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A Strategic Approach to
High Technology Marketing

David M. Gardner

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A Strategic Approach to High Technology Marketing

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A STRATEGIC APPROACH TO HIGH
TECHNOLOGY MARKETING

ABSTRACT

Three basic fundamental factors that drive marketing strategy for high technology products are proposed. Based on a two dimensional definition of high technology, the critical concepts that any strategy for high technology products are evaluated followed by a discussed of several important implementation issues.

A STRATEGIC APPROACH TO HIGH
TECHNOLOGY MARKETING

Is marketing strategy for high technology products different? And if it is different - different than what? And, even if many would agree that there are differences, are the differences relatively minor, or large and significant? Most would agree that marketing strategy and practice should be different for business versus consumer products, for convenience goods versus specialty goods and even for products in decline versus products in maturity. But, can this agreement be extended to high technology products versus low technology products? Are not high technology products just new products? The question is complicated, of course, by the fact that some high technology products are business¹ products, while some are consumer products.

The objective of this paper is to propose criteria for evaluating, from a marketing strategy perspective, the technology level of products and the associated implications for marketing strategy and theory. Important to this effort, will be the development of contrasts between critical variables that differentiate marketing strategy for "low" and "high" technology products.

¹ Business product is the general term used here to refer to products primarily sold business-to-business. They are products primarily purchased by organizations to become part of, or to help in the production of products sold by the organization. Industrial products are one type of business-to-business products.

This paper is premised on the assumption that differences exist. Some of the differences are relatively small and relatively insignificant - others are large and significant. Gardner (1990) has clearly argued that high technology products are not "just" new products. Rather, they are products that differ on the dimensions of both technology and perceived change required by both buyer and user.

Gardner (1990) offered a definition of high technology that is widely generalizable, but has specific implications for marketing strategy. Prior definitions of high technology (Rexroad 1983, p.3; Grunewald & Vernon, 1988, p.61; Samili & Wills 1986, p. 23; Link 1987, p.11) were rather narrow in scope and certainly were not generalizable. Furthermore, these definitions offer little guidance for studying or crafting marketing strategy. Gardner (1990) furthermore observed that Shanklin and Ryans (1984), in their significant work on the marketing of high technology products side stepped the problems of defining high technology, but instead focused on the necessity of supply side marketing.

Gardner's definition of high technology is derived from the interaction of levels of technology (Ansoff 1984, p. 102) with the perception of innovations from the consumer/user perspective (Robertson 1967, p.7). He proposed a 3 x 3 matrix as the basis for a definition of high technology as well as a guide for marketing strategy. As shown in Table 1, products in Cell 9 would be categorized as being the "most" high technology products

with products in Cells 6 and 8 being categorized as slightly less high technology. Products in Cell 5 may be categorized as high technology and products in Cell 7 share some of the characteristics of high technology products. Products in Cells 1,2,3 and 4 of Table 1 are categorized as traditional marketing.

[Insert Table 1 about here]

Using the logic that categorizes products in Cell 9 of Table 1 as the highest on the technology continuum, Gardner (1990) defined "high technology" products as:

products that are the result of turbulent technology and which require substantial shifts in behavior of at least one member of the product usage channel.

Table 2 illustrates the differences between cells while Table 3 suggests products that may be appropriately classified according to this definition.

[Insert Table 2 and 3 about here]

A critical question that guides the remainder of this paper is the difference or differences, if any, between marketing strategy for products in Cells 5,6,7,8 and 9 and marketing strategy for products in Cells 1,2,3 and 4 of Table 1. In this author's view, the answer is clear - there are significant differences. However, it should also be quickly pointed out that the differences are self-evident if you accept the definition of high technology offered above. Furthermore, the differences lie primarily in the deployment, strategically, of existing variables, not the creation of entirely new concepts. But, at

the same time, marketing strategy for high technology products is not the same as marketing strategy for toothpaste, snack foods and many other consumer products, or for industrial solvents and machine screws, as well as the majority of business products, even though the process of strategic assessment is similar and the process of strategy construction is also similar.

What follows is a discussion of the perspective necessary to successfully devise marketing strategy for products in Cells 5,6,7,8 and 9 of Table 1. It is not a step-by-step planning process, but rather a way of viewing the requirements of strategy for products that are the result of turbulent technology that purchasers perceive to be discontinuous.

This perspective is based on a taxonomy derived from an extensive review of the literature as well as many interviews and discussions with a wide variety of people involved in various aspects of the marketing of technology in both Australia and the United States. There are three fundamental factors that drive the marketing of high technology. From these fundamental factors follow the key, critical concepts that need to be measured and addressed. In order to devise a comprehensive positioning and communication strategy, logic insists that such a strategy follow from these factors and concepts.

