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A comparison of marketing approaches used by high-tech firms: 1985 versus 2001

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Abstract

The authors present a follow-up to a study conducted in 1985 that investigates the use of marketing approaches used by high-tech firms. The firms were surveyed to determine if their use of marketing approaches has changed. The 2001 study confirms the emergence of Web-based marketing approaches as of particular importance to high-tech firms. The findings should serve as a reference for practitioners to assess their marketing efforts and to evaluate the change in tactics used to market high-tech firms.

Keywords: Marketing; High tech; Web-based marketing; Marketing strategy; Promotional strategy

1. Introduction

The last two decades of the 20th century have witnessed a marked growth in the use of marketing techniques in high-tech industries (Davidow, 1988; Davies & Brush, 1997; Davis, Fusfeld, Scriven, & Tritle 2001; Easingwood & Koustelos, 2000; Grunenwald & Vernon, 1988; Lynn, Schnaars, & Skov, 1999; Meldrum, 1995; Miller, 1989; Shanklin & Ryans, 1987; Smith, Sinha, Lancioni, & Forman, 1999; Traynor & Traynor, 1989, 1992, 1994, 1997; Wheeler & Shelley, 1987). While high-tech companies have historically relied on their unique technological advantage to remain competitive, the firms have found that it is becoming more and more difficult to maintain a competitive edge through technological advantage alone (Davidow, 1988; Davies & Brush, 1997; Davis et al., 2001; Smith et al., 1999; Traynor & Traynor, 1989, 1992, 1994, 1997; Wheeler & Shelley, 1987). Be that as it may, high-tech firms have been experimenting with alternative marketing approaches and enlisting marketing talent to aid in their competitive effort on the buying and selling battlefield (Davidow, 1988; Easingwood & Koustelos, 2000; Grunenwald & Vernon, 1988; Nuzum, 2001; Smith et al., 1999). Some executives have accepted this change in focus, viewing similarities in the task of marketing high-tech products and services to that of marketing designer clothing, beer, and rock concert tickets. Other executives perceive the task of marketing high technology more traditionally, emphasizing technical superiority or exclusivity (Davies & Brush, 1997).

Another important change that has opened opportunities and challenges to everyone is Web-based marketing. Web-based sales were $48.3 billion in 2001, representing an annual growth rate of 45.9%, and are expected to grow to over $108 billion by 2003 (Shim, Eastlick, Lotz, & Warrington, 2001). The Internet is becoming an accepted way to purchase all types of goods and services with some types of buying and selling being more appropriate for high-tech firms (Herbig, Samli, & Wills, 1997; Ward & Lee, 2000). Herbig et al. (1997) suggest that the emergence of the Internet and electronic communications has changed the traditional marketing transactional process by allowing customers to enter into direct communication with technical support personnel and thereby reducing the reliance on the technical backgrounds of the high-tech salespeople. The Internet brings the buyer and seller closer

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together and is especially well suited to high-tech companies (Herbig et al., 1997).

Inasmuch as there has been growth in the use of marketing techniques, and high-tech firms are beginning to venture into the unknowns of the Internet, broadcast, and print media for their heretofore "better mousetrap" offerings, there is a growing need for assessment of the efficacy and suitability of marketing approaches. Given the dearth of research on the use of marketing approaches by high-tech firms, the focus of this study is to investigate the use of marketing tools by high-tech firms and to ascertain the change in approaches over a 15-year period. This study reports the findings of a study conducted in 2001 as a follow-up to a study conducted in 1985. A comparison of the findings reveals trends in the use of marketing approaches by high-tech firms.

