"PRODUCT INNOVATION: A TOOL FOR COMPETITIVE ADVANTAGE"

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A TOOL FOR COMPETITIVE ADVANTAGE

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Abstract

This paper assesses the overall contribution of product innovation to competitive advantage, analyzes the conditions under which such a contribution is likely, and discusses how this likelihood can be increased through company action. It concludes that pioneering is not riskier than following, and that successful pioneers enjoy substantial and lasting competitive advantages. Success depends on the innovation's relative advantage, compatibility, complexity, and the strength of the accompanying marketing effort. Lead time allows pioneers to build up resources that contribute to sustainability, but customer and technological changes may destroy the competitive value of these resources.

Key Words

Innovation, Competitive Advantage

INTRODUCTION

By product innovation we refer to a product which is new, at least in some respects, for the market into which it is introduced. Product innovations vary in their degree of newness from, on one extreme, products which create entirely new markets (e.g., the first airplane, photocopy machine, electronic gene synthesizer) to, on the other extreme, only marginally new innovations (e.g., the first compact disk player allowing to charge more than one compact disk).

From a competitive perspective, product innovation can be seen as a tool for achieving a competitive advantage, alongside other tools such as price reductions on existing products, the development of new customer services, and new communication and distribution programs. Initially, the competitive advantage created by a product innovation manifests itself in the speed and magnitude of market acceptance. In the longer term, the sustainability of the competitive advantage is reflected by the market share which the innovative product is able to maintain against follower products launched by competitors.

Major product innovations often provide the basis for a new business or new firm. For example, Xerox built a company around photocopiers and Digital Equipment around minicomputers. In such cases, the unit of analysis becomes the business, and the question of interest is whether the pioneering business is able to maintain a dominant share against follower businesses. Evaluating the sustainability of a competitive advantage due to innovation at the business level typically requires a longer term view as compared to analyzing a specific product innovation. For example, although

EMIs first scanners were highly successful, EMI failed to sustain its competitive advantage across several product generations and exited the market eight years after launching the pioneering product.

The objectives of this paper are: to assess the overall contribution of product innovation to competitive advantage; to analyze the conditions under which a positive contribution is likely; and to discuss how company actions can increase the likelihood of a positive contribution.

THE MARKET RISK OF PRODUCT INNOVATION

Product innovations are new products, but not all new products are product innovations. It is well known that new product introduction involves a significant risk of market failure. A recent review of empirical studies estimates the failure rate to be about 35% for consumer goods and 25% for industrial goods (Crawford, 1987). Do innovative new products have the same failure rate as other types of new products?

There is a growing literature which suggests that innovative (also called first to market or pioneer) products enjoy important competitive advantages (e.g., Urban et al., 1986; Robinson and Fornell, 1985; Robinson, 1988). However, other authors emphasize the risks of innovation. For example, Levitt argues that "the trouble with being a pioneer is that the pioneers get killed by the Indians" (Levitt, 1965, 1966). Similarly, Olleros (1986) presents numerous cases of pioneer failure.

Systematic evidence on the influence of innovation on the new

product success rate comes from studies on new product success/failure, where many product- and other characteristics were measured.

Are Pioneering Products More Successful?

Pioneering or entry timing is typically measured with questions like "we were the first into the market with this type of product" (Dillon et al., 1979) in survey studies. Several studies found that first to market products either had the same frequency of success or failure as later entries (Dillon et al., 1979; Cooper, 1979, 1981; Glazer, 1985) or enjoyed a slight advantage (Maidique and Zirger, 1984; Cooper and Kleinschmidt, 1987). One study, concentrating on scientific instrument innovation, found some evidence that first entrants were somewhat more likely to fail than second entrants (SPRU, 1972; Rothwell et al., 1974).

Overall, these findings suggest that pioneering products do not enjoy a significantly greater success rate than follower products. This contradicts the studies which conclude in favor of important pioneer advantages. At the same time, the results go against the opinion that pioneers are systematically disadvantaged in comparison to followers.