FUNDAMENTAL FACTORS

The basic, fundamental factors that drive strategy must be acknowledged and made explicit to assure that their role and influence is understood. It is this set of fundamental factors

that most substantially differentiates the marketing of high technology from the marketing of other products and services. These factors must be consistent with the paradigm developed above and give clear direction for the strategy derived from them. The three fundamental factors that meet this test are:

- * risk
- * behavioral resistance to change
- * systemic resistance to change

These, then, are the three fundamental factors around which a situation audit would be organized. The impact of these factors affects both the consumer/buyer and the organizational dimensions of the proposed paradigm.

Risk

Risk is an inherent aspect of innovation, especially innovation associated with high technology. As Sheth and Ram (1987, p.78) suggest:

It arises because all innovations, to some extent, represent uncertainty and pose potential side effects that cannot be anticipated completely. Customers know there are risks and try to postpone adopting an innovation until they can learn more about it.

Two types of risk need to be considered. The first, is the actual, measurable harm, with associated probabilities, linked to the purchase of a product in Cells 5,6,7,8, or 9 in Table 1. This can be economic loss, performance uncertainty, lost opportunity or even the possibility of physical harm. It can result in financial loss, a competitive detriment, a research and development setback or a host of results that have potential

negative outcomes with some probability. Contrasted with lower levels of technology, Davidow (1986, p.42) observes:

By comparison, high-tech is high risk. Here, the buyer is always concerned whether the system will arrive on time, whether it will work as specified, whether it can be properly applied, and whether the supplier will be able to fix it when it breaks.

Or, there is the risk of positive outcomes that are not as anticipated. The key factor differentiating this type of risk from perceived risk is that probabilities can be estimated. And as Porter (1985, p. 289) points out:

Buyers often have very different risk profiles, the result of such things as their past history, age and income, ownership structure, background and orientation of management, and nature of competition in their industry.

But, a second type of risk, perceived risk, also must be considered. Perceived risk as defined by Bauer (1960, p.390):

Consumer behavior involves risk in the sense that any action of a consumer will produce consequences which he cannot anticipate with anything approximating certainty, and some of which at least are likely to be unpleasant.

Bettman (1973) found perceived risk was likely to be greatest when:

- there is little information about the product category,
- there is little experience with brands in the product category,
- the product is new,
- the product is technologically complex,
- the consumer has little self-confidence in evaluating brands,
- there are variations in quality between brands,
- the price is high,
- the purchase is important to the consumer.

Products in Cells 5,6,7,8 and 9 of Table 1 are more likely to possess these characteristics than those in Cells 1,2,3 and 4. The uncertainty associated with products in Cells 5,6,7,8 and 9 in Table 1 does seem to lead to an active search for information (Jacoby, Chestnut & Fisher 1978, Locander & Hermann 1979).

Resistance to Change

Change is often viewed as exciting. But realistically, most individuals and most organizations do not handle change well. As the growing literature focusing on the implementation of strategy attests (Walker & Ruekert 1987), individuals resist change when it affects their security, their position of power or the learned and accepted way of doing things. Likewise, organizations resist change when, for whatever reason, "a discontinuous departure from the historical behavior, culture, and power structure (Ansoff 1984, p. 388)" of that organization is introduced.

Ironically, as the demand for innovation increases so does the resistance. Corporations resist even though innovation often means survival. Customers resist innovation even though it means better products and services (Sheth & Ram 1987, p. 26).

In the context of marketing strategy for high technology products, there appear to be two sources of resistance to change. The first, behavioral resistance to change is common to both consumer and business products, no matter what the level of technology, with the possible exception of products in Cell 1 of Table 1. The second, systemic resistance to change, is organizational in nature and consequentially is of concern for business products.

Behavioral Resistance To Change

More specifically, behavioral resistance to change is that human characteristic that all humans possess in some measure: the resistance to changing familiar behavior patterns to accommodate new behavior patterns associated with newer technology. As defined by Ansoff (1984, p. 482) it is both active and passive opposition to change by individuals or groups. The results of behavioral resistance to change within organizations are cost overruns, delays, distortions or rejection of change. For consumer products, resistance to change is the implicit basis for the diffusion of innovation curve. The shape of the curve is related to the proportion of the intended market that is willing to change behavior sufficiently to adopt the new product.

Ram and Sheth (1989, p. 6) suggest that consumers resist innovation for two main reasons:

1. An innovation may create a high degree of change in the consumers' day-to-day existence and disrupt their established routines.
2. An innovation may conflict with the consumers's prior belief structure.

