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The International Marketing Strategies of New England High-Technology Firms

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INTRODUCTION

American industry's patterns of international marketing strategy are changing. Attention has focused on export growth product lines, and differential industrial and geographic penetration achieved by U.S. business in their international marketing efforts. Among our industries with rapidly growing overseas sales are the high technology industries.

The high technology industries which operate in the New England states include companies of widely ranging sizes, competing in activities at varying stages of their life cycle and with varying degrees of differentiation. Certain New England high technology companies have aggressively emphasized international marketing, and have achieved extraordinary foreign sales growth and profitability, while other companies with outwardly similar characteristics have not. This research seeks to examine certain aspects of international marketing strategy, and study more specifically the relationship connecting international marketing strategy, foreign sales performance, and overall corporate performance. If the data indicate that certain international marketing strategies are associated with above-average foreign sales performance and overall corporate performance, we shall present possible reasons for this association.

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The research reported here represents an exploratory study; depending on the results, the study can be extended, and hypotheses refined. For the present, secondary sources on publicly-held companies were the sole basis of data-gathering; companies to constitute the potential sample were drawn from the membership of the Massachusetts High Technology Council and national stock exchange listings.

RELATED RESEARCH FINDINGS

Research findings relevant to high technology industries' international marketing strategies have been summarized by McGuinness and Little (1981). They review evidence that new products have achieved superior export performance, usually after selling well in the home market (Hufbauer 1966; Stobaugh 1968; Wells 1969). They also cite studies which show that managers place low priority on developing export markets. Managers tend to rate export markets as risky, unprofitable, volatile, and difficult to enter (Abdel-Malek 1974; Tookey 1964; Kacker 1975). Motivation to initiate international marketing may come from within the firm if managers feel their product line has a technological advantage (Tesar 1975), or it may come from outside in the form of an unsolicited foreign order (Simpson and Kujawa 1974; Hackett 1973).

The form of international marketing strategy chosen depends on characteristics of the firm such as size, breadth of product line, etc. (Stopford and Wells 1971), and on characteristics of the product such as familiarity, engineering complexity, and distribution channels through which it will pass (Niedel 1971.)

The cited studies emphasize the firm's longitudinal evolution of strategy. In contrast, the present study is cross-sectional, and captures the companies in various phases of their strategic evolution. Because of that difference, the present study examines relationships which the others do not address directly. It seeks linkages between international marketing strategy and overall corporate performance.

RESEARCH DESIGN

This study analyzes the nature of international marketing strategy adopted by a small sample of New England firms in high-technology industries, studying the outcomes associated with such strategy choice.

Variables of interest are the level and growth rate of foreign sales, the nature of international marketing commitment, and the profitability of overall operations. This study also assesses whether greater or lesser commitment to international marketing is associated with greater corporate success overall.

While approximately a hundred companies were initially identified, sufficiently complete data for the purposes of our analysis could be gathered for only 39 companies.

The data were derived from published publicly available sources, namely annual and quarterly reports and 10-K reports. Raw data were collected for the following variables:

- Total Sales
- Net Assets
- Return on Equity (ROE)
- Return on Assets (ROA)
- Average Share Price
- Earnings Per Share (eps)
- Foreign Sales
- Foreign Profits
- Foreign Assets, and
- Degree of Commitment to International Marketing
i.e., use of exporting vs. foreign sales subsidiaries vs. foreign manufacturing arrangements.

These data were collected for the period 1976-79, a period following a recession and indicating the growth phase of the business cycle, yielding a total of 36 variables. Key elements of these data are as follows: mean sales \$319 m (1979) vs. \$172 m (1976); mean ROE 22.5% (1979) vs. 14.1% (1976); mean foreign sales \$84 m (1979) vs. \$48.5 m (1976).

The sample thus consists primarily of medium-sized companies with average sales for 1979 having nearly doubled from the average 1976 level. The range of firms covered is wide with small firms being represented. The companies on the whole are quite profitable, with an average return on equity higher by 50% from the 1976 level. The sample companies also have considerable foreign involvement, with approximately 25% of total sales being derived from abroad, a proportion that has not changed much over the 4-year span.

