Marketing & Technology: A Strategic Co-alignment-A Case Based Study

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Abstract : Firms in high-technology markets are growing at twice the rate of the economy as a whole and have generated significant returns for their shareholders in recent years. Despite the rapid growth and profit earning capability of the market, firm performance varies and even in the same sector. In the perspectives of the developed nation characterized by technology intensive markets, it has found that three critical capabilities of the firm namely marketing, Research and Development (R& D) and operations that influence the performance of the firms. In the context of India, marketing activities are still neglected in the technology driven organizations. The paper aims to address complex strategic issue of Marketing and Technology relationship in the context of liberalized Indian economy in which organization design parameters has played a pivotal role. The present research work examines the relative importance attached to different levels of three capability measures in respect of technological innovation of the firm in the specific sector as a case. The estimation of the relative importance of the attributes such as Marketing, R& D and Operations and also the relative importance of the different levels of different attributes is done through Conjoint Analysis.

Keywords : Marketing, Technology, R& D, Operation, Performance, Conjoint

1. Introduction

The business environment of the recent past has been characterized by turbulence. As a result, the growth prospects of a specific sector as well as the relative positions of the individual firms within that sector should be reassessed. The causes of such turbulence are numerous and interdependent, but it is now proved that a major engine of the unprecedented instability is technology.

In this research study, our aim is to examine the issues associated with management of technology and highlight some of the key factors involved in integrating technological consideration into the overall strategic marketing plan. To address this complex strategic issue of Marketing and Technology relationship in which organization design parameters has played a pivotal role, this research study

was taken in the context of liberalized Indian economy focusing on selected organizations of the specific sector. The objectives of the study is to defining and identifying technology as an economic good and then analyze the implications of technological change for firm behavior taking individual firm of that specified sector as a case.

2. Literature Review

Technology has been identified as the major driver of the unprecedented instability in the business environment in the last two decades (Capon, Noel & Glazer, Rashi 1987).

High technology market firms are growing at double the pace of the economy as a whole and have provided significant returns to their shareholders in recent past. Despite the exponential growth and profitability in the technology intensive markets, significant fluctuation is evident in the firms' performance, often within the same industry (Business week, 1998).

Past research indicates that external market factors had attributed variation in the inter-firm performance within a sector (Porter 1980, Montgomery and Wenerfelt 1988). Other related researches have attempted to explain inter-industry differences in research and development (R & D) investment and innovative performance after identifying the potentiality of the opportunity conditions across industries (Griliches 1984, Boulding and Staelin 1995).

The few existing detailed case studies of individual firms in high technology markets emphasize the role of R & D and manufacturing in enhancing firm performance (Iansiti and West 1997). The role of marketing was rarely acknowledged.

The conceptual framework developed by Dutta S, Narasimhan & Rajiv S (1999) has indicated three critical capabilities of the firm namely marketing, R& D and operations that influence the performance of the firms in the technology intensive market. The capabilities of the firm in the three verticals individually and jointly affect both demand side and supply side advantages and ultimately the firm performance.

A firm with strong marketing capabilities can identify and understand the customers' needs and expectations in a better way. Those understandings also help in understanding the factors that influence consumer preference and choice. Kodama (1992), Von Hippel (1989) and others pointed out that firm with superior market scanning capabilities has performed than others. With this thorough knowledge of the market, the firm will be able to achieve better targeting and positioning of its brands relative to competing brands. This higher level of product differentiation will enable the firm to increase the market share and also show

better financial performance (Kohli and Jaworski 1993, Day 1994).

R& D capability is critical to achieving superior performance in the technology intensive market for two reasons. High technology markets are characterized by shorter product life cycles and high rate of new product introductions incorporating new technology. A superior R & D capability with strong base of innovativeness will help the firm to satisfy both demand side effect, i.e., meeting aspiring consumer expectations as well as supply side effect i.e. outweighs the competitors. With this a firm can enjoy strong consumer loyalty (Givon et al. 1995). R& D expenditure is the most fundamental resource available to the firms for technological innovation. If all other things are being equal, firms with higher R&D expenditure should manage to absorb more technological advancement (Cohen and Levinthal 1990).

A strong operations capability in these high technology markets requires a complete integration and coordination of a complex set of tasks. Supply chain mechanisms should be so efficient that the final product will be delivered to the customers with desired requirements at competitive prices. Internal environment of the organization will also be fine-tuned to enhance the employee skills and imbibe dynamicity in the organizational culture. Thus, the more efficient a firm is in the technology market, the higher is the efficiency in balancing the demand and capacity. Iansiti and West (1997) suggest the crucial role played by operation in ensuring the successful implementation of innovations of developing new products. Srinivasan et al (1997) and Narasimhan et al. (2006) has emphasized on strong interdependency in between R &D and operation capabilities for high quality innovations. The challenges of the operations are mainly three fold: a) integrated product design for marketing b) increasing in productivity by optimizing the resources c) creating favorable internal environment for absorbing the change.