They also argue that consumer resistance can be grouped into two categories:

1. **Functional** barriers relate to three areas: product usage patterns, product value, and risks associated with product usage.
2. **Psychological** barriers arise from two factors: traditions and norms of the customers, and perceived product image (p. 7).

Ansoff argues that, especially for organizations, two characteristics of behavioral resistance to change are:

- resistance is proportional to the degree of discontinuity in the culture and/or the power structure introduced by the change.
- for a given discontinuity, the resistance will be inversely proportional to the time over which change is spread (Ansoff 1984, p. 390).

Systemic Resistance to Change

Systemic resistance to change is organizationally related resistance based primarily on the organization's inability or incompetence to recognize and deal with the issues of change. More specifically, it is "resistance to change which is induced by lack of organizational competence or capacity for handling it (Ansoff 1984, p. 482)." This type of resistance is considerably different than behavioral resistance to change. Systemic resistance to change is primarily related to the lack of skills and/or appropriate attitudes and resolve to anticipate and cope with change facing the organization. It is incompetence based either on the lack of people with the proper skills and attitudes for assessment and implementation and/or an organizational structure that is not supportive of understanding and coping with change.

For instance, Sheth and Ram (1987, p.39) argue that:

... the more specialized and focused the organization, the less adaptable its operations are likely to be, for when all the strands of a web interconnect in the service of a single objective, the alteration of a single strand can threaten the unity and strength of the entire fabric.

And Ford and Ryan (1977, p. 376) have observed:

The purchase of technical know-how may be negotiated largely by engineering staff. This is possibly the same staff who have failed to meet the company's expectations in technical expertise resulting in the need to buy-in know-how. These individuals may be reluctant to make such a purchase as this which may infer their own incompetence.

The key issue for White (1988, p. 43) is that some organizations encourage an acceptable level of risk taking and encourage entrepreneurial behavior, while others do not see such behavior consistent with the betterment of the company.

Each of these is a fundamental issue in defining marketing strategy because each determines the basic elements of strategy, their combination and deployment. For instance, if the actual or perceived risk is high, then marketing strategy must aggressively deal with this level of risk by devising initiatives to control or reduce it. Likewise, if behavioral resistance is strong, many obstacles must be overcome, especially acceptance as well as barriers to successful implementation. And, if systemic resistance is anticipated, marketing efforts may have to be organized in a manner that "holds-the-hands" of an organization or even possibly providing a service in which the new technology is imbedded.

CRITICAL CONCEPTS

What concepts must any marketing strategy address, at the minimum, for products in Cells 5,6,7,8 and 9 in Table 1? Following from the fundamental factors discussed above, it is posited that there is a set of key, critical concepts that will be central to such a strategy. The criteria for selecting these

concepts is rather simple. Each of these selected concepts in some way relates to risk and behavioral and systemic resistance to change. However, the actual determination was difficult because each must be an established, well documented concept, not a minor finding or working hypotheses.

These critical concepts fall into two major categories: consumer/buyer and organizational. For the consumer/buyer category, the concepts are behavioral. Each of these behavioral concepts is an important part of consumer behavior theory and each is an important component in almost all consumer behavior theories. For the organizational category, the critical concept of technology push versus demand pull is central to the literature of technology (Burgelman & Sayles 1986, Chpt 3). Channels, as a concept, is included because of repeated findings of inadequate or non-existent channels for products in Cells 6,8, and 9 of Table 1. The concept of culture impacts on both categories, and because of the basic and pervasive nature of culture, it may be the single most important concept in understanding marketing strategy for high technology products. This is not necessarily an exhaustive list. It does suggest, however, that any marketing strategy for products in Cells 5,6,7,8 and 9 in Table 1 must, at the minimum, address these concepts in some form.

At the most basic level is the issue of culture. Both societal and organizational culture need to be understood and addressed. In general, culture refers to the learned patterns of

behavior, norms, beliefs and customs of a group. The group can be an ethnic group, a country, or an organization. Some cultures are open and forgiving, others are hostile and unforgiving. At IBM, you supposedly wear blue suits. At certain Big 8 accounting firms you "don't eat lunch at McDonalds." Culture is a critical concept because it affects commonly held values that lead to characteristic modes of response. If, as is generally assumed, culturally determined values guide behavior, then it is imperative to assess and understand the impact of culture, whether it be organizational or societal in nature. As Davidow (1986, p. 49) observes:

Culture is important not only for a company's internal operation but for marketing departments and the customers as well. Culture establishes the tone of a company in the market place; it forms a part of the corporate image. It is just about impossible to be perceived as a service-orientated company and yet have a corporate culture that does not value service. Customers see through the fraud. Similarly, technology leadership is earned in the market by deeds, not by public relations. And technology prospers only in a culture that values it.

