas subsidiaries (including affiliated companies) participate in the new product

development process. The number of overseas subsidiaries that participated ranged from one to 10, with one-to-two being the most numerous:

1–2	subsidiaries	participating	9	products
3–4	"	"	3	"
5–6	"	"	1	"
7–8	"	"	2	"
9–10	"	"	1	"

Fourteen of the 16 overseas subsidiaries that did participate, joined at the very first stage of the new product development process.

The survey results demonstrate, to some extent, the complexities involved in carrying out the global market approach to new product development. Since the new product is developed *for* and *in* one or more countries, a multinational firm adopting this approach has to broaden its scope of geographical coverage much more than a firm adopting either the home market approach or the lead market approach, who can basically concentrate on one single national market. And, at the same time, a firm adopting the global market approach has to integrate its new product development activities considerably more across the different national markets.

But despite these complexities, we found that more than three-fourths of the products surveyed were developed with the global market in mind. This finding suggests that the rewards to be gained from the global market approach can be substantial. If implemented properly, this approach will enable a multinational firm to gain competitive advantages of both cost leadership and differentiation.

IV. *Competitive Advantages of Speed*

Rapidly changing technology, shorter product life cycles, and increased competition are forcing a growing number of multinational companies to search for ways to make their development cycles more speedy and flexible. These companies are discovering that development speed and flexibility play a key strategic role to achieve competitive advantages stemming from lowered cost and increased differentiation. Take Xerox and Procter & Gamble as cases in point.

Xerox, which was threatened by Japanese competitors in the copier business, adopted a new approach to product development in 1981. To get copying machines to market faster and at lower cost, Xerox instigated major changes to stream-line its complex and bureaucratic new product development process. The end result, according to Xerox, was a 50% reduction in development time as well as a 50% reduction in development cost.[9]

Having realized that the major problem confronting the company was its slow and expensive development process, Xerox made the following changes. First, it compared itself with the best of its competitors on such details such as the number of drawings an engineer made a year and, subsequently, established much tougher benchmarks for new product development. Second, it collapsed its centralized decision-making hierarchy, shift-

[9] Based on interviews conducted with Fuji-Xerox in Japan and "How Xerox Speeds Up the Birth of New Products," *Business Week*, March 19, 1984.

ing power from the president's office to the level of project engineers. Third, ideas that have been generated from bottom up were immediately tested for feasibility by "product synthesis" teams who gave a "go/no go" decision. Fourth, if a "go" decision were reached, the chief engineer developed a manufacturing process in a pilot plant housed near the design team. And sixth, outside suppliers were involved early in the design process and given the responsibility to solve a design problem on their own. In the past, they were simply told what to do by Xerox.

Procter & Gamble has also been speeding up the development cycle for its consumer packaged goods on several fronts. For one thing, it introduced more rapid environmental tests by housing a small-scale river and a water treatment installation inside its detergent factory. By doing so, it has cut the time needed for some tests from 18 months to six. On the production front, P & G has decided to start work on a new production plant while the product was being test marketed, rather than waiting until the test market was virtually completed. In the case of "Citrus Hill" orange juice, launched in 1983, this procedure more than halved the development-to-production cycle to less than four years. And finally, the company has decided to curtail its test market period, which used to take up to two years, to barely a year in many cases. Improved methods to simulate a test market has enabled P & G to test market Citrus Hill for less than a year. [Based on Lorenz (1986) and interviews with P & G managers in Japan]

These attempts on the part of Xerox and Procter & Gamble to shorten the development cycle are not isolated cases. The business press has mentioned attempts on the part of IBM, Hewlett-Packard, Deere & Co., Matsushita, Casio, and others to do the same.[10]

Although attempts on the part of different multinational firms to shorten their development cycles have been cited briefly in a number of different publications, companies trying to embark on similar programs are often at a loss where to begin. To assist these companies, an analytical framework is developed below. The framework identifies four key issues that these companies have to address and, suggests possible analyses that they can undertake to come to grips with those issues.

Analytical Framework

Companies trying to achieve shorter development cycles should start out by comparing themselves with competitors on how long certain comparable development projects have taken. Second, they should determine what impact a faster or slower development time may have on company profits. Third, if a problem does exist, they could identify the bottlenecks that are causing the delay. And fourth, they should examine different organizational mechanisms and managerial systems that may help resolve the problem. Each of these four steps, shown in Exhibit 6, is discussed in more detail below.