Differences in sample characteristics provide one explanation for the conflicting opinions. Studies which observe pioneer advantages generally analyze only successful markets, that is, markets which have grown to a size sufficient to allow the survival of several competing products, including the pioneer. Because pioneer failure due to unsatisfactory market development is not observed in these studies, they overestimate the advantage of innovation (Glazer, 1985).

The conflict with those authors who paint a pessimistic picture of pioneering could be due to differences in the degree of innovativeness. Illustrations of pioneer failure tend to focus on well-known radical innovations (e.g., Olleros, 1986), whereas the "first to market" measures in the systematic empirical studies do not differentiate between incremental and radical innovations. Does the degree of innovativeness make a difference for the failure rate?

Degree of Innovativeness and Market Risk

One aspect of innovativeness concerns the technology embodied in new products. In a study of 40 federally sponsored innovation projects, the degree of radicalness of the technology was the major determinant of commercial failure (Ettlie, 1982). But in a study of 203 new Canadian industrial products, the use of new or advanced technology in the product's design, although unrelated to the product's financial performance, was positively correlated with market share (Cooper and Kleinschmidt, 1987). In another study (58 new U.S. electronic products), "radicalness with respect to world technology" had a slightly positive association with new product success (Maidique and Zirger, 1984). The conflict in findings between Ettlie's study and the other two is probably due to differences in the technological radicalness of the products included, with Ettlie's federally sponsored projects representing a greater degree of radicalness than the other two. In fact, one of the latter studies noted that "very few, if any, of the products in the study could be classified as 'technological breakthroughs'" (Maidique and Zirger, 1984, pp. 195-6). In

summary, the relationship between technological novelty and market risk appears to be non-linear: some degree of technological novelty is beneficial, but extreme novelty increases the market risk.

A second aspect of innovativeness concerns the product's uniqueness or distinctiveness. A study of 195 Canadian new industrial products concluded that "merely having a 'unique product' which is 'first to market' does not appear vital to successful product outcomes." (Cooper, 1981, p. 59). But in a study of 100 new U.K. grocery brands, distinctiveness ("in appearance or performance") had a strong positive correlation with success (Davidson, 1976). Because distinctiveness in the latter study was performance-related, its results do not contradict the conclusion of the former: uniqueness or distinctiveness per se, that is, unrelated to customer-relevant performance dimensions, is irrelevant for innovation success.

Customer familiarity with the product concept, finally, is a third aspect of innovativeness. On one extreme, an innovation may represent a substitute in a well-established product category. Insulin produced via genetically reprogrammed bacteria as a substitute of insulin produced via animal extraction is a case in point. The other extreme is represented by an entirely new product concept such as, for example, the first computer. In a study of 23 biomedical instrumentation R&D programs, only programs with high concept familiarity succeeded (Teubal et al., 1976). Similarly, "customer familiarity with products in the category" was positively correlated with financial performance and market share in the previously mentioned study of 203 Canadian industrial new products (Cooper and Kleinschmidt, 1987). These studies support

the hypothesis that concept familiarity is an important factor in innovation success.

The empirical findings regarding the relationship between the degree of innovativeness and market risk can now be summarized:

1. Some technological novelty enhances the chances of market success, but radical technological novelty reduces it.
2. Uniqueness per se is irrelevant for market success.
3. The greater the concept novelty, the higher the market risk.

THE EVOLUTION OF PIONEER MARKET SHARES

The cost of developing and introducing follower products typically is lower than for pioneering (Mansfield et al., 1981; see also Porter, 1985, Ch. 5). If followers have the same chance of market success as pioneers, then following would appear to be preferable to pioneering. Before drawing this conclusion, however, one needs to look more closely at the evolution of pioneer performance over time.

Pioneers initially enjoy a monopoly situation with a market share of 100%. As soon as competing products enter the market, the pioneer's market share necessarily has to come down. The critical question is whether pioneering provides advantages that carry over to the competitive phase.