The three identified capabilities are also complements to each other. The interactions can serve in a better way to enhance the performance of the organization. Past studies (Gupta et al , 1987 Griffin and Hauser 1996) indicated that interaction between marketing and R &D can improve the firm's performance. Strong marketing network can provide the correct and necessary information from the consumer end to do the necessary innovations for improving the product. Strong interactions in between R & D and operations throughout the development process to ensure the successful commercialization of the technologies and products at a competitive price and also minimize the internal and external volatility (Hayes et al. 1988). Srinivasan et al. (1997) has pointed out the high complementary between marketing and operations capabilities to develop integrated product design for marketability and manufacturing.

The conceptual framework developed by Dutta S, Narasimhan, O. & Rajiv S, (1999) consider the firm's capabilities in marketing, R & D and operations

functions as well as interactions between them. All of them are critical drivers of competitive advantage in a specific sector.

Organizational Performance = f (Marketing Capabilities, R & D Capabilities, and Operations Cabilities)

To summarize, we can say, the firms' success in technology intensive market needs to address two things:

➢ The ability to come up with innovations constantly

➢ The ability to commercialize these innovations into the kinds of products that capture consumer needs and preferences.

To address the two issues in highly competitive technology intensive market, the capacity building in the three identified verticals are utmost necessary. A research gap exists in identifying the significance of the each operations and also mapping the level of importance of the attributes associated with each operations. This research study is highly industry as well as time specific. The dynamism of the industry varies from one to another and also with time. An attempt has been made in this study to explore the relative importance of the capability parameters for the absorption of technological change in an identified sector in the context of liberalized Indian economy.

3. Research Objectives

The paper is aimed to have an understanding of the impact of technological innovation on organizational capabilities.

The broad objective can be subdivided as follows:

• To explore the relative importance of the Capability Parameters for the absorption of technological change

• To estimate the relative importance attached to different levels of three functional capabilities in respect of their impact on the performance of organization and also the relative importance attached to each attribute.

4. Research Methodology

4.1 Research Aim- An attempt has been made to examine the issues associated with integrating technology into the overall strategic marketing plan.

4.2 Context of the Study- The paper aims to address complex strategic issue of Marketing and Technology relationship in the context of liberalized Indian economy in which organization design parameters has played a pivotal role.

4.3 Research Framework- Defining and identifying technology as an economic good and then analyze the implications of technological change for firm behavior taking individual firm of a specified sector as a case.

In our conceptual framework, three critical capabilities influence the performance of firms in high technology markets:

- ❖ Marketing
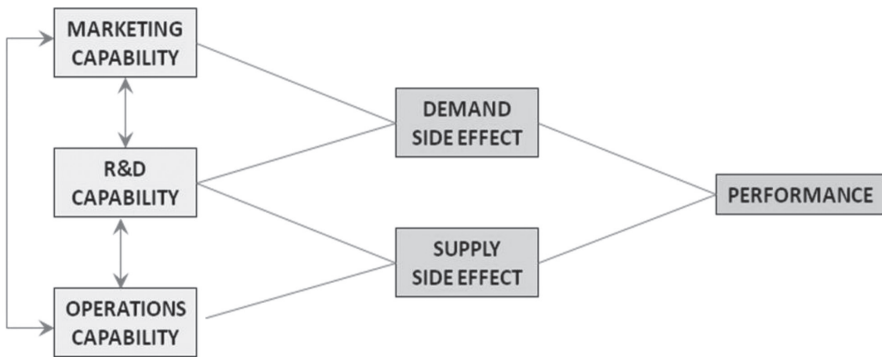- ❖ Research & Development
- ❖ Operations

Fig 1 Conceptual Framework of Firms' Capabilities and Performance

4.4 Research Design

The present research work examines the relative importance attached to different levels of three capability measures in respect of technological innovation of the firm in the specific sector as a case.

- ❖ Select Firm - Siemens India is a technology powerhouse that has stood for engineering excellence, innovation, quality and reliability.
- ❖ Sector - Electrification, automation and digitalization are the long-term growth fields of Siemens.
- ❖ Sources of Data - The three experimental units i.e. Marketing, R&D and Operations are taken into consideration and the key personnel are interviewed with structured set of questionnaire to get their perception in this regard.