2. Methodology

A questionnaire was designed to gather information on the use of marketing tools by high-tech firms. Vice presidents of marketing and chief executive officers were asked to rate the importance of the following 13 marketing tools: product image (reputation), having state-of-the-art technology, personal selling efforts, having a strong service organization, price competitiveness, completeness of product line, reputation of the company's distributors, use of marketing research, advertising and media employed, creativity of the advertising message, having strong patent protection, employing a competent advertising agency, and Web-based marketing. Moreover, the executives were asked to rate the importance of 11 promotional tools: sales and sales management, advertising in trade magazines, trade shows, technical seminars/presentations, sales promotional materials, direct mail advertising, packaging, newspaper advertising, television advertising, radio advertising, and Web-based advertising.

Finally, a number of questions were designed to profile each high-tech firm: primary type(s) of business, firm's date of establishment, size of the firm in annual revenues, number of employees, percentage of the firm's business that was government contract versus commercial, percentage of the firm's business sold outside the United States, percentage of the firm's business restricted from being sold abroad because of national security and other trade restriction reasons, and percentage of revenue spent on advertising, R&D, sales, trade shows, and sales promotion.

The data were collected via questionnaires from vice presidents of marketing and chief executive officers of 500 high-tech firms. The firms were randomly selected from the top 10 ranked high-tech industries. These industries are designated "high tech" by virtue of their level of total R&D expenditures. Table 1 lists the top 10 ranked high-tech industries. The top 10 industries were identified in a paper prepared by Lester A. Davis, an economist with the Office of Trade and Investment Analysis, International Trade Administration, U.S. Department of Commerce (Davis, 1982).

Table 1
Top 10 high-tech industries based on total R&D expenditures

Guided missiles and spacecraft
Communication equipment and electronic equipment
Aircraft and parts
Office computing and accounting machines
Ordinance and accessories
Drugs and medicines
Industrial inorganic chemicals
Professional and scientific instruments
Engines and turbines and parts
Plastic materials and synthetic resins, rubber, and fibers

Ranked from highest to lowest.

The top 10 ranked industries ranged in R&D expenditure from an average of 6 cents/dollar for the plastics industry to an average of 64 cents/dollar for the guided missiles and spacecraft industry. Given the average R&D expenditure of 3 cents/dollar for all manufacturing firms, the lowest high-tech firm included in this study had R&D expenditures of twice the national average. The firms were chosen from the Standard and Poor's listing of industrial manufacturers. Only Standard Industrial Classification codes, which were designated as being among the top 10 industries, were sampled. A proportional, systematic random sample was generated by mailing 500 questionnaires to the high-tech firms. Nonrespondents were queried with follow-up mailings and, in some instances, telephone calls.

In the 2001 follow-up study, the original 164 firms were contacted and the original questionnaire was used. Of the original 164 firms that responded in the 1985 study, 126 firms were willing to participate in the follow-up study. Again, most firms included their return address so that the researchers were able to call nonrespondents to ascertain the reasons for their nonresponse status. The findings reflect a comparison between the original 164 firms surveyed in 1985 and the 126 firms willing to participate in the 2001 study. The *t* test is used to determine just how great the difference between the means of the 1985 and the 2001 samples is. Analysis of variance (ANOVA) is employed to access the size of firm differences. The data were tabulated and descriptive statistics were generated (SAS User's Guide, 1998).

3. Findings

3.1. Firm demographics

The average date of establishment of all firms was 1952 (8% were established before 1900, 26% were established in 1900–1945, 35% were established in 1946–1969, and 31% were established since 1970). The firms were categorized by annual sales revenue into three groups—below $10 million, between $10 and $99 million, and above $100 million. Ranging in size from $1 million to $12 billion in sales, the

largest firm in the survey employed over 10,000 employees, while the smallest firm employed only 6 people.

The respondent firms were reasonably distributed among the three categories, 37%, 37%, and 26%, respectively. Of the firms reporting, 63% of the firms' business were described as commercial, whereas 37% of the business were described as government contract work. Approximately 16% of the firms reported sales of their products outside the United States. When the high-tech managers were asked to report the percentage of their sales restricted from being sold abroad for national security or other trade restriction reasons, it was quite understandable that many of the firms did not respond. As one can imagine, this is a very sensitive question. But of those firms that did respond, they reported that on the average 8% of their sales were restricted; this ranged from 0% for many to 100% restriction for some. The average firm in the study reported a R&D expenditure of 12 cents/dollar, representing a R&D expenditure of four times the national average.