(1) Competitor analysis

The first step involves the comparison of how long it takes one firm to develop a new

[10] See "How the PC Project Changed the Way IBM Thinks," *Business Week*, October 3, 1983; "Hi-Speed Management for the High-tech Age," *Fortune*, March 5, 1984. Academicians have also made reference to similar attempts within 3M, Fuji-Xerox, Canon, Honda, NEC, Epson, and Brother [3] See Imai, et al. (1985); Takeuchi and Nonaka (1986).

product vis-a-vis its competitors. As simple as this may sound, whoever may be conducting the analysis should make sure that (a) relevant competitors are being chosen, (b) comparable products are being selected, and (c) equivalent stages of development are being measured.

Some companies may not have to go far to find a relevant competitor. Xerox, for example, compared its development time frame with that of Fuji Xerox and discovered that it took the latter close to 40% less time to develop a medium-sized copier in the late 1970s. This discovery prompted headquarters to embark on the sweeping changes mentioned earlier. Other companies may have to go quite a distance to find a relevant competitor. Those companies pursuing a global strategy often have to go out of their countries to find such a competitor.

Companies should be careful to select comparable products for comparison. Comparability does not only mean similarity of features. It also extends to the "newness" of the product, both to the marketplace and to the company. Booz, Allen & Hamilton (1982), for example, takes these two dimensions and classifies new products into the following six categories: (1) new-to-the-world products, (2) new product lines, (3) additions to existing product lines, (4) improvements in/revisions to existing products, (5) repositionings, and (6) cost reductions. Obviously, since the length of time required to develop each of these six categories of new products is substantially different, comparisons should be made as much as possible among products within the same category.

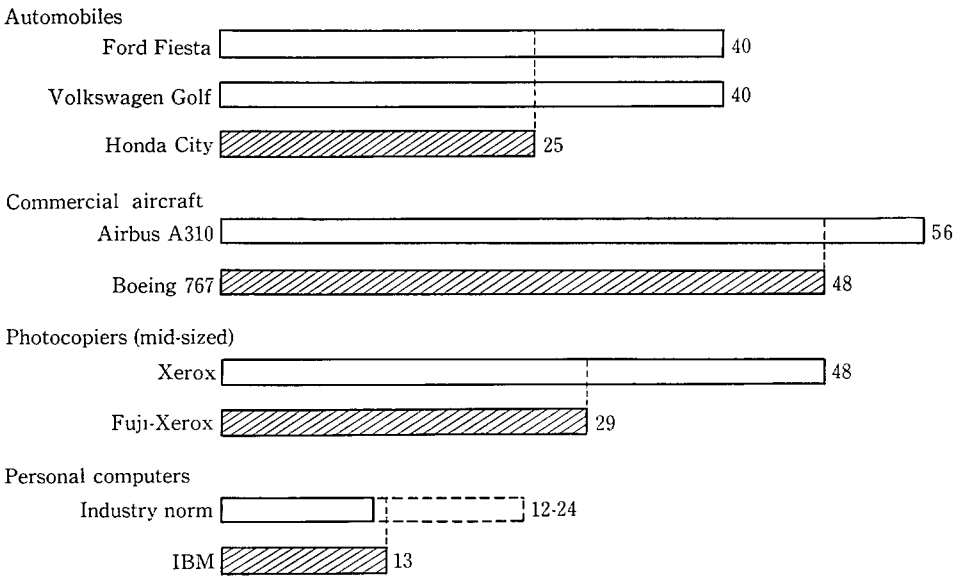
Care should be taken to ascertain that one's definition of a development cycle is comparable to that of its competitors. Some companies may define the "start" of the development project as well as the "end" differently from others.

Mindful of these precautions, a company can construct a simple chart comparing its development time frame with that of its competitors. Exhibit 7 provides some sample comparisons in automobiles, commercial aircraft, photocopiers and personal computers. The shaded bars represent competitors with the shortest development time frame at the time.