4.5 Measurement Tools

The identified attributes and different levels of capability parameters taken in to

consideration for measuring technology branding. The perception of an individual regarding the possible combination of the attributes for measuring the readiness of accepting the technological change is considered as rating point (Rank).

4.6 Method

The estimation of the relative importance of the attributes such as Marketing, R& D and Operations and also the relative importance of the different levels of different attributes is done through Conjoint Analysis.

5.Analysis & Findings

The following Model has been constructed by incorporating the different levels of the Capability Parameters, such as, marketing capability, research & development capability and operations capability of the firm. The Coefficients associated with them are calculated by solving the following equation on the basis of observations on

$(Rank, T_1, T_2, B_1, R_1, R_2, D_1, D_2, P_1, V_1)$

$Rank = \beta_0 + \beta_1 T\_1 + \beta_2 T_2 + \beta_3 B_1 + \beta_4 R_1 + \beta_5 R_2 + \beta_6 D_1 + \beta_7 D_2 + \beta_8 P_1 + \beta_9 V_1 \ldots\ldots [1]$

Where $T_1, T_2, B_1, R_1, R_2, D_1, D_2, P_1, V_1$ are the levels of attributes and $\beta_1, \beta_2,$ ....are corresponding coefficients.

Table 1: Value of coefficients associated with the Levels of organizational Capability Parameters

Levels of Design Parameters	Value of coefficients associated with the Levels of Design Parameters		
	Experimental Unit I [Marketing]	Experimental Unit II [R & D]	Experimental Unit III [Operations]
Constant	9.000	10.000	13.000
T_1	5.000	5.500	6.000
T_2	5.000	2.500	4.000
T_3	-10.000	-8.000	-10.00
B_1	0.500	0.500	2.000
B_2	-0.500	-0.500	-2.000
R_1	-1.000	2.500	1.500
R_2	0.500	2.000	2.000
R_3	0.500	-4.500	-3.500
D_1	-1.000	-0.500	0.500
D_2	-0.500	0.000	2.000
D_3	1.500	0.500	-2.500
P_1	0.500	1.500	5.000
P_2	-0.500	-1.500	-5.000
V_1	2.000	2.000	4.000
V_2	-2.000	-2.000	-4.000

Based on the coefficients associated with the independent variables such as T_1, T_2, B_1, R_1, R_2, D_1, D_2, P_1, V_1 rescaled part-worth have been worked out (Ref Table 2). In this context, a scale is defined with the extreme values as 0 and 1.

Table 2 : Rescaled Part-worth corresponding to the different levels of the Capability parameters

	Part-worth Experimental Unit I [Marketing]			Part-worth Experimental Unit II [R & D]			Part-worth Experimental Unit III [Operations]	
	Original	Rescaled		Original	Rescaled		Original	Rescaled
T_1	5.000	1.000	T_1	5.500	1.000	T_1	6.000	1.000
T_2	5.000	1.000	T_2	2.500	0.777	T_2	4.000	0.875
T_3	-10.000	0.000	T_3	-8.000	0.000	T_3	-10.00	0.000
B_1	0.500	0.700	B_1	0.500	0.629	B_1	2.000	0.750
B_2	-0.500	0.633	B_2	-0.500	0.555	B_2	-2.000	0.500
R_1	-1.000	0.600	R_1	2.500	0.777	R_1	1.500	0.719
R_2	0.500	0.700	R_2	2.000	0.740	R_2	2.000	0.750
R_3	0.500	0.700	R_3	-4.500	0.259	R_3	-3.500	0.406
D_1	-1.000	0.600	D_1	-0.500	0.555	D_1	0.500	0.656
D_2	-0.500	0.633	D_2	0.000	0.592	D_2	2.000	0.750
D_3	1.500	0.767	D_3	0.500	0.629	D_3	-2.500	0.469
P_1	0.500	0.700	P_1	1.500	0.703	P_1	5.000	0.9375
P_2	-0.500	0.633	P_2	-1.500	0.481	P_2	-5.000	0.3125
V_1	2.000	0.800	V_1	2.000	0.740	V_1	4.000	0.875
V_2	-2.000	0.533	V_2	-2.000	0.444	V_2	-4.000	0.375

Note: $T_1+T_2+T_3 = 0$; $B_1+B_2 = 0$; $R_1+R_2+R_3 = 0$; $D_1+D_2+D_3 = 0$; $P_1+P_2 = 0$; $V_1+V_2 = 0$;

6. Discussions

The perceptions of individuals of each vertical regarding the relative importance of different levels of attributes of capability parameters are listed in the table 3. Then, relative importances as well as rank of each design mechanisms have been made for each individual.