And in an insightful analysis White (1988, p. 43) proposes a very critical distinction:

So it comes as no surprise to managers that industry leaders adopt and exploit technology. Even the most conservative companies are willing to use technology where appropriate. The resistance seems to lie in the corporate culture's acceptance of risk.

The second concept is level of involvement of the individual decision maker. Almost by definition, products in Cells 1,2,3 and 4 of Table 1 are low involving products (Assael 1987,p.83). As Sirgy (1983, p.124) states:

A low-involvement purchase is that type of behavior that is considered not important to the purchaser. It is not important to his/her belief system and he/she does not identify himself/herself with it.

In contrast, for the case of high involving products, Sirgy (1983, p. 126) points out:

Under high-involvement conditions, the individual goes beyond the simple process of perceptual categorization. He/she attempts to integrate this information by comparing it to his/her prior beliefs. The newly formed beliefs (arising from message comprehension) may be (in)consistent with the prior beliefs. This involves a belief-change process

Involvement, as a concept, is complex and the literature is diverse. However, a testable proposition with regard to involvement can be offered as:

Proposition 1: most products in Cells 5,6,7,8 and 9 in Table 1 are likely to be high involving products in the sense that they are important to the customer/consumer, to their belief systems, are seen as potentially risky and information about these products has the potential to be inconsistent with prior beliefs.

Motives were originally proposed by Howard and Sheth (1969) as a central element of The Theory of Buyer Behavior.

Motives are the biogenic or psychogenic needs, wants or desires of the buyer in purchasing and consuming an item in a product class. They include the consciously sought goal, which is considered to determine behavior (Howard & Sheth 1969, p. 99).

As such, motives are very basic, deeply held and determine behavior. While Howard and Sheth did not explicitly have high technology products in mind when they offered this definition, they did clearly recognize that marketing strategy needs to take into account the influence of motives. They argue that buying behavior could be impacted:

- (1) by causing the buyer to perceive the product as a means of satisfying a given motive, that is, by making a brand a "perceived instrumentality,"
- (2) by intensifying the motive, and
- (3) by changing the content of the motive (Howard & Sheth 1969, p. 116).

Howard and Sheth (1969) also identified choice criteria² as another central element of their theory. It should be noted that The Theory of Buyer Behavior was based on a model of repetitive brand choice decisions (Howard & Sheth 1969, p. 25). While repetitive brand choice is an assumed characteristic of products in Cells 1,2,3,4 of Table 1, it is not assumed for Cells 5,6,7,8 and 9. However, choice criteria is assumed to be a valid concept for assessing marketing strategy for high technology, although it is often referred to as "purchase criteria."³ Michael Porter (1985, p. 138-39) in his discussion of buyer purchase criteria makes several useful observations.

Whatever the value a firm provides its buyers, buyers often have a difficult time assessing it in advance. Buyers then, frequently do not fully understand all the ways in which a supplier actually or potentially might lower their costs or improve performance - that is buyers often do not know what they should be looking for in a supplier.

The buyer's perception of a firm and its product, therefore, can be as important as the reality of what the firm offers in determining the effective level of differentiation achieved.

Porter (1985, p.142) further suggests that purchase criteria

² The third element (alternative brands) of the Howard and Sheth (1969) Theory of Buyer Behavior is not included as a basic concept in this discussion.

³ See Bonoma and Shapiro (1983), pp. 62-64 as representative of the current approaches to purchase criteria.

can be divided into two types: use and signaling criteria. For

Porter:

Use criteria are specific measures of what creates buyer value. Signaling criteria are measures of how buyers perceive the presence of value. While use criteria tend to be more oriented to a supplier's product, outbound logistics and service activities, signaling criteria often stem from marketing activities.

And as O'Shaughnessy (1987, p. 107-08) points out, in addition to intrinsic choice criteria, choice criteria may reflect functions that the purchaser anticipates the product will provide. These functions can be technical performance, legalistic, integrative, economic and adaptive.

Consequently, we can offer a second testable proposition which can be stated as:

Proposition 2: choice criteria in Cells 1,2,3 and 4 in Table 1 are reasonably well formed and most likely "routine." However, for products in Cells 5,6,7,8 and 9, choice criteria will almost certainly be less well formed and more characteristic of what Howard and Sheth (1969, p. 27) have identified as extensive and limited problem solving.

For Howard and Sheth (1969) attitudes linked motives and choice criteria. And whatever the linkage, attitudes are a central concept in all theories of consumer behavior. For Assael (1987, p. 176):

Attitudes are the consumer's evaluations of the ability of alternative brands or product categories to satisfy these needs. Therefore, needs influence attitudes, and attitudes influence purchases.

The multi-attribute approach to attitudes is widely used in marketing. This approach to understanding purchaser attitudes

has provided a rich literature upon which to draw.