FIG. 6 ANALYTIC FRAMEWORK FOR ACHIEVING SHORTER DEVELOPMENT CYCLES

	Issue	Analysis
Step 1	Do we have a problem?	Competitor analysis
Step 2	Is the problem serious?	Profit impact analysis
Step 3	Can the problem be identified?	Causal analysis
Step 4	Can the problem be resolved?	Organizational analysis

FIG. 7 COMPETITIVE PRODUCT DEVELOPMENT TIME FRAMES
(in months)



Source: Field research and estimates by McKinsey & Company (1985).

A company has to somehow gather rather sensitive information regarding its competitors in order to construct such charts. Intelligence data on competitors can come from many sources: the business press, speechs or reports delivered by a competitor, customers and suppliers that are common to competitors. Knowledge gleaned from managers or other personnel who have left the competitor, estimates by the firm's engineering staff, market research firms, trade associations, and so on. Sources of competitive data are described in more detail in Porter (1980).

(2) Profit impact analysis

The second step in the analytical framework involves quantifying the impact of faster or slower development time frames on profits. A reduction in development time is expected to have a positive profit impact. A slowdown in development time, on the other hand, is expected to have a negative profit impact.

The expected positive impact of faster development time on profit can be inferred from the numbers cited in the Xerox example. We noted earlier that a 50% reduction in the development speed of its newer models had led to a 50% reduction in development costs. In addition, manufacturing costs of the newer models were 35% to 75% less than the ones they replaced, according to Xerox. Taking the 1045 Model as an example, these cost reductions enabled Xerox, in 1984, to price this model 42% less than its processor of five years ago. The end result: back orders and multiple orders at record levels for Xerox in 1984.

The expected negative profit impact of reduced development time has been quantified by Reinersten (1983), who built a simple economic model to analyze the effects of shipping

a new product six months late onto the market. Analyses were conducted under two scenarios. The first was a high-growth market (20%) with short product-life cycles (5 years) and annual price erosion of 2%. The second was a slow-growth market (7%) with long product-life cycles (10 years) and no price erosion. The results obtained substantiate the expected negative impact:

(a) In a high-growth market with short product-life cycles, shipping a product six months late can reduce its life-cycle profits by 33%,

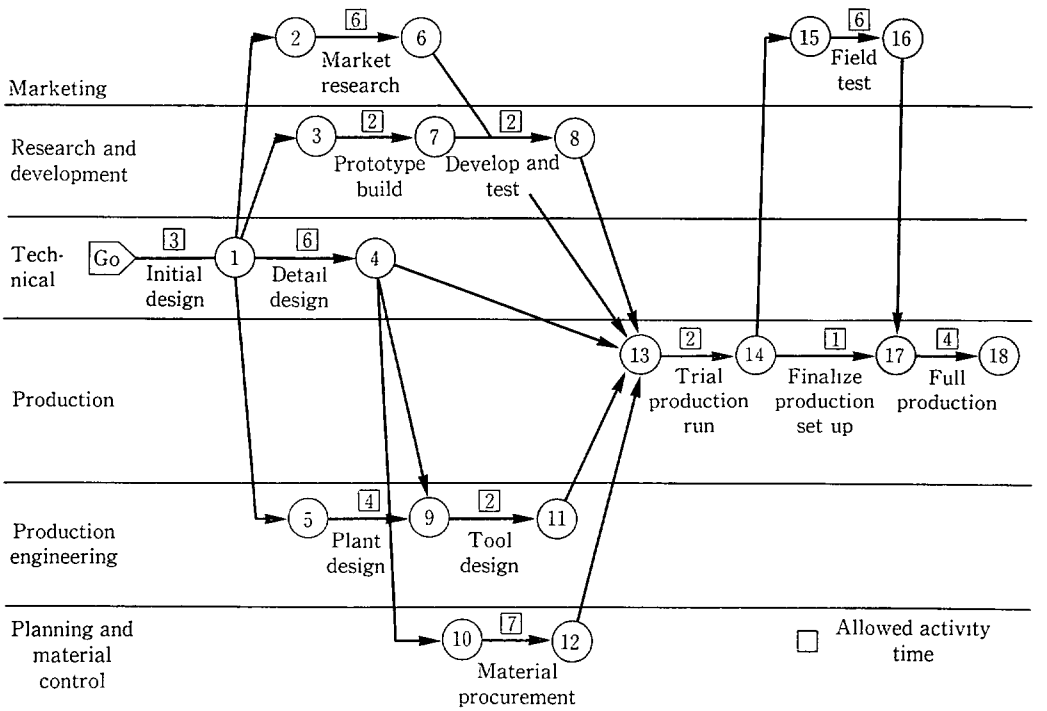
(b) In a slow-growth market with long product-life cycles, late shipment creates a 7% decline in these profits.