Table 3 : Perceptions of Individuals on capability parameters

Group	Relative importance of different levels of Attributes of Capability Parameters
Experimental Unit I [Marketing]	T1-V1-D3-B1-R2-P1
Experimental Unit II [R & D]	T1-R1-V1-P1-B1-D3
Experimental Unit III [Operations]	T1-P1-V1-R2-B1-D2

Case -I

Estimation of Relative Importance of the Organizational Capability Parameters for Technology Adaptation [Based on Perception of Experimental Unit I (Marketing)]

Table 4 : Measures of relative importance of design parameters based on perceptions of Experimental Unit I [Marketing]

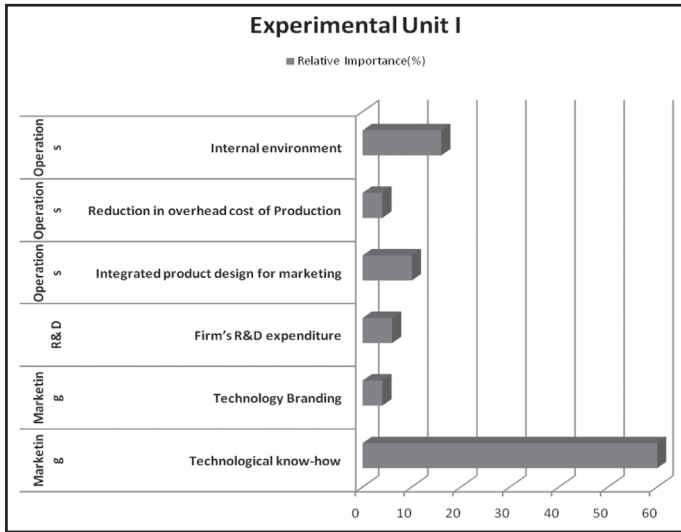| Design Mechanism	[Highest Utility - Lowest Utility]=Difference	Difference ÷ Sum	Relative Importance	Rank of Importance
Technological know-how	5.00-(-10.00) =15.00	15/25=0.6	60	1
Technology branding	0.500-(-0.500) = 1.00	1/25=0.04	4	5
Firm's R&D expenditure	0.500-(-1.000)=1.50	1.50/25=0.06	6	4
Integrated product design for marketing	1.500-(-1.000)=2.50	2.50/25=0.1	10	3
Reduction in overhead cost of Production	0.500-(-0.500) = 1.00	1/25=0.04	4	5
Internal environment	2.000-(-2.000)=4.000	4/25=0.16	16	2
Sum	∑Difference = 25.000			

Fig 2 Relative Importance (%) of attributes based on perception of Individual of Experimental Unit I [Marketing]

Case -II

Estimation of Relative Importance of the Organizational Capability Parameters for Technology Adaptation [Based on Perception of Experimental Unit II (R & D)]

Table 5 : Measures of relative importance of design parameters based on perceptions of Experimental Unit II (R & D)

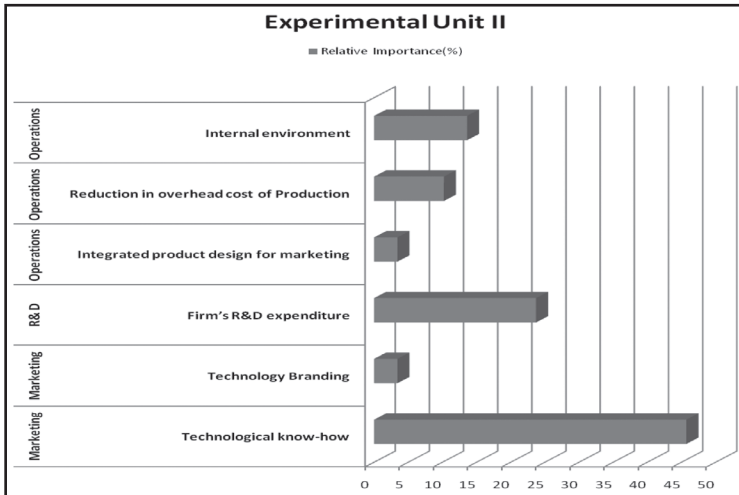| Design Mechanism	[Highest Utility - Lowest Utility]=Difference	Difference ÷ Sum	Relative Importance	Rank of Importance
Technological know-how	5.50-(-8.00) =13.50	13.5/29.5=0.457	45.7	1
Technology branding	0.500-(-0.500) = 1.00	1/29.5=0.034	3.4	5
Firm's R&D expenditure	2.500-(-4.500)=7	7/29.5=0.237	23.7	2
Integrated product design for marketing	0.500-(-0.500) = 1.00	1/29.5=0.034	3.4	5
Reduction in overhead cost of Production	1.500-(-1.500) = 3.00	3/29.5=0.102	10.2	4
Internal environment	2.000-(-2.000)=4.000	4/29.5=0.136	13.6	3
Sum	∑Difference = 29.500			

