
The Role of High-Tech Marketing in Improving the Efficiency of Marketing Services in Enterprises

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Abstract: This article describes the role and place of high-tech marketing in assessing the effectiveness of marketing activities in the enterprise. In addition, the article analyzes the possibility of increasing the efficiency of enterprise marketing services through high-tech marketing.

Key words: marketing activities, marketing efficiency, marketing services, high-tech marketing.

Introduction

High technology has several popular connotations. For the enthusiasts, high technology is the epitome of national competitiveness which will usher in unprecedented opportunities for economic growth and competitive advantage. For the skeptics, high technology is nothing more than the myriad electronic devices and gadgets which move on and off the store shelf with remarkable speed. The primary product characteristics behind these connotations are rapid change and extreme complexity because of which high technology is frequently associated with speedy product development and hyper-competition. The term high technology products is generally used for any product, ranging from sports shoes to RFID (Radio Frequency Identification), whose functioning is beyond the reach of common knowledge. The definition of high technology products/markets has been proposed in different contexts such as projecting employment growth to formulating policy proposals to enhance national competitiveness[1].

Therefore, the issues of marketing of high technology products are complicated and challenging due to the peculiar characteristics of high technology products which are discussed in later sections. Some researchers have addressed issues related to high technology marketing. Roberts (1992) proposes that the success of high technology companies depends upon many factors comprising technological and marketing influences at the time of or soon after company founding. Many marketing-related factors are associated with the later success of emerging companies, including visible marketing organization and practices, and an accurate understanding of customer needs and competition. Ziemer (1992) proposes a decision support system to aid scenario construction for sizing and timing marketplaces in high technology industries.

Their methodology focuses on two important issues related to marketplace dynamics: recognition of the customer for the product class under consideration, and the transition of the marketplace life-cycle for the product class from “emerging” to “maturing”. Steele proposes an economic theory of technological products as a mathematical extension of neo-classical economics in which the technological performance of a product is allowed to vary. Linton presents a model for forecasting the likely market size and demand for an early-stage emerging process technology.

Their study proposes **high technology marketing** “market driving” as opposed to market-driven or market-oriented as a new paradigm for marketing high technology products and innovations. Market driving is represented by “a firm’s ability to lead fundamental change in the evolution of industry conditions by influencing the value creation process at the product, market or industry levels”. Though the above studies have focused on some specific elements and stand-alone issues in high technology marketing, a need exists for a study that provides a broad overview of the marketing-specific issues in high technology area and relates it to the lessons drawn from practice. Our paper aims to fulfill the above recognized gap in the literature[2].

High technology industries: definitional viewpoints and characteristics.

Moriarty and Kosnik and Shanklin and Ryans define high technology industries as characterized by a high degree of market, technological, and competitive uncertainty. Other researchers define high technology on the basis of inputs used. Output-based definitions used by some other researchers classify high technology products or industries based on the productive value-added output of firms. A related view of increasing returns and network externalities is discussed next. A more specific and detailed definition of high technology industry is based on the characteristics of an emerging techno-paradigm[3].

These viewpoints are discussed in the sections below. Uncertainty View Moriarty and Kosnik define high technology industries as characterized by a high degree of market, technological, and competitive uncertainties.

It highlights the fact that it is the intersection of these three characteristics that typifies a high technology marketing environment. For example, some consumer goods industries might have high degrees of market uncertainty but they would not be classified as high technology if they do not operate under a high degree of technological uncertainty. Each of the three characteristics of the high technology environment is described in the sections below. Market Uncertainty It refers to the ambiguity about the type and extent of customer needs that can be satisfied by a particular technology.

Anxiety about these factors might result in customers delaying adoption of a new innovation. Also, customer needs may change rapidly and unpredictably in high technology environments. Next, customer anxiety may be perpetuated by a lack of clear standards and dominant design for innovations in a market. For example, ten years after they were introduced, only 20 per cent of the US households had purchased a colour TV. In many cases, the market for high technology innovations is slower to materialize. Technological Uncertainty This source of uncertainty is characterized by not knowing whether the technology or the company providing it can deliver on its promise to meet specific needs[4].

First, questions are raised regarding whether or not the new innovation will function as promised. The second relates to the time-line for availability of the new product which can always take longer than expected. Third, technological uncertainty may arise from concerns about the supplier and the service of the new technology. Further, there are concerns over the unanticipated side effects of a technology. For example, companies regularly debate whether the investments in information technology have really made their businesses more productive or whether the continued efforts to keep current with software upgrades and the use of computers for personal activities (like e-mail and surfing) have actually resulted in productivity decrement.

Finally, technological uncertainty exists because of the high degree of technological obsolescence. Competitive Volatility The third characteristic which underlies high technology markets is competitive volatility. It refers to the changes in the competitive landscape such as identifying the competitors, their product offerings, the tools they use to compete, and so on. Porter’s five-forces framework could be a useful paradigm to understand this effect. Often, new technologies are commercialized by companies outside the threatened industry. These new players are viewed as disruptive and are frequently dismissed by incumbents. However, they end up ‘rewriting the rules of the game,’ and may change the face of the industry for all the players[5].