(3) Causal analysis

The third step involves identifying where the deterioration of development speed is taking place or where the opportunities for improvement may lie. It also involves identifying possible causal factors for the delay.

To keep track of the length of time required to complete a development cycle, a firm can resort to PERT (Program Evaluation and Review Technique), CPM (Critical Path Method), or any similar variant. In their simplest forms, they provide a detailed and explicit

FIG. 8 A SIMPLISTIC PERT CHART USED IN NEW PRODUCT DEVELOPMENT



Source: R. Hill, *Marketing Technological Products to Industry*, Oxford: Pergamon Press, 1973.

listing of the new product development activities to be performed, the various departments involved, and time estimates for the completion of each activity. The activities are arranged sequentially in a network-type diagram and the expected time estimates are assigned to each activity. A simplistic PERT network utilized by a British manufacturer is presented in Exhibit 8. [3] [For a more detailed discussion on the application of PERT or CPM on npd, see Wind (1982), ch. 8]

In the above example, the firm may designate the material procurement activity, which is taking seven months, as a source of major delay for the entire npd process. The firm may find, for instance, that seven months are now required since the material suppliers have not been invited to join the project from the initial design stage. Thus a PERT chart or a similar method, in and of itself, can offer clues as to possible factors causing the delay.

A firm can also benefit from keeping track of development speed at different stages of its evolution. Reinertsen obscures that as a firm grows in size and adopts a more "professional" approach to npd, its speed of development deteriorates over time.

> In its early days, a company does not worry much about product development. Despite a shoestring engineering budget, it quickly develops products that dazzle customers and astound large competitors. But eventually, the organization grows and adopts a more "professional" approach toward product development. Engineers work only on those products defined by a product-requirements document. These requirements are carefully negotiated, of course between marketing and engineering.
>
> No work begins on any project without a detailed business plan, a massive document that analyzes the market, assesses competitors, evaluates technological threats, and projects future product economics.
>
> Top management establishes a series of milestone meetings to review project status.