Given the fact that the same firms were surveyed, the firm demographic data collected during the 2001 study did not significantly depart from the demographic data collected during the 1985 study. There was, however, a migration of firms from one size category to another. In particular, after 15 years of corporate growth, numerous firms moved from the smaller size category to a larger size category. A number of firms in the below $10 million in sales had either gone out of business or grown into the next category, the $10–99 million category. Similarly, several firms migrated to the above $100 million category. Another significant change was the percentage of firms that reported an increase in the percentage of government contract work. This percentage rose from 37% to 44%.

3.2. The 2001 study

Table 2 reports the use of marketing tools by high-tech firms in the 2001 study. In Table 2, product image (reputation) once again emerged as the most important marketing approach used by high-tech firms followed closely by personal selling as the second most important marketing tool. Interestingly, state-of-the-art technology dropped to third in importance in the 2001 study. With the inclusion of a question regarding the use of Web-based marketing, this tool emerged as the fourth most important tool. Having a strong service organization ranks fifth followed by price competitiveness. Surprisingly, the creativity of the advertising message was ranked higher than in the 1985 study, ranking more important than the use of marketing research. Advertising-related variables were rated as much less important to the high-tech marketers. Having strong patent protection was relegated to the least important marketing tool in the 2001 study.

Again in the 2001 study, ANOVA results suggested that the size of the firm appeared to be a distinguishing factor in numerous aspects of the analysis. Product image (reputation) was viewed as significantly more important among the large firms ($F = 10.46$, $P < .001$). Personal selling efforts were ranked more important by the large firms in comparison with the small and medium-sized firms. The respondents from the medium-sized firms rated state-of-the-art technology less important than the small and large firms. Price competitiveness was rated more important as a marketing tool for the large and medium-sized high-tech firms, while the small firms rated price competitiveness as a less important marketing tool.

Completeness of product line was perceived as more important by the medium-sized and large firms, with the small firms rating completeness of product line as less important. Perhaps the small firms possess the perception that they have limited capability, while the large firms, more

Table 2
A statistical comparison between marketing tools used by high-tech firms in 1985 and 2001

Marketing tools	Size of firm							
	All firms		Below $10 million in sales		$10–99 million in sales		$100+ million in sales	
	1985	2001	1985	2001	1985	2001	1985	2001
Product image	6.2	6.6	6.3	6.4	6.1	6.5	5.7	6.7[a]
Personal selling efforts	6.0	6.5[a]	6.3	6.3	5.8	6.3[a]	5.5	6.7[a,b]
Having state-of-the-art technology	6.1	6.2	6.2	6.2	5.7	5.8	6.2	6.1
Web-based marketing	n.a.	6.1	n.a.	6.2	n.a.	6.0	n.a.	6.3
Having a strong service organization	5.6	5.7	5.5	5.5	5.6	5.4	5.5	5.5
Price competitiveness	5.3	5.4	4.9	4.9	5.4	5.4	5.5	5.8[a,b]
Completeness of product line	5.2	4.9	4.8	4.8	5.5	5.5	5.0	5.0
Reputation of company's distributors	4.5	4.8	4.6	4.5	4.4	4.3	4.2	4.2
Creativity of the advertising message	4.0	4.8[a]	4.1	4.1	4.5	4.5	3.0	4.9[a,b]
Use of marketing research	4.3	4.6	4.3	4.5	4.1	4.1	4.4	4.7
Advertising and media employed	4.3	4.5	4.7	4.7	4.3	4.3	3.2	3.9[a,b]
Employing a competent advertising agency	3.4	3.5	3.3	3.0	3.4	3.4	3.0	3.0
Having strong patent protection	3.7	3.2[a]	3.2	2.9	3.2	2.7[a]	4.7	3.8[a,b]