Annual rates of change were derived from the raw data and formed the basis of analysis presented in this paper. An important reason for this procedure is that autocorrelation is considerably reduced, and the spurious correlation that might surface is suppressed. It is interesting to note that the growth rate of total sales and that of foreign sales accom-

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pany one another. In 1979, for example, total sales grew at 35.1% while foreign sales grew at 30.7%. This fact, together with the information that foreign sales as a proportion of total sales was relatively constant indicates that the foreign sector was not appreciably more or less dynamic than the domestic sector. It is possible, then, that the nature of international marketing strategy has some influence on the performance of the foreign sector, as well as on the overall business.

This point leads to the principal focus of the study. The question we seek to investigate is whether the nature of international marketing strategy adopted is crucial to firm success in the high-technology industries. In other words, we are seeking to establish a correspondence between the performance of these 39 firms and the international marketing strategies they adopted. Such a statement of the research problem clearly ignores other, perhaps more important, factors affecting performance.

Perhaps the most important of the other factors is product attributes, incorporating technology. The firms with technologically superior products should reap handsome rewards. In fact, technology could influence both the growth of total sales and the growth of foreign sales. However, we might reason that above and beyond technology there should be some association between international marketing strategy and overall performance. It is this latter line of reasoning that guides the analysis in this study.

To analyze the question as posed, one needs to specify variables that measure firm performance and variables that measure international marketing strategy and results. For our purposes, success is measured as growth in total sales, growth in earnings per share and growth in average share prices. Naturally, these three indicators of success are inter-related, being different facets of a basic underlying factor. The success variables are (for the period 1976-79):

- 1) Average annual growth in sales.
- 2) Average annual growth in earnings per share.
- 3) Average annual growth in average share price.

The three success variables measure success from slightly different viewpoints. Growth in total sales is an internal management perspective, being related to the size of the firm, its market leadership and market power. Growth in earnings per share is a measure of success from the standpoint of shareholders; while growth in average share price also covers the comparative risks of firms within an industry and takes into consideration the opportunity earnings of alternative investments, a more global view of success. The international marketing variables are:

- 4) the importance of foreign sales measured as a proportion of total sales, annually, averaged for 1976-79,
- 5) average annual growth rate of foreign sales (1976-79),
- 6) the total number of foreign subsidiaries.

This information is available in the 10-K reports under the segment information disclosure; however, disclosure is required only if the segments exceed 10% of total sales, hence a majority of the sample does have a reasonable threshold level of foreign involvement. We also seek to categorize the nature of international marketing strategy, with the two styles being a) exporting and the establishment of foreign sales subsidiaries, and b) the establishment of foreign manufacturing facilities. (Initially, exporting and the establishment of foreign sales subsidiaries were to have been separated as two distinct strategies; however, sample size for the exporting category turned out to be too small, forcing the combination of these two categories into one.)

This classification of international marketing strategies is broad; it ignores joint ventures, exclusive distributorships, piggy-back ventures (using a larger company's sales force abroad), etc., because disclosure requirements do not cover these arrangements. Also, international marketing strategy involves many more dimensions than mode of entry. The results presented must accordingly be considered indicative only, and must be interpreted with some circumspection.

To summarize, we explore the relationship between two strategies of international marketing: a) exporting and foreign sales subsidiaries and b) foreign manufacturing; and several international marketing outcomes: 1) foreign sales growth; 2) foreign sales to total sales (%); and 3) number of foreign subsidiaries, as well as several overall firm performance indicators: 1) average growth of total sales; 2) average growth in earnings per share; and 3) average growth in share price.

RESULTS

Exhibit 1 summarizes the results of a comparison of the means of the key international outcome variables and overall firm success variables when the total sample is divided into two groups on the basis of their choice of foreign manufacturing or foreign sales subsidiaries as the mode for international marketing. Exhibit 1 shows that statistically significant differences are found for the number of subsidiaries and for the average growth in share prices. The foreign manufacturing group has