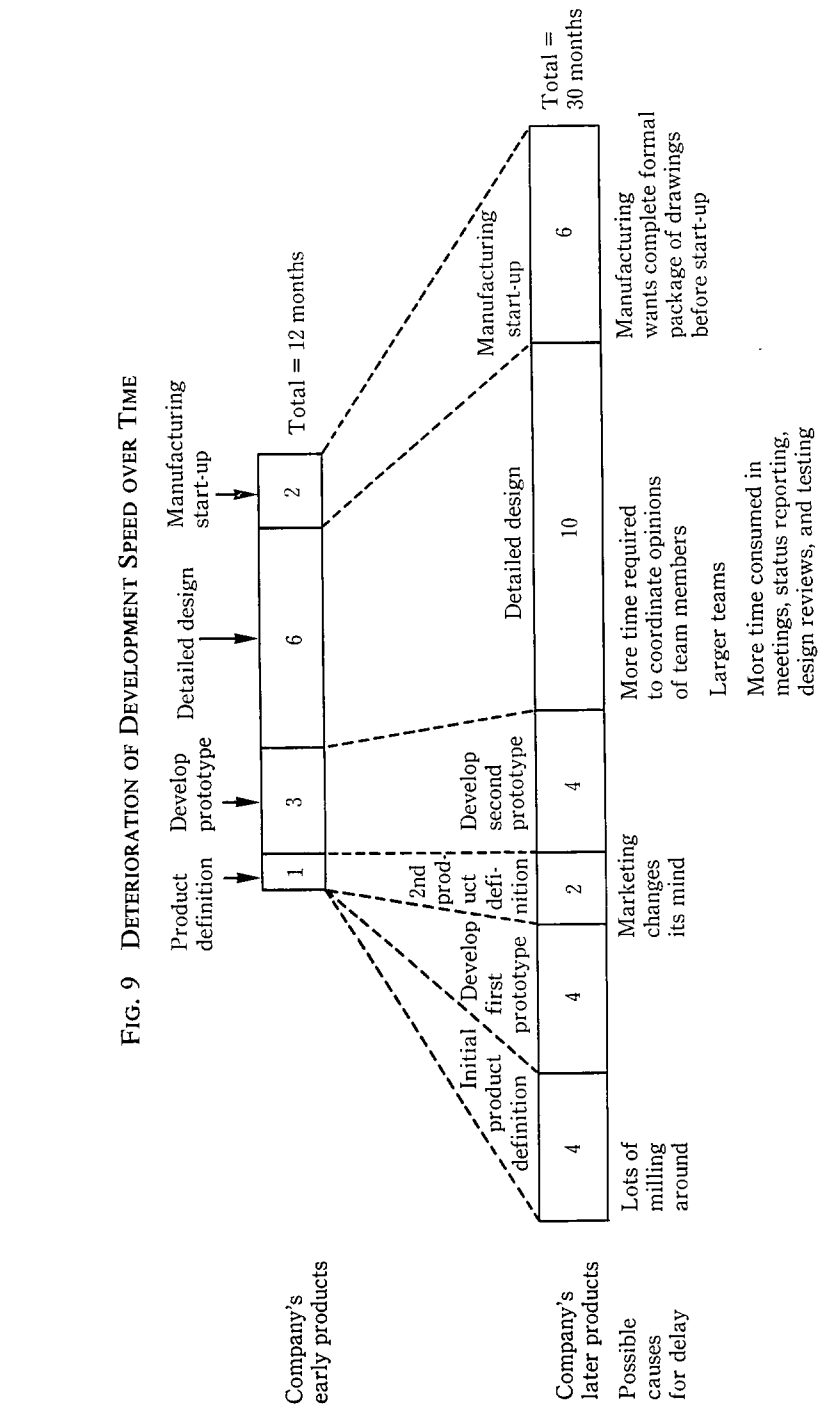
Reinersten kept track of the number of months it took the company to develop its products at two points in time and concluded that development speed has deteriorated from 12 months for the early products to 30 months for the later products. As Exhibit 9 indicates, the number phases increased from four to six during the two points in time and the time required to complete each phase increased (e.g., from six to 10 months in the case of detailed design) as the company moved from the early to the later npd project. This before-and-after type of an analysis also enables the firm to identify possible causes for the delay. For example, Reinersten gives two possible explanations why the time required to complete the detailed design phase increased from six to 10 months: (a) more time is required to coordinate the opinions of larger teams and (b) more time consumed in meetings, status reporting, design reviews, and testing.

(4) Organizational analysis

The fourth step involves the identification of various organizational designs and managerial systems that enable companies to implement shorter development cycles. Companies will have to analyze the wide array of solutions available to them and decide which ones will help solve the problems identified in the third step.

In the Xerox case mentioned earlier, recall how the company decentralized this decision-making process and created project teams—some of which were competing in parallel with other—to speed up its development cycle. These steps were necessary to overcome the

FIG. 9 DETERIORATION OF DEVELOPMENT SPEED OVER TIME



Source: Adapted from Reinertsen (1985).

underlying problem, which was its highly centralized and hierarchical organizational structure.

Hewlett-Packard, on the other hand, realized that it was falling behind some of the competitors in the computer business because its product development was being conducted too much on a decentralized, piecemeal basis. In the past, when Hewlett-Packard was primarily an instruments company, the most enduring form of product development within the company was known as the "next-bench" syndrome. A Hewlett-Packard engineer would develop a new product by asking a co-worker sitting on the next bench, "Hey, what do you need?" The theory was that whatever instruments Hewlett-Packard engineers wanted, other engineers needed as well. To resolve this syndrome, the company started to encourage its engineers to go visit and talk to their customers. It also formed competing project teams to develop "integrated solutions" for the customers.

Forming parallel or competing project teams is only one of the many organizational/managerial arrangements that a firm can implement to solve its problem. Basically, these solutions fall into three categories. The first set of solutions apply to the *organization* at large. The second apply primarily at the level of the *group* or project team. And the third set of solutions apply to the *individual* level. These three sets of solutions are (listed below, in no particular order of importance.