Input-based View Input-based view defines high technology products or industries on the basis of the physical or human capital inputs to the production process. Accordingly, the two major factors that drive input-based analyses are R&D expenditures and occupational profile statistics. Markusen, Hall and Glasmeier define all industries with an excess of job growth above the manufacturing average as high technology.

Other similar studies have defined high technology as an industrial sector which satisfies one of the two conditions:

- 1) percentage of the sector's R&D expense in its valueadded output is higher than 10, or
- 2) percentage of the sector's scientists and engineers in total employment exceeds.

High technology marketing evolution of high technology industry should also have a temporal dimension which makes it even more complex. For example, while a telephone might be considered a high technology product in the late 19th century, nano-technology or robotics might be considered as highend technologies in today's context.

High technology markets exploit and create change rather than consolidate and defend the existing conditions. Therefore, the interdependence between marketing and technology is of critical importance. Low technology companies may basically adjust their marketing strategies to reflect relatively stable technological conditions. High technology companies, however, must recognize that both technological and marketing conditions are rapidly changing[6].

High technology markets are characterized by their dynamism and complexity which necessitate a changing target market over the life-cycle. The complexity of the product also impacts market acceptance in different ways in high technology markets. As high technology products are more complicated, they require greater customer education and more product information. High technology products result from innovations. Innovations can be thought of as falling onto a continuum from evolutionary to revolutionary.

While evolutionary innovation is critical to sustaining and enhancing shares of mainstream markets, revolutionary breakthroughs lie at the core of wealth creation. In fact, by definition, revolutionary innovations serve as the basis of future technologies, products, services, and industries. The term 'disruptive innovation' has been used to describe innovation that is highly revolutionary or discontinuous in nature in which customers and consumers embrace new paradigms in favour of the old.

Examples of disruptive innovations include the lightbulb industry's disruption of the candle industry, the desktop computer industry's disruption of the mainframe computers, the DVD industry disrupting the VHS industry and so on. Any marketing strategy for a high technology product must take into consideration the following differentiating features of a high technology product:

- High technology product purchase is usually high involvement inducing because the perceived risk is greater.
- There is limited or no choice available for high technology products.
- The analysis for high technology is at product level (as compared to the low technology analysis at brand level).
- The focus of a high technology product is on problem solution whereas the focus of a low technology product is on brand attributes.
- The communication for a high technology product should have high information content.
- A high technology product may involve some amount of a push strategy for communication, promotion, and distribution.
- The existing distribution channels might not be sufficient for a high technology product. They evolve over a period of time. Further, high technology products have short channels to

facilitate manufacturer control and ensure the quality and usage during the initial market launch.

- Demand pull brings in revenue for a low technology product whereas technology push brings in revenue for a high technology product until it reaches mass markets.

Marketing implications and challenges in high technology industries

In the earlier sections, we discussed some distinguishing characteristics of high technology industries such as high degrees of market and technological uncertainties, competitive volatility, high R&D expenditures, rapid obsolescence, and the presence of network externalities. These characteristics imply that marketing must be adapted and modified to effectively handle the resulting complex marketing environment. Further, since high technology firms are primarily engineering or product-oriented, they exhibit a culture in which engineering knowledge is valued more than marketing acumen. This necessitates the identification and discussion of specific challenges faced by marketers of high technology products. Product Launch The first issue that is relevant to product launch in high technology markets relates to the understanding of the difference between the manager's and the customer's perspectives. The manager's perspective in a high technology industry is usually product-oriented.

The adherents to this view believe that customers do not know what they want, are unable to articulate desires or are not knowledgeable about the products they seek. In the Indian context, as discussed in a later section, an energy-efficient furnace developed by The Energy Resources Institute (TERI) can be considered as a technological breakthrough in the grey cast iron melting furnaces.

Although higher energy efficiency translates to a reasonable payback on investment, there are barriers such as prevailing practice, investment barrier, etc., which inhibit a faster rate of adoption of the new technology. Several authors have suggested that high technology markets, unlike low technology markets, must focus on both demand-side and supply-side marketing.

Based upon the belief that supply can create its own demand, supply-side marketing appeals to new product developers who follow a product orientation. In practice, however, the supply-side so dominates the demand-side that the needs of the consumers are ignored in strategy development.

However, the history of technology is full of examples that contradict this notion. Sony's BetaMax, considered by many to be a better machine, lost the market to the VHS format videocassette player largely due to not meeting the needs of consumers. Similarly, Philips' Compact Disk Interactive (CD-I) entertainment system was billed as a major technological breakthrough for consumers as it combined the television and audio compact disc technology in an interactive system. However, sales of the CD-I system were disappointing largely due to the errors at the product launch in not focusing on the profiles of innovators and early adopters.

Also, product readiness and availability is of prime importance in launching high technology products. A popular example is of Apple Computers which introduced Newton, a hand-held message pad computer promoted as a "personal digital assistant".