an average of 12 subsidiaries vs. 4.6 for the group using exports and foreign sales subsidiaries. Also, the foreign manufacturing group had significantly lower growth of share prices, with 45% appreciation vs. a 66% growth for the foreign sales subsidiaries group. Differences were also observed on the other variables, with the foreign manufacturing group exhibiting a lower rate of growth of foreign sales, 27% vs. 34%, and a lower rate of growth in earnings per share, 30 vs. 46%; of course, the lower percentage rate of growth may arise because of the higher base of foreign sales in the firms with foreign manufacturing. As for the lower growth rate of eps, this may be the result of other factors in the domestic markets that have not been considered here. One must note however that we are dealing with a homogeneous group of New England manufacturers who are presumably faced with similar economic environments. Continuing, one notes that the foreign manufacturing group has a slightly higher proportion of foreign to total sales, 28.5 vs. 25%, and a slightly higher rate of growth in total sales, 35 vs. 32%. To summarize, while the differences in the latter group of variables are not significant, they might be pointing to a diminishing returns effect that begins once international business exposure has gone beyond a certain point. We might speculate that distance costs (Caves 1971) outweigh the returns from international marketing beyond a certain exposure level. Clearly, the small sample size limits the inferences that can be made from the findings, while certainly underlining the need for examination of these issues with a larger, national sample.

Exhibit 2 summarizes the regression results examined, with overall success variables as defined earlier, measured annually, being the dependent variables. As can be seen, the international marketing variables are most closely related to growth in total sales, less so in relation to growth in earnings per share, and least of all where growth in average share price is concerned. This finding is in line with the fact that the three dependent variables represent a gradual and greater incorporation of external (to the firm) perspectives of success. Since the international marketing outcome measures are firm-specific, they are less associated with externally oriented performance variables. The major inference to be made from Exhibit 2 is the association between the international marketing measures and overall firm performance. That is, while Exhibit 1 has shown limited effects of the choice of strategy in international marketing, Exhibit 2 seems to show that the existence of international marketing contributes to overall firm performance, with perhaps a too great emphasis on international marketing actually resulting in somewhat reduced returns (Exhibit 1). Again,

caution must be exercised in making generalizations from a small sample; the findings are suggestive in raising questions for future research.

Exhibit 3 consists of tabulations of each of the international marketing outcome variables and the overall firm performance variables against the two modes of international marketing isolated in this study, namely, foreign manufacturing and foreign sales subsidiaries or exports. The outcome variables have been grouped into three groups in each case, and it is remarkable that in no case is there any relationship between international marketing strategy. Statistical measures such as the chi-square, Cramer's V were calculated and were statistically not significant for each of the five tables in Exhibit 3. The implication of this finding is that not only are the average levels relatively unaffected by the choice of strategy, but that the distribution of the outcome variables are also relatively unaffected by the choice of foreign manufacturing or foreign sales subsidiaries in international marketing strategy.

CONCLUSIONS

This exploratory study has presented a model specification which addresses the relationship between international marketing strategy, international marketing outcomes, and overall corporate performance. The results show that the existence of an international marketing commitment is beneficial to overall corporate performance for the firms in the sample. However, the test of the hypothesis that mode of international marketing strategy influences performance turns out to be inconclusive. Present data are not able to differentiate conclusively between the international marketing strategies employed and their incremental contribution to firm performance. A larger data base and more detailed model specification would allow for more refined testing, and might identify relationships between mode of entry and performance depending on product characteristics, years since entry, number of competitors, etc.

In terms of future research then, the following steps are warranted:

a) Extend the data base to include variables that capture product characteristics such as the technology factor, through indications of levels and growth of R&D spending, number of research employees, new product introduction, etc.

b) Increase the number of firms in the sample, to cover more New

England high-technology firms as well as national firms outside the New England area, which would facilitate comparisons of experience.

Secondly, given that international marketing strategy seems important for total growth, it remains to be seen how this international marketing strategy emerged. The experience with exporting and foreign business among U.S. firms has been that it is the larger firms that account for the vast proportion of U.S. sales abroad. Hence, one needs to consider embryonic high-technology companies also to discover their international marketing strategies and the implications thereof.

Such consideration of strategy indicate that field-level case study and interview-based research among firms are necessary. Interviews with key international marketing executives are necessary to uncover data on strategy formulation, attitudes to international marketing, preferences in the organizational structure possibilities of foreign marketing arrangements, and day-to-day problems in policy implementation. Appendix 1 provides information on the sample companies studied, and one striking feature is that nearly all of them have foreign sales subsidiaries concentrated in Europe, and about half have foreign manufacturing subsidiaries.

It seems clear that international marketing strategy is helpful to overall business growth. Implementation of these findings suggests helping small high-technology companies without international business experience get involved in foreign selling by providing them with information about successful paths adopted by similar larger companies in their industry.