Organization:

1. Have top management commit resources to new product development
2. Ensure that the project have a champion capable of obtaining resources and preventing intervention by the company bureaucracy.
3. Invest in equipment and support, such as computer-aided design and engineering (CAD/CAE)
4. Invest speculatively in tooling before the total design is resolved and order long-lead-time parts in advance, rather than waiting for a complete release of the entire design
5. Simplify the product specification process by stating the product idea succinctly as possible
6. Restrict detailed front-end planning to important, hard-to-define items
7. Do not allow cumbersome top management reviews or indecisions to delay design work.
8. Limit reporting requirements that may steal precious time from the development effort
9. Involve outside suppliers from the start of the project
10. Make selective use of rapid-turnaround outside design services when necessary

Group:

1. Form a multi-functional project team, whose members work together from start to finish
2. Give maximum autonomy to the project team
3. Choose the right leader and leave the leader assemble his own team
4. Include project members who are willing to work long, hard hours into the team
5. Create an open work environment in order to foster communication among project members. This may mean locating all team members together.

6. Let project members share as much information and know-how as possible.
7. Encourage project teams to test important technical and market concepts early and ruthlessly
8. Ensure that project members know the cost of delay
9. Have competing teams work on parallel development projects
10. Establish an evaluation and reward system based on group performance

Individual:

1. Train individuals to acquire multiple technical skills as well as multiple functional skills
2. Encourage engineers to go out into the field and listen to what customers and dealers have to say
3. Tolerate and anticipate mistakes
4. Use overtime liberally
5. Make excessive use of sweat shirts, banners, and "hoopla" to create enthusiasm.

Tradeoffs of Speedy Development

Although we noted earlier that a faster development cycle has a positive impact on profit, companies should be careful not to overexercise their options. Some of the solutions listed above are costly to implement. These include, among others, investing speculatively in equipment and tooling, hiring rapid-turnaround outside design services, having competing teams work on parallel projects, and using overtime liberally. Liberal use of these costly solutions can lead to higher product costs. Management should be mindful of this tradeoff between speed and product costs and decide which solutions to adopt from a strategic point of view.

In addition, a "crash" program often requires extraordinary effort on the part of all project members throughout the span of the development. Monthly overtime of 100 hours are not uncommon, based on our interviews. Considering the fact that many of the projects that we observed had taken more than two years to complete, the danger lies in burning out talented individuals in a relatively short period of time. Management must also be mindful of the tradeoff between speed and human burn out.

V. *Conclusions*

This paper started out by highlighting the growing strategic importance of npd in today's fast changing and increasingly competitive environment. A conceptual framework was developed to assist multinational companies think about international new product development in a more systematic manner. We pointed out that competitive advantages can be gained from adopting a global approach to npd. The key lies in integrating the various npd activities—e.g., design, development, introduction—across a number of different national markets.

An analytical framework for achieving shorter development time was developed in the paper as well. The key here also seems to lie in integration. Companies must first of all integrate the activities of the multifunctional project team across different stages or phases

of the npd process. In the past, a product development process typically moved sequentially from one stage or phase to the next. The project is "handed off" from one group of functional specialists to the next, with little integration taking place across the phases. Takeuchi and Nonaka (1986) call this the "relay race" approach to npd.

But the solutions presented in this paper seem to suggest that a more holistic and integrated approach toward product development can help companies achieve speed. Under the integrated approach, members of the multifunctional development team interact with each other constantly throughout the development process. The boundaries that existed in between the phases become less rigid and structured. The evolution from the sequential approach toward an integrated approach for npd can be illustrated using a simplified example, as shown in Exhibit 10 below.

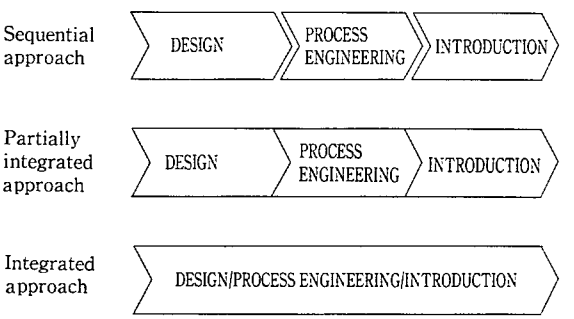
Since project members work together from start finish under integrated approach, they have no qualms about (a) overlapping one or several phases on top of each other or (b) combining adjacent phases into one or even eliminating one or several phases all together. The net result, in either case, is a shorter development time compared to the traditional step-by-step approach.