Multi-attribute models view a person's attitude toward a product/brand as the sum of (1) the person's beliefs about the extent to which certain attributes are offered by the product/brand under consideration, weighted by (2) the importance the person attaches to each attribute⁴.

This leads to the third testable proposition which is stated as:

Proposition 3: for products in Cells 1,2,3 and 4 in Table 1, multi-attribute attitude analysis is at the brand level. However, for products in Cells 5,6,7,8 and 9, the multi-attribute attitude analysis is primarily at the product level.

The multi-attribute approach to attitudes is important for at least two reasons. First, it can serve as the basic building block for understanding product attributes and the resultant communication strategies. And, second, is it's usefulness in design of communication strategies. Assael (1987, p.201) suggests five strategic implications of multi-attribute attitude models:

1. Identify the strengths and weaknesses of the company's brand in relation to the competition.
2. Identify the needs of segments of the market based on the value component.
3. Determine the need for product repositioning.
4. Identify the determinant attributes for strategic purposes.
5. Identify new product opportunities.

⁴ See Mazis, Ahtola and Klippel (1975) for a useful discussion and comparison of four multi-attribute models.

However, it is in the role as the basis of understanding behavioral intentions that the multi-attribute approach to attitudes is most useful for high technology product marketing strategy. Since the link between attitude and behavior is often weak, behavioral intention has been found to be a relatively good predictor of behavior (Ryan & Bonfield 1975). This model, generally associated with Fishbein, is stated as:

$$B \simeq BI = [A_{act}]w_0 + [(NB)(MC)]w_1$$

where:

- A_{act} = the attitude toward performance of a specific act
- NB = normative belief, the degree of belief that others expect or do not expect the individual to perform a specific act
- MC = motivation to comply or not comply with the expectation of others.

Demand pull versus technology push comprise a central concept whose focus is on the origin of the innovation. Burgelman and Sayles (1986, p. 33) suggest that these represent the two major origins of innovation.

1. Marketing-oriented managers can direct scientists into what appear to be exciting markets with assured high demand. (This is often called, in fact, "demand pull.") Here innovation, the need, is father to (or mother to) the new "invention."
2. Scientists, attuned to the realities of the corporation's interest, look for new technologies and scientific breakthroughs with good commercialization potential. (This is called "technology push.")

While this distinction may be somewhat oversimplified, it does clearly point out that some innovations originate primarily without direct reference to the market, while others originate within a problem solving search for solutions. Utterback (1982, p. 33) clearly demonstrates that "ideas for innovations originate communication about a need, followed by search for technical possibilities to meet the need." In all fairness to Burgelman and Sayles, they also propose "need-pull" as a preferred approach.

In the "need-pull" model, the definition and exploration of markets are usually handled by a business/marketing-trained specialist. This individual's identification of a high-potential market initiates a search process for inside- or outside-the-firm technical knowledge that might be used to develop an innovative product to enter that market (Burgelman & Sayles 1986, p. 39).

For the purposes of understanding the marketing of high technology products, however, it is the reaction of the market to the new technology that is important. If, the product has its origins primarily in the "technology-push" milieu, the probability of "resistance to change" is higher than if the product is the outgrowth of either the "demand-pull" or "need-pull" milieu. Consequently, we can suggest the fourth testable proposition which is stated as:

Proposition 4: Innovations in Cells 5,6,7,8 and 9 of Table 1 are most likely to be the result of the "technology-push" milieu while it is almost certain that innovations in Cells 1,2,3 and 4 will be associated with "demand-pull" or "need-pull."

In the context of the origin of the innovation, it is important to review the differences between supply-side and

demand-side marketing. Supply-side marketing has been referred to by Shanklin and Ryans (1984, p. 5) as:

any instance where a product can create a market - in other words, a demand for itself - instead of the conventional other-way-around. Or put differently, the product is responsible for the demand, rather than the demand being responsible for the product.

The implicit premise of their Marketing High Technology (1984) leads directly to the fifth testable proposition which is stated as:

Proposition 5: Innovations that fall into Cell 9 and to a lesser extent, Cells, 5,6,7 and 8 are high technology products.

While there is a certain intuitive logic to their supposition, holding that as a universal belief is potentially dangerous.

Channels, as a critical concept for marketing strategy of high technology products, is founded on the careful observation of the introduction of a number of products that would be classified as being in Cells 5,6,7,8 and 9 in Table 1. In addition, Porter (1980) clearly suggests that for emerging industries, there is often an absence of infrastructure, which in the case of high technology is the absence of existing channels of distribution that reach the intended market segments with reasonable efficiency. For instance, the introduction of the personal computer required the creation of entirely new channel(s) of distribution before it could move beyond the "hobby" or introductory stage.