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EXHIBIT 1

T-Test Results, Comparisons of Means of Key Variables

GROUP 1 - Foreign Manufacturing		GROUP 2 - Exports and Foreign Sales Subsidiaries		T - TEST			
VARIABLE	NUMBER	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB	
NOSUBS	NO OF SUBSIDIARIES						
	GROUP 1	19	12.0526	8.383	1.923		
	GROUP 2	20	4.6000	3.455	0.773	5.89	
						0.000	
AVGRFRSL	AVERAGE GROWTH RATE OF FOREIGN SALES						
	GROUP 1	14	0.2671	0.166	0.044		
	GROUP 2	16	0.3429	0.250	0.063	2.28	
						0.143	
AGFRXTSL	AVERAGE OF FOREIGN TO TOTAL SALES						
	GROUP 1	19	0.2853	0.152	0.035		
	GROUP 2	18	0.2542	0.213	0.050	1.95	
						0.170	
AGRSL	AVERAGE GROWTH RATE TOTAL SALES						
	GROUP 1	19	0.3449	0.213	0.049		
	GROUP 2	20	0.3199	0.153	0.034	1.93	
						0.164	
AGREPS	AVERAGE GROWTH RATE EPS						
	GROUP 1	18	0.3029	0.505	0.119		
	GROUP 2	20	0.4568	0.548	0.123	1.18	
						0.740	
AGRASP	AVERAGE GROWTH RATE SHARE PRICES						
	GROUP 1	15	0.4500	0.335	0.087		
	GROUP 2	14	0.6594	0.638	0.170	3.61	
						0.023	

EXHIBIT 2

Regression Results
Independent Variable Coefficients

Dependent Variable:	Growth in Foreign Sales	Foreign Sales/Total Sales	Constant	R ²
(%)	79	78	77	
Growth in Total Sales 79	.73	.09	.01	.79
Growth in Total Sales 78	--	.58	.004	.75
Growth in eps, 79	1.06	.22	-.05	.72
Growth in eps, 78	.52	.52	.33	.53
Growth in average share price, 79	2.42	-.20	-.22	.50
Growth in average share price, 78	--	.94	-.23	.34

EXHIBIT 3-1

AVG. GR. RATE OF FOREIGN SALES BY INT. MKT. STRATEGY

	I<20% ND 40%	BET 20 A ND 40%	>40%	ROW TOTAL
	1	2	3	
EXP OR FOR SALES	4	7	5	16
FOR MFG	3	9	2	14
COLUMN TOTAL	7	16	7	30
	23.3	53.3	23.3	100.0

EXHIBIT 3-2

AVG. OF FOREIGN TO TOTAL SALES BY INT. MKT. STRATEGY

	I<19% ND	BET 19 A ND	>33%	ROW TOTAL
	1	2	3	
EXP OR FOR SALES	8	6	4	18
FOR MFG	5	8	6	19
COLUMN TOTAL	13	14	10	37
	35.1	37.8	27.0	100.0

EXHIBIT 3-3

AVG. GR. RATE OF TOTAL SALES BY INT. MKT. STRATEGY

	I<26% ND 39%	BET 26 A ND 39%	>39%	ROW TOTAL
	1	2	3	
EXP OR FOR SALES	8	7	5	20
FOR MFG	7	7	5	19
COLUMN TOTAL	15	14	10	39
	38.5	35.9	25.6	100.0

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EXHIBIT 3-4

AVG. GR. RATE EARNINGS PER SHARE BY INT. MKT. STRATEGY

	I<30%	BET 30 A	>45%	ROW
	I	ND 45%	I 2 I 3 I	TOTAL
EXP OR FOR SALES	I 5 I	I 7 I	I 8 I	I 20
FOR MFG	I 7 I	I 7 I	I 4 I	I 18
COLUMN TOTAL	12	14	12	38
	31.6	36.8	31.6	100.0

EXHIBIT 3-5

AVG. GR. RATE SHARE PRICES BY INT. MKT. STRATEGY

	I<26%	BET 26 A	>50%	ROW
	I	ND 50%	I 2 I 3 I	TOTAL
EXP OR FOR SALES	I 3 I	I 4 I	I 7 I	I 14
FOR MFG	I 6 I	I 4 I	I 5 I	I 15
COLUMN TOTAL	9	8	12	29
	31.0	27.6	41.4	100.0