Scores range from 1 (*not important*) to 7 (*important*).
[a] $t < 0.05$.
[b] $P < .001$.

than likely, have more resources at their disposal to enable them to provide full service. The firms with sales of over $100 million did not rate advertising as important as the small and medium-sized high-tech firms. The importance of the creativity of the advertising message was viewed differently by the firms: the large firms rated the creativity of the advertising message as quite a bit more important than the small and medium-sized firms that rated the importance as only 4.1 and 4.5, respectively, on a seven-point scale. The small high-tech firms rated the choice of advertising media as significantly more important than the large high-tech firms.

Surprisingly, having strong patent protection was not rated as an important marketing tool; however, when comparing small and medium-sized versus large high-tech firms, a statistically significant difference was found between the former and the latter, with the $100+ million high-tech firms perceiving having strong patent protection as being a more powerful marketing tool. Firm size did not appear to be a factor in the ratings of the use of marketing research, strength of the firm's service organization, employing a competent advertising agency, and reputation of the firm's distributors.

Table 3 reports the use of promotional tools by high-tech firms in the 2001 study. Again, sales and sales management activities were rated most important followed by advertising in trade magazines and by participation in trade shows. The inclusion of a question in the 2001 study directed at Web-based advertising demonstrates that Web-based advertising has become an important promotional tool, ranking fourth among the 11 promotional tools.

Table 3
A statistical comparison between promotional tools used by high-tech firms in 1985 and 2001

Promotional tools	Size of firm							
	All firms		Below $10 million in sales		$10–99 million in sales		$100+ million in sales	
	1985	2001	1985	2001	1985	2001	1985	2001
Sales and sales management	5.6	6.1[a]	5.2	5.8[a]	5.2	5.7[a]	6.2[b]	6.2[b]
Advertising in trade magazines	4.9	5.4[a]	4.9	5.4[a]	4.9	5.2	4.6	5.3
Tradeshows	4.8	5.2	5.0	5.4	4.1[b]	4.9[a,b]	5.0	5.1
Web-based advertising	n.a.	5.1	n.a.	5.5	n.a.	4.7[b]	n.a.	5.0
Technical seminars/ presentations	4.8	4.8	4.7	4.7	4.8	4.8	4.8	4.8
Sales promotional materials	4.5	4.7	4.0	4.0[b]	4.8	4.9	4.5	4.6
Direct mail advertising	4.4	4.6	4.4	4.8[a]	4.2	4.4	4.3	4.3
Packaging	2.9	3.4[a]	2.5	2.5[b]	3.0	3.6[a]	3.1	3.1
Newspaper advertising	1.6	1.9	1.4	1.4	1.4	1.8	1.9	1.9
Television advertising	1.2	1.3	1.2	1.2	1.4	1.5	1.2	1.4
Radio advertising	1.1	1.0	1.1	1.1	1.2	1.2	1.0	0.9

Scores range from 1 (*not important*) to 7 (*important*).
[a] $t < 0.05$.
[b] $P < .001$.

When asked to evaluate the use of promotional methods, the executives from the large firms in the 2001 study rated sales and sales management as significantly more important in comparison with other promotional methods than the medium-sized and small high-tech firms ($F = 7.26$, $P < .001$). In addition, the importance of participation in trade shows was rated less important as a promotional tool by the medium-sized firms than by the small and the large firms ($F = 2.64$, $P < .001$). The medium-sized firms rated Web-based advertising as of lesser importance to their promotional efforts ($F = 3.47$, $P < .001$). Sales promotional materials were ranked of greater importance to the small firms ($F = 6.72$, $P < .001$).