A channel of distribution is more, much more, however, than merely the physical distribution of a product. Rather, it

involves, at a minimum: physical possession, ownership, promotion, negotiation, financing, risk taking, ordering and payment (Vaile, Grether and Cox 1952, p. 113). But beyond these primarily economic orientated factors, channels take on structural properties that are based on considerations of technological, cultural, physical social and political factors (Stern & El-Ansary 1982, p.27).

Consequently, channels arise, and/or are used, because they offer the most efficient route to matching the offering of the manufacturer, to the needs of the purchaser. For the purposes of marketing strategy for high technology products, it cannot be assumed that existing channels can serve this matching function in an efficient manner. Therefore, assessment of existing channels and the design of channels becomes a critical concept for innovations in Cells 5,6,7,8 and 9 of Table 1. From this follows a testable proposition that is stated as:

Proposition 6: It is very likely that channels for products in Cell 9 will be, at least initially, non-existent. As channels develop, they will be very short with the manufacturer being the dominate, controlling force, in the channel. As products move toward being classified in Cells 7 and 8 of Table 1, the channel structure will most likely be characterized as "rapidly changing."

The exact design of channels should receive careful attention, because as Davidow (1986, p. 46) points out:

The bottom line is this: Distribution channels are powerful differentiators and frequently own the customer, and if a company is going to reach that customer, it must figure out how to bias the distribution network in its favor.

Each of these critical concepts lend credence to the belief

that marketing strategy for high technology products must be different. Yet, there still may be other critical concepts that will differentiate. However, the critical concepts discussed above cannot be ignored in the positioning and communication strategy for high technology products.

POSITIONING AND COMMUNICATION STRATEGY

Market segmentation is a too narrowly defined term to describe the target marketing activities that need to be employed by the high-tech company. Rather, positioning seems to best describe the steps that the high-tech marketer needs to follow if it is to identify correctly the firm's target markets and to place them in priorities (Shanklin & Ryans (1984, p. 63).

From the thorough situation analysis organized around the fundamental factors and the critical concepts comes the basic positioning and communication strategy for the high technology product. It must be understood, however, that no positioning and communication strategy can be designed without a clear focus on market targets. For without a focus on market targets, no strategy, especially strategy for high technology products can be effective.

While a detailed discussion of the various combinations of marketing variables such as price, promotion, product attributes and distribution is beyond the scope of this paper, several general observations are appropriate.

Price In their recent discussion of pricing for high technology products and services, Grunenwald and Vernon (1988, p.62) argue that the critical element is change.

The end result of this highly dynamic situation is that pricing decision making is an extremely high-risk

process, one that has strategic implications for the high-tech firm. The critical nature of environmental factors, the hypersensitivity of profits to costs and competitive factors, and the relatively short product/service life cycle make the establishment of the price for high-technology goods and services a very special process.

While it is generally agreed that products that fall into Cells 5,6,7,8 and 9 are less price sensitive than those in Cells 1,2,3 and 4 in Table 1, two well known practices need to be acknowledged. First, the anticipated reaction of competitors and competing technology should determine a skimming versus a penetration pricing approach (Dean 1976). And second, cost based pricing strategies should only be adopted with great care. Costs are almost impossible to estimate for early stage innovations as well as the difficulty of estimating the effects of the experience curve. However, more importantly, cost based pricing strategies often ignore purchaser perception. Consequently, cost based pricing may lead to products that are either over-priced or under-priced. The strategies of perception pricing and value pricing as suggested by Grunenwald and Vernon (1988, p.68-9) are useful alternatives to cost based strategies.

Promotion In addressing the issue of whether advertising for high technology products is different, Beckwith (1986, p. 154) observed that:

From an advertiser's viewpoint, what most distinguishes high-tech products is that they are carefully considered purchases.

Wroe Alderson (1965) argued that promotion had two components. The first was product information, which included performance

data, price and how and where to purchase the product. The second was "reason-to-buy" information, which could be economic or psychological. For innovations in Cells 5,6,7,8 and 9 of Table 1, technical product information will be most relevant with some reason-to-buy information. The almost total reverse is appropriate for products in Cells 1,2,3,4.

This, then argues for more direct, one-to-one promotional efforts for products in Cells 5,6,7,8 and 9 or in other words - a push strategy versus the more familiar pull strategy which is appropriate for Cells 1,2,3 and 4. It also suggests that the role of product brochures is limited. They are necessary, but cannot perform a major portion of the information function. This also implies that it is necessary to understand, both the role and type, of information appropriate for the intended target market. In particular, Beckwith (1986) points out that the emphasis is often on "trying to create a market rather than share it," and a primary advertising strategy is "selling the company along with the product (page 154)."