APPENDIX 1

HI TECHNOLOGY SAMPLE CHARACTERISTICS

NO.	NAME OF FIRM	INDUSTRY	NATURE OF FOREIGN INVOLVEMENTS
1	Alpha Industries	Elec. Comm. Sys.	Disc Exports
2	Amicon	Med. Prod.	Mfg. in Ireland; Distributors Europe wide; Lab., Warehouse in Netherlands
3	Analog Devices	Electr. Meas. Devices	Sales Subsidiaries in Europe; Mfg. in Ireland, England
4	Analogic Corp.	Precision Computer Products	Foreign Subsidiaries, Distributorships and Exports
5	Augat, Inc.	Integrated Circuits	Mfg. in France, Switzerland; Marketing Subs. in Europe
6	Baird Corporation	Analytical Instruments	Sales/Service Subs., Europe, Brazil

APPENDIX 1

HI TECHNOLOGY SAMPLE CHARACTERISTICS

NO.	NAME OF FIRM	INDUSTRY	NATURE OF FOREIGN INVOLVEMENTS
7	Barry Wright	Data Processing Accessories	Subs.--W. Germany, Canada
8	Compugraphic	Photocomposition Devices	Mfg. Ireland; Subs. W. Germany, France, Mexico; Distribution
9	Computer Vision	CAD/CAM	Wholly-owned Subs., Europe
10	Data General	Mini-computers	20+ Foreign Subs., 100% owned inc. Europe, Brazil, Ireland
11	Data Terminal Systems	Electronic POS Systems	Subs.: Europe, Ireland, Puerto Rico (PR)
12	Digital Equipment	Mini-computers	25+ Subs. including Europe, Brazil, Ireland
13	Dynatec Corporation	Communication, Bio-Med. Products	Mfg.--U.K. Marketing Subs.--Europe, Malaysia, Singapore, Hong Kong
14	E. G. & G.	Energy	14+ Subs. including Europe, Brazil, Mexico, Venezuela, Egypt
15	Electronics Corporation	Electronic Controls	4 mfg. subs. incl. PR
16	Foxboro	Instrumentation/control systems	7 mfg. subs. incl. Europe, Brazil, Mexico, Venezuela
17	G.C.A.	Capital equipment - semi-conductors	Exports: 2 subs., Japan, Switzerland
18	Gen. Rad.	Electronic Test Equipment	7 100% owned subs.
19	Haemonetics Corporation	Blood processing machines	4 European sales subs.; and distributors
20	Helix Technology Corporation	Cryogenics	2 foreign distributors
21	High Voltage Eng.	Electronic Components	5 foreign subs. - Europe
22	Instrumentation Labs.	Sc. instruments	4 mfg. subs. - incl. PR; and 5 sales subs. - Europe
23	Ionics, Inc.	Elec-chem. Processes	3 foreign subs.
24	Itek Corp.	Optical/elec. tech.	Mfg. + Sales Subs.
25	A.D. Little	Consulting	11 foreign subs. - Europe, Brazil
26	M/A Com.	Microwave Comms.	7 foreign subs. - Europe
27	Millipore	Fluid-processors	16 foreign subs.; mfg. in France, Puerto Rico
28	Modicon/Gould	Programmable Controllers	34 foreign plants
29	New England Nuclear	Radioactive chem.	3 foreign subs.
30	Orion Research	Sc./bio-med. Instr.	2 subs. incl. PR.
31	Prime Computer	Computers	8 foreign subs. incl. PR.
32	Raytheon Co.	Defence	19 subs.

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APPENDIX 1

HI TECHNOLOGY SAMPLE CHARACTERISTICS

NO	NAME OF FIRM	INDUSTRY	NATURE OF FOREIGN INVOLVEMENT
33	Sprague Electricals	Capacitors	7 foreign plants
34	Technical Operations	High tech. prod.	2 foreign subs. - Europe
35	Teradyne	Semi-conductor test equipment	6 foreign subs. - Europe
36	Thermo-Electron	Pollution Control	5 Foreign Subs. incl. Brazil; Mfg. in U.K.
37	Unitrode	Semi-Conductors	5 Subs. incl. Ireland
38	Valtec	Fiber Optics	Exports
39	Waters Assoc.	Analytical Instruments	10 Foreign Subs., incl. PR

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