Under the "fundamental theorem of market share determination," market shares are generally assumed to be proportional to the marketing effort (e.g., product quality, price, communication and distribution) shares (Kotler, 1984, p. 231). Companies with identical marketing effort, therefore, ought to have identical

market shares. This means that follower companies which are able to match the pioneer's marketing effort ought to achieve market share parity with him. This model of market share determination, therefore, does not foresee any lasting effects of pioneering. What do the available empirical studies show?

Market Shares of Pioneer vs. Follower Products

Bond and Lean (1977) studied two pharmaceutical markets. They noted that basically similar follower products were unable to achieve significant market shares despite heavy promotional spending and lower prices. Another study found that the pioneer brands enjoyed a substantial and enduring market share advantage in six out of the seven cigarette market segments studied (Whitten, 1979). Spital (1983) tracked market shares of pioneering semiconductor components and found that 17 out of 22 pioneer products remained market leaders in competition against "plug-compatible" followers. The most extensive study was carried out by Urban et al. (1986) who studied 128 brands in 34 frequently purchased consumer goods categories. Order of market entry had a significant impact on market shares many years after market entry, the average time in the market being 25.9 years and 20.5 years for the second and third entrants respectively. Urban et al. (1986) concluded that pioneers enjoy significant market share advantages over followers with identical products and marketing effort. Table 1 shows their estimates of identical followers' market shares relative to the pioneer.

Table 1

Market Share Penalty of Similar Follower Products

Entry Order	Follower's Market Share Relative to Pioneer
2	0.71
3	0.58
4	0.51
5	0.45
6	0.41

Source: Urban et al., 1986, p. 654

These results are consistent with the observation that new products which offer no advantages relative to existing products have a high failure rate (Davidson, 1976; Cooper, 1979, 1981; Cooper and Kleinschmidt, 1987). Overall, these studies suggest that pioneering products enjoy substantial and lasting market share advantages over similar follower products with similar marketing effort.

The qualifying conditions - similar products and marketing efforts by followers - also clearly indicate under what circumstances followers can successfully challenge pioneers. First, the handicap of late entry can be overcome by a superior product. Zantac's successful entry into the ulcer treatment market which was previously dominated by the pioneering drug Tagamet is a case in point. Second, pioneers can also be overtaken when similar follower products are backed up by superior marketing resources. IBM's successful late entry into the PC market illustrates this case. The combination of a superior product with superior marketing effort, finally, is the most powerful entry strategy for a follower. This was JVC's entry strategy for its VHS system which lagged Sony's Betamax system by more than one year. The VHS system's two-hour recording time compared to one hour for the

Betamax represented a significant product improvement. This product superiority, together with the superior marketing effort of the 42 firms adopting the VHS standard as compared to the 11 firms adopting Betamax resulted in rapid market domination by the follower system.

Pioneer vs. Follower Businesses

Several studies have looked into the market share performance of pioneer businesses as compared to later entrants. Biggadike (1979) found that follower firms were still significantly smaller than the pioneers five to eight years after entry. Robinson and Fornell (1985) analyzed the long-term market share impact of pioneering for consumer goods businesses, and Robinson (1988) for industrial goods businesses. Pioneering had a substantial and lasting positive impact in both types of industries, although the advantage to pioneering was much more important in consumer goods than in industrial goods industries. Furthermore, the advantage decreased over time.

In Urban et al.'s (1986) product-level study, order of entry had a direct impact on market share, independent of marketing effort and product positioning. By contrast, in the business level studies no direct market share impact was observed (see also Vanhonacker and Day, 1987). Instead, order of entry appeared to influence market share through its impact on the businesses' marketing effort: pioneers had higher relative product quality and a broader product line than followers, and these two variables in turn strongly influenced market shares. Table 2 summarizes these results. The results also suggest that follower businesses can

overtake pioneers if they achieve superior product quality and build a broader relative product line. Nike's entry into the running shoes business appears to fit this pattern. Nike displaced the previous U.S. market leader Adidas by product innovation and by offering a broad product line which included up to 140 different running shoes at any one time.