Packaging was rated of lower importance by small firms ($F = 8.42$, $P < .001$). The large firms used newspaper advertising significantly more than the medium-sized and small firms; however, the overall importance given to newspaper advertising by all firms was not rated high. An analysis of the importance of advertising in trade magazines, technical seminars/presentations, direct mail advertising, radio, and television advertising did not reveal any statistically significant size of firm differences.

3.3. A comparison of 1985 and 2001 studies

A comparison of mean differences between the 1985 and the 2001 studies reflects a change in thinking by the high-tech executives. A statistical analysis of the comparison between marketing tools used by high-tech firms in 1985 versus 2001 revealed several significant differences. In Table 2, product image was viewed as more important by the executives from the large high-tech firms surveyed in the 2001 sample (6.2 and 6.6, respectively). Personal selling efforts were perceived as significantly more important by the executives from both the medium-sized and the large high-tech firms. Price competitiveness was viewed as important by the executives from the large high-tech firms in the 2001 sample. The marketing tool of creativity of the advertising message grew in importance between the two studies, increasing from 3.0 in the 1985 study to 4.9 in the 2001 study as judged by executives in large high-tech firms. The executives from the large high-tech firms perceived the advertising media employed to be more important in the 2001 sample. The executives from all high-tech firms, particularly large high-tech firms, devalued the importance of having strong patent protection in the 2001 survey. Finally, Web-based marketing tools were ranked fourth by the high-tech executives in the 2001 survey, being ranked at 6.1 in perceived importance. Web-based marketing tools were not listed on the 1985 survey.

A statistical comparison of the perceived importance of promotional tools used by high-tech companies revealed several significant departures between the rankings in the 1985 and 2001 studies (Table 3). Sales and sales management tools grew in perceived importance, increasing from 5.6 in 1985 to 6.1 in the 2001 study. These differences were statistically significant for the executives in the medium-sized and large high-tech firms. Advertising in trade magazines grew in importance as judged by the high-tech executives from the small high-tech firms. Participation in trade shows became significantly more appealing to the high-tech executives from the medium-sized high-tech firms. Direct mail advertising emerged as more important to the high-tech executives from the small firms in the 2001 study. Similarly, packaging grew in importance to the executives from the medium-sized high-tech firms. Various advertising media—newspaper, television, and radio—did not change in perceived status. Finally, Web-based advertising emerged as the fourth most important promotional tool as perceived by the high-tech executives in the 2001 survey. Again, this option was not available in the 1985 survey.

4. Conclusions

High-tech companies are facing the ongoing challenge of competition by adapting organizationally and philosophically to the marketplace. It is clear that the marketing efforts of high-tech firms are as important, if not more important, than the reliance on state-of-the-art technology. Product image (reputation) has grown in importance since the 1985 study. High-tech marketing executives are placing more emphasis on marketing activities that create a well-known brand image. Sales and sales management and a strong service organization continue to play a major role in the competitive battle. With the development of the Internet, Web-based activities have grown in importance. Some firms have indicated that as much as 40% of purchasing and selling are conducted on the Web. Web-based marketing approaches have brought the buyer and seller closer together, enabling technical knowledge to be omnipresent. Moreover, more firms view creativity in the advertising message as a way to differentiate their company from competitors. There appears to be an acknowledgement that, even in highly technical fields, the presentation of the message tends to separate firms from the competition. In addition, price competitiveness has emerged as more important in the 2001 survey for at least the large high-tech firms.

The primary promotional weapons used by high-tech marketers appear to be sales and sales management, advertising in trade magazines, trade shows, Web-based advertising, technical seminars/presentations, and use of sales promotional materials including direct mail advertising.

It appears that high-tech marketing firms are continuing to develop effective marketing programs and to explore various alternative marketing plans. Marketing efforts have gained momentum during the last two decades of the 20th century. The new millennium should begin a more serious investigation of the most effective marketing tools and promotional mixes to assist high-tech firms in realizing their goals. It is hoped that this study provides some directions for practitioners and opens avenues for further investigation to achieve the most effective balance between technological differentiation and marketing savvy.

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