Communicator credibility is always important. However, it needs to be evaluated very carefully for Products in Cells 5,6,7,8 and 9 in Table 1 due to the higher levels of risk. For instance Rossiter and Percy (1987, p. 290) suggest that:

Some high risk product categories are perceived (especially by new category users) as so complicated, either by virtue of having a very large number of important attributes, or attributes that are technically specialized and thus difficult to evaluate, that the decision maker trying to make a brand choice experiences "information overload."
One way to avoid information overload, which consumers

typically do, is to rely on the recommendation of an expert.

Closely associated with the credibility of the communicator is the need to evaluate the need for two-sided communications. In a stream of research by Kamins (Kamins & Assael 1987a, Kamins & Assael 1987b, Kamins 1989), it has been demonstrated that in situations where the likelihood of a product not performing as anticipated, being flawed or other reasons for possible disconfirmation, that two-sided communication (presenting product reservations) is usually superior.

Product Attributes The central observation with regard to product attributes is that the purchaser is likely to place less emphasis on product attributes for Products in Cells 5,6,7,8 and 9 in Table 1. Rather the purchaser is seeking a solution to a problem that can be solved by a product with a given set of attributes. Consequently, compensatory models may provide more guidance than non-compensatory models for these products. Conversely, non-compensatory models may be of more use for products in Cells 1,2,3 and 4 of Table 1.

Table 4 contains a summary of the major differences between the assumptions underpinning high and low technology marketing strategy. These differences, while critical, may not be large or startling. However, they do necessitate a careful, and often different approach to strategy for the high technology product.

[Insert Table 4 about here]

KEY ELEMENTS OF HIGH TECHNOLOGY PRODUCT STRATEGY

Technology leadership is exerted through "function," in

producing products with advanced performance or features. Marketing leadership is exerted through "application," in service, distribution and pricing. Both technology leadership and marketing leadership are important to ensure that the commercial benefits of innovation will be captured by the innovating corporation (Betz 1987, p. 113).

The role of marketing strategy for high technology products is to successfully match, or "apply" the "functions" of the product to the correct opportunities in the market. In his analysis of the Silicon Valley, Forester (1987, p. 58) argues:

With so much emphasis on electronics whizz-kids and venture capitalists, commentators have often overlooked the role of marketing and public relations in the growth of successful Valley companies. After the initial technical breakthroughs in the 1950's, 1960's and early 1970's, commercial factors became just as important, if not more important, than the technology itself.

To address these "commercial factors," the vast majority of marketing strategies for high technology products, i.e., those products falling into Cells 5,6,7,8 and 9 of Table 1 will possess, at the minimum, the following elements as indicated in Table 5.

[Insert Table 5 about here]

These elements are consistent with the discussion above and in one way or another appear in a wide variety of articles, books and papers concerning various aspects of the marketing of technology, and high technology in particular. The proper use and combination of these elements address the issues of risk, behavioral resistance and systemic resistance to change. They also address associated issues. Clearly, however, they stand in

stark contrast to the combination of elements generally conceded necessary for the marketing of mass marketed consumer goods and the vast majority of business products.

While the elements in Table 5 appear similar to those that might be included in a list for the marketing of services or many business to business products, the critical factors of Table 4 clearly suggest strong differences. In particular, the inclusion of the fundamental factors of risk and resistance to change significantly alter the marketing strategy for high technology products.

Driven by the fundamental factors of risk and resistance to change, coupled with the necessary acquisition of new behaviors on the part of customers/consumers for products in Cells 6,7, 8 and 9 in Table 1, it is imperative, then that any strategy directly address these factors.

The critical focus of the process of strategy construction and implementation is to analyze it from the perspective of the purchaser. The purchaser of high technology is most likely looking for a solution to a problem, but also bound by both behavioral and systemic resistance to change. At this implementation stage , several generalizations seem appropriate. First, as Davidow (1986, p. 29) suggests, a good device is not enough. The purchaser is looking for a complete product, one that has the correct dimensions, those dimensions added to the product by marketing. Second, as also suggested by Davidow (1986, p. 30-31), the needs of the purchaser will evolve which

makes it imperative for the product to evolve as well. Segments will come and go. Consequently, the product will need to be continually matched to changing segments and their respective needs. Porter (1980, p. 120) clearly states the necessity to identify which segments will open up early and which will open later. This is a crucial and vital question as well as the understanding that the initial market segment is most likely a "temporary" segment. This is particularly true for products in Cells 7,8 and 9 of Table 1.