Table 2

Evolution of Market Share (MS) Avantages:

Industrial and Consumer Goods Businesses

	Age of Pioneer Business (in Years)	
	20 or less	More than 20
Industrial Goods Businesses		
- Relative Product Quality	4.27	1.95
- Relative Product Line Breadth	3.83	3.20
Pioneer's Total MS Advantage	8.10	4.15
Consumer Goods Businesses		
- Relative Product Quality	8.01	1.71
- Relative Product Line Breadth	9.42	5.23
Pioneer's Total MS Advantage	17.43	6.94

Source: Robinson, 1988, p. 92

Enhancing the Contribution to Competitive Advantage

Although innovative new products fail as often as follower products, these empirical studies show that innovative products and businesses which meet with market acceptance enjoy substantial and lasting market share advantages. The next question that arises is: how can the contribution of product innovation to competitive advantage be enhanced? Answering this question requires a more detailed specification of the conditions that influence the market acceptance of innovations as well as the circumstances under which pioneers can sustain their advantages.

IMPROVING THE MARKET ACCEPTANCE OF INNOVATIONS

The Role of Product Characteristics

Empirical studies on innovation success generally conclude that the product itself is the major determinant of market acceptance. But what are the specific product characteristics that account for success or failure?

Davidson (1976) emphasized superior product performance and distinctiveness in his study of new grocery products. Cooper (1979; 1981) similarly found that product uniqueness and superiority was the dimension discriminating most strongly between success and failure in a broad cross-section of new industrial products. An independent and different analysis of Cooper's data arrived at the same conclusion: "Unique products of higher price and better quality generally tend to succeed" (Dillon et al., 1979, p. 1191), and Cooper's most recent study confirmed the role of the product advantage as the most important success factor for new industrial goods (Cooper and Kleinschmidt, 1987). Reekie (1981) showed that 42% of new drugs with a high FDA performance rating achieved market shares exceeding 20%, compared to only 18% for drugs having little or no performance advantage.

The description of successful innovations as possessing superior performance and uniqueness, while allowing to summarize evidence across widely different industries, is lacking in specificity. This makes these characteristics more useful for an ex post explanation than for ex ante diagnosis and prediction of innovation market acceptance.

Diffusion of innovation theory suggests six innovation

characteristics with broad applicability yet greater specificity than the uniqueness/superiority characterization. The six attributes can be easily memorized by the "ACCORD" acronym, which stands for: relative Advantage, Compatibility, Complexity, Observability, perceived Risk, and Divisibility (trialability). The meaning and empirical support for these characteristics are described in Rogers (1983), Tornatzky and Klein (1982), and Gatignon and Robertson (1985). Tornatzky and Klein's (1982) comprehensive review of empirical studies concluded that compatibility (+), relative advantage (+), and complexity (-) had the most consistent significant relationships to innovation acceptance. Compatibility and relative advantage were also the characteristics with the strongest relationship to purchase intentions in a recent study of 19 durable consumer goods innovations (Holak and Lehmann, 1987).

The ACCORD characteristics can be used ex ante as part of a diagnostics and screening system (Donath, 1984) in order to improve the market acceptance of the innovation.

The Role of the Marketing Effort

A unique and superior product is a necessary but often insufficient condition for innovation success. Achievement of competitive advantage typically also requires that the product be brought to the attention of and be made available to the appropriate target customers. This requires communication, sales force and distribution resources. Several success/failure studies provide consistent empirical support for the importance of the marketing effort in innovation success (Cooper, 1979, 1981; Dillon

et al., 1979; Yoon and Lilien, 1985; Cooper and Kleinschmidt, 1987).

CONDITIONS AFFECTING THE SUSTAINABILITY OF COMPETITIVE ADVANTAGE

The Role of Lead Time

It is often desirable for pioneers to dispose of a long lead time before competitors follow. The lead time serves several functions. First, because of the monopoly situation, the pioneers may be able to charge higher prices. Second, the lead time allows the pioneer to improve his product positioning and marketing mix. This makes it more difficult for followers to enter with a superior product and marketing mix. Third, during lead time pioneers can build up both specific and complementary resources which will allow them to better resist competitors (see Flaherty, 1983; Spital, 1983).