In addition, companies must also integrate or synchronize the npd activities at three different levels of the organization. Forming multifunctional project teams alone is not sufficient. They need the financial and systemic support of the entire organization as well as highly motivated and skilled individuals in order to create the synergy needed to make things happen. Only when the npd activities at all levels are synchronized can organizations begin to move smoothly and with any kind of speed.

But at the same time, companies should be warned against becoming overloaded with integration. Too much integration can bog down an organization, unless proper checks and balances are instigated. The kinds of activities that we have discussed in this paper—e.g., multinational intelligence activities, multifunctional project teams, overlapping phases of development, and multi-level synergy—are indeed very complex. Managing these activities professionally and mechanically may lead to excessive numbers of planning sessions, coordination meetings, and reviews. Agility and flexibility can be lost and bureaucracy can creep in, as a result.

To avoid these pitfalls, companies should make a conscious effort to manage the npd process with an entrepreneurial spirit and unconventional moves in mind. In other words, they must be willing to take risks and try something new.

FIG. 10 SEQUENTIAL VS. INTEGRATED APPROACH IN NEW PRODUCT DEVELOPMENT



Thomas J. Watson Jr. voiced a similar concern back in 1963. Referring to the young men in middle management positions at IBM, he said:

> They seem reluctant to stick their necks out or to bet on a hunch. . . This is not always because they lack nerve. Sometimes they make the mistake of thinking that top management places a greater premium on following form then on anything else. I wish we could stir them up a bit and encourage a little more recklessness among this group of decision-makers. Every time we've moved ahead in IBM, it was because someone was willing to take a chance, put his head on the block, and try something new.

We close by drawing a moral from Watson's words. Those companies that are unwilling to stick their necks out and try something new seem destined to lose the "mortal contest" that Watson talked about at the beginning.

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APPENDIX 1

PRODUCT CATEGORIES COVERED IN THE PILOT SURVEY

RAW MATERIALS

1. CRYSTALLIZED CELLULOSE
2. SYNTHETIC FIBER

COMPONENTS

3. SEMI-CONDUCTOR
4. LCD PANEL DISPLAY
5. MECHANICAL PARTS FOR MINI-PRINTER
6. FLOPPY DISK DRIVE
7. MONITOR DISPLAY
8. B & W CATHODE-RAY TUBE
9. COLOR CATHODE-RAY TUBE

MACHINE TOOLS

10. COMPUTER NUMERICAL CONTROL
11. CORRUGATING MACHINERY
12. IRON/STEEL MANUFACTURING MACHINERY
13. PRINTING MACHINERY FOR PHOTOSENSITIVE RESIN
14. INDUSTRIAL SEWING MACHINE
15. MASK ALIGNER
16. MACHINING CENTER

INDUSTRIAL PRODUCTS

16. FORKLIFT TRUCK
17. EXCAVATOR (POWER SHOVEL)
18. ELEVATOR
19. MARINE DIESEL
20. BULK/OIL CARRIER

MEDICAL PRODUCTS

22. CT SCANNER
23. ARTIFICAL KIDNEY RELATED PRODUCTS

OFFICE PRODUCTS

24. PPC COPIER (SMALL-SIZED)
25. PPC COPIER (MEDIUM-SIZED)
26. PRINT-OUT CALCULATOR
27. DOT-MATRIX PRINTER FOR OFFICE USE
28. MOBILE TELEPHONE
29. ELECTRIC KEY TELEPHONE SYSTEM
30. DESK-TOP PROFESSIONAL PERSONAL COMPUTER

DURABLE CONSUMER GOODS

31. COLOR TV
32. PROJECTION TV
33. VIDEO-CASSETTE RECORDER
34. MICRO-WAVE OVEN
35. ROOM AIR-CONDITIONER
36. PORTABLE GENERATOR
37. SMALL-SIZED TRACTOR FOR HOME USE

DURABLE CONSUMER GOODS (PERSONAL)

38. CAMERA
39. HAND-HELD PERSONAL COMPUTER
40. PERSONAL COMPUTER
41. PRINTER FOR PERSONAL COMPUTER
42. AUDIO PRODUCTS
43. CAR STEREO
44. AUTOMOBILE
45. MOTORCYCLE