But above all, is the necessity of planning to achieve what Porter (1985, p. 11) and Aaker (1988, p.5) have identified as a "sustainable competitive advantage." Key to achieving this sustainable competitive advantage for Porter (1985, p. 11) is a strategy based on either low cost or differentiation. Neither strategy is likely to be appropriate for products in Cells 7,8, or 9 of Table 1. However, as products move into other cells, the necessity to move towards either low cost or differentiation strategies will tend to insure continued, long-term survival and above average performance.

A critical decision in achieving a sustainable competitive advantage for products in Cells 5,6,7,8 and 9 of Table 1 is whether to pursue a pioneering or a prudent follower strategy (Haines, Chandran & Parke (1989). There are strong advantages and disadvantages to both strategies. But, not having a strategy is foolish and short sighted.

Scherer and McDonald (1988) offer some very practical

observations and advice, especially relevant for the smaller high technology firm, but applicable for larger firms as well to overcome potential problems associated with marketing products in Cells 5,6,7,8 and 9 of Table 1. They suggest (page 284) the following possible options:

Market-oriented joint ventures with existing marketers or distributors to speed up the diffusion of the new technology

Licensing available technology to speed up development and commercialization

Cooperative R&D agreements to reduce risks and spread technological bets

Subcontracting, to keep the fixed investment base low.

CONCLUSIONS

From the above analysis, the only conclusion that can be reached is that marketing strategy for high technology products is different, and the differences are real. Furthermore, using the criteria developed, it is also clear that high technology products are not just "new" products. Admittedly, some of the differences are not large. However, what has been developed, then, is a classification system that results in criteria that can be objectively verified to properly classify products as to the level of technology. From this classification system, distinct implications for marketing strategy can be ascertained.

Several implications for the practice of marketing as well as marketing strategy must necessarily follow from the above analysis. The first is that we must carefully question the universal application of many well accepted principles and theories of marketing. Certainly, the injunction to think in

terms of contingencies is well taken. And second, properly designed marketing strategy can have a major impact on the success of high technology products. While we have known this, we can now be more accurate in our prescription of the practice of marketing while also improving our descriptive understanding of what happens.

It remains, however, for another day, the development of specific strategies for individual cells and the development of even more clear differences between traditional marketing and the marketing of innovation and high technology products.

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Table 1
CUSTOMER/CONSUMER

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		Continuous	Dynamically Continuous	Discontinuous
Stable Fertile/ Evolutionary Turbulent		{1}	{2}	{7}
		{3}	{4}	{8}
		{5}	{6}	{9}

Table 2

Levels of Product Technology
for
Marketing Strategy

<u>Level</u>	<u>Cell</u>	<u>Technology</u>	<u>Purchaser Perception</u>
"Highest"	9	Turbulent	Discontinuous
	8#	Fertile	Discontinuous
	6	Turbulent	Dynamically Continuous
	7	Stable	Discontinuous
	5	Turbulent	Continuous
	4	Fertile	Dynamically Continuous
	2#	Stable	Dynamically Continuous
	3	Fertile	Continuous
	"Lowest"	1	Stable

The assignment of Cell 8 versus 6 and Cell 2 versus 3 is yet to be tested.

Table 3
Product Examples

P R O D U C T \ T E C H N O L O G Y		PURCHASER		
		Continuous	Dynamically Continuous	Discontinuous
Stable Fertile/ Evolutionary Turbulent		{1}	{2}	{7}
		B&W TV "New" snack food	Micro-wave pizza PC software, *(unsoph user)	Major software change
		{3}	{4}	{8}
		PC Software, *(soph user)	FAX Desk-top publishing, *(soph user)	Computer-to computer comm
		{5}	{6}	{9}
		Genetically engineered seed corn	Hi definition television	Paper less banking Organ transplant

* unsoph user = unsophisticated user segment
soph user = sophisticated user segment

Table 4

DIFFERENCES BETWEEN
HIGH AND LOW TECHNOLOGY MARKETING
STRATEGY

<u>High Technology Strategy</u> {Cells 5,6,7,8,9}	<u>Low Technology Strategy</u> {Cells 1,2,3,4}
High involvement	Low Involvement
Limited or no choice criteria	Well formed choice criteria
Analysis at product level	Analysis at brand level
Push strategies	Pull strategies
Personal selling	Advertising
Training & Service	Sales Promotion
Warranties	
Short channels, undergoing change, manufacturer control	Established channels, strong channel relationships
High information content	Low information content
Focus on problem solution	Focus on brand attributes
Technology push	Demand pull/need pull

Table 5

ELEMENTS OF ANY HIGH TECHNOLOGY
MARKETING STRATEGY

- * Direct Sales
- * High Levels of Service
- * Post Sales Support/Training
- * Strong & Aggressive Channel Support
- * High Information Content

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