The EMI case illustrates the problems a short lead time creates for pioneer firms. While EMI management expected to have a lead time of about four years, the first competitors entered in fact approximately 18 months after EMI's entry. This was too short to allow EMI to broaden its product line, improve key product performance parameters, create a loyal customer base, and achieve a sales volume sufficient to sustain its sales and service network.

Lead time varies with the appropriability regime and on competitors' response time. The appropriability regime refers to the pioneer's ability to protect its technology against use by followers. It depends on the nature of the technology (simple-complex; codified-tacit) and the system for protecting

intellectual property (Teece, 1987). The competitors' reaction time depends on the effectiveness of their product development and introduction system and on organizational response barriers. Mansfield et al. (1981) found that followers' development times are usually shorter than those of pioneers, although significant variations across industries exist. Even when technology is easy to appropriate, competitors may be prevented from following quickly by various organizational response barriers (MacMillan and McCaffery, 1982).

The Role of Pioneer Resources

If a company anticipates that lead time will be insufficient, it may decide to build up resources before market entry. This is what Smith, Kline & French did with Tagamet. They acquired foreign drug companies and built production capacity starting five years before the actual launch, at a time when regulatory approval and commercial chances were still highly uncertain (Nayak and Ketteringham, 1986, Ch. 5). Anticipatory build-up of resources requires both foresight and a willingness to take risks. Striking alliances with other firms is an alternative strategy for firms which anticipate that their own resources will be insufficient to resist followers.

Empirical studies of innovation performance capture the resource-basis of innovators through the concept of innovation relatedness, innovation-company fit, or synergy in its various aspects, that is, from the point of view of technological, production, distribution, and customer relatedness. These studies consistently find that relatedness improves innovation success

(Cooper, 1979, 1981; Maidique and Zirger, 1984; Baker et al., 1986; Meyer and Roberts, 1986; Cooper and Kleinschmidt, 1987).

Threats to Pioneer Resources

Resources built up by pioneers during the lead time or thereafter do not guarantee long-term sustainability of competitive advantage. The major threats to the value of these resources arise from customer and technological changes. Changes in market segments and key buying factors may require new types of competences. For example, the growth of the corporate segment for PCs has put Apple, which was built mainly around private PC users, at a disadvantage compared to IBM or Olivetti. The impact of technological change depends on whether the change is competence-destroying or -enhancing (Abernathy and Clark, 1985; Tushman and Anderson, 1986). Whereas competence-enhancing technological change tends to reinforce the pioneer's advantages, competence-destroying technological change reduces the value of his accumulated resources. The successive displacement of pioneers in the semiconductor industry (Foster, 1986, p. 133) is a well-known example of this phenomenon.

CONCLUSIONS

One of the important strategic choices in new product management concerns the timing of market entry in relation to competitors. Some companies aim to be market pioneers, others prefer to enter as followers. One often hears the opinion that pioneering is risky because of the high probability of failure. The review of the available empirical evidence here suggested that pioneering is not riskier than following. Moreover, pioneering products which meet with market acceptance enjoy substantial and lasting competitive advantages.

However, to gain the full benefits of product innovation, the likelihood of positive market acceptance and the defensability of the pioneer advantage should be assessed and increased. Market acceptance depends importantly on the product itself and the accompanying marketing program. Positive market acceptance is high if the product has a strong relative advantage, is compatible with customer behavior and values, of low complexity, and if the accompanying marketing program offers communication, sales force, and distribution support.

The longer the lead time, the more easily pioneers can build up the resources necessary to compete against follower firms. Lead time depends on the appropriability regime and potential followers' response time. If lead time is short, pioneers ought to build resources in anticipation or engage in alliances if they expect entry by competitors with superior resources. Pioneers need to watch out for customer and technological changes which risk to render obsolete accumulated skills and experience.

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