The personal digital assistant was a new product category in pocket size combining wireless electronic communication with file management and handwriting recognition capabilities. Although Apple claimed that its Newton could recognize handwriting, send faxes, and receive wireless messages, during the launch, it could not send wireless messages or receive faxes and was not particularly adept at handwriting recognition. Thus, Newton was not a "complete product" which contributed to its failure in the market.

Diffusion of Innovations and its Role in High Technology Diffusion In the context of marketing, diffusion is a special type of communication in which messages regarding innovation, or something new, are sent from the creator to the members of the population. The diffusion process consists of four key elements: an innovation, the social system on which the innovation impacts, the communication channels of that social system, and time. The main focus of diffusion theory

has been on the means by which information about an innovation is disseminated through the social system.

Segmentation Issues in High Technology Markets Research by Parasuraman and Colby shows that technology readiness (TR) is a key factor in the adoption of innovative products and services. TR refers to the propensity to adopt and embrace technology in home life or work. It reflects a set of beliefs about technology. Although explained primarily in the context of high technology consumer products, the concepts of TR can be highly predictive of the speed of technology adoption and level of usage of technology in all kinds of high technology markets.

TR is multi-faceted with some factors being contributors and others being inhibitors. The contributors include:

- Optimism: The degree to which one believes in the inherent benefits of cutting-edge technology such as offering convenience, time flexibility, mobility, and stimulation.
- Innovativeness: The tendency to experiment with new technology including gathering information and influencing others. The inhibitors include:
- Discomfort: A perceived lack of control over technology including a desire for assistance and a preference for simplicity.
- Insecurity: Concern about the safety, security, and privacy of technology as well as a need for assurance that it is working properly.

Diffusion of an industrial innovation: a case-study of an energy-efficient furnace

Background of the Foundry Sector in India and the Efforts by TERI There are about 5,000 grey iron foundry units in India most of which are in the small-scale sector. Foundries melt pig iron and scrap to cast them into useful shapes. Some common items produced by foundry units are manhole covers, sanitary pipes for buildings, water pipes for municipalities, hand-pumps and water pump-sets, electric motor bodies, automotive parts, and industrial items.

A majority of the small-scale foundry units employ cupola for melting. Cupola is a vertical-shaft furnace using coke as fuel. A blower supplies air for combustion of the coke into the furnace. Correct quantity and pressure of the combustion air and its distribution are crucial to ensure efficient combustion. Most of the operating cupolas have been designed and fabricated by local fabricators (or mistries) having little formal technical knowledge. This results in inefficient combustion and higher energy consumption.

In order to showcase an energy-efficient cupola design to small-scale foundry units, TERI set up a demonstration plant consisting of an energy-efficient cupola design called the divided blast cupola (DBC) at a foundry unit in Howrah. After successful demonstration, the challenge was to replicate the technology among the other foundry units. The market research and promotion activities conducted to disseminate the technology, the barriers encountered, and alternative marketing strategies being adopted are summarized below.

Market Size Determination A foundry unit would replace its existing cupola by an energy-efficient cupola only if the payback on investment, through coke saving in its operation, was found to be attractive. Hence, an analysis to estimate the size of foundry for which the payback on investment will be attractive was made.

High technology marketing decided to target this segment first. A longer-term strategy for replication was to establish a rapport with the initial adopters of the technology and develop them as industry mentors. Successful diffusion of the technology would then depend upon managing and using the industry mentors for replication at the cluster or regional level. A study of the lead users, that is, those cupola owners who have been attempting refitment and refinement procedures to the basic cupola to improve energy efficiency, would also be helpful for future dissemination of the technology.

Only three foundry units, two from Coimbatore and one from Rajkot, signed up immediately following the cluster level market promotion activities. Some factors that prevented greater number of foundry units from adopting the technology were felt to be the following:

- Barrier due to prevailing practice: Conventional melting furnace was well-entrenched in the units. Since an existing furnace has a life of about ten years, most entrepreneurs were reluctant to discontinue the usage of their old furnace and build a new one especially since it involved higher cost and time commitments.
- Limited in-house technological capability: Most foundry units have limited technological capability to evaluate and absorb new technologies and hence are apprehensive of managing change to new operating practices.
- Investment barrier: The new technology required higher upfront investment compared to conventional technology. Small-scale units are very cost-sensitive and typically look for first-cost minimization options rather than life-cycle costs.

High technology marketing keting research study to assess the marketing potential of the new technology in India.

A representative eight-step procedure for conducting such a study is provided as follows:

- management decision problem
- marketing research problem
- research design
- sampling design
- contact methodology
- field work and data collection
- data preparation and analysis
- report generation

Following Malhotra's framework for marketing research problems, the management decision problem for such a study could be defined as: Should we promote the DBC technology further or not? Its associated marketing research problem(s) could be to assess the marketing potential of the DBC technology in India, and, if the potential is found attractive, to provide marketing strategy formulation for the dissemination of the technology.

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