Fig 3 Relative Importance (%) of attributes based on perception of Individual of Experimental Unit II (R & D)

Case -III

Estimation of Relative Importance of the Organizational Capability Parameters for Technology Adaptation [Based on Perception of Experimental Unit III (Operations)]

Table 6 : Measures of relative importance of design parameters based on perception of Experimental Unit III (Operations)

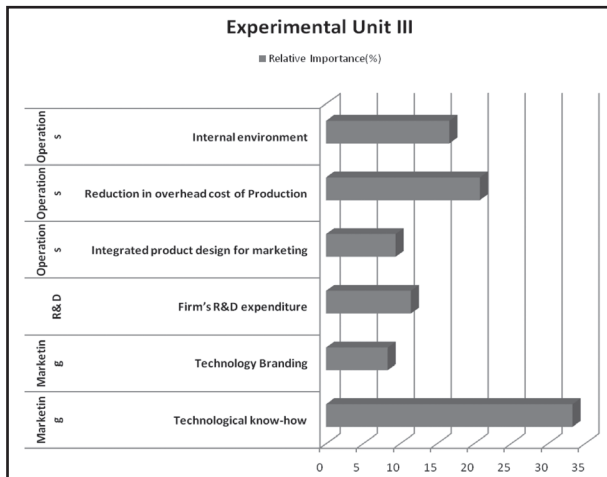| Design Mechanism	[Highest Utility - Lowest Utility]=Difference	Difference ÷ Sum	Relative Importance	Rank of Importance
Technological know-how	6.00-(-10.00) =16.00	16/48=0.333	33.33	1
Technology branding	2.000-(-2.000)=4.000	4/48=0.083	8.33	6
Firm's R&D expenditure	2.000-(-3.500)=5.500	5.5/48=0.114	11.4	4
Integrated product design for marketing	2.000-(-2.500)=4.500	4.5/48=0.094	9.4	5
Reduction in overhead cost of Production	5.000-(-5.000)=10.000	10/48=0.208	20.8	2
Internal environment	4.000-(-4.000)=8.000	8/48=0.167	16.7	3
Sum	∑Difference = 48.000			

Fig 4 Relative Importance (%) of attributes based on perception of Individual of Experimental Unit III (Operations)

Table 7 : Rank of Importance of Capability Parameters

Capability Parameter	Attributes	Rank of Importance (Relative Importance in %)		
		Experimental Unit I Marketing	Experimental Unit II R & D	Experimental Unit III Operation
Marketing	Technological Know-how	1 (60.00)	1 (45.70)	1 (33.33)
Marketing	Technology Branding	5 (4.00)	5 (3.40)	5 (8.33)
Marketing		(64.00)	(49.10)	(41.66)
R & D	Firm's R&D expenditure	4 (6.00)	2 (23.70)	4 (11.47)
R & D		(6.00)	(23.70)	(11.47)
Operations	Integrated product design for marketing	3(10)	5(3.4)	5(9.4)
Operations	Reduction in overhead cost of Production	5(4)	4(10.2)	2(20.8)
Operations	Internal environment	2(16)	3(13.6)	3(16.7)
Operations		(30.00)	(27.2)	(46.87)

Past research clearly indicated that the rapid growth and profitability is very high in technology driven markets but still there exists significant variation in the performance of the firms, often within the same industry. It was also indicated that the role of R& D and operations capability are greatly acknowledged in the literature but the significance of the marketing role is not so much getting importance.

The present research has attempted to understand the role of marketing, R & D and operations capabilities .towards organizational performance in the emerging technology driven market of India. The perceptions of three functional heads of Siemens India in the regard have been analyzed for the model development to validate the conceptual framework of firm's capabilities and performance..

The results show that marketing capabilities has its great importance. Marketing capability has its greatest impact on the innovative output for firms that have a strong technological base. As the Siemens India has a strong R&D base and that would lead to gain maximum benefits from a strong marketing capability. Marketing capabilities has increased the awareness of the wide applicability of the innovative products. On the other hand, a strong market orientation is one of the most fertile sources of ideas for innovation.

R& D capability is of moderate importance as the new innovations may not be the great challenge for the firm like Siemens but the main challenge is to commercialization of the innovative products that address the customer needs and preferences.

With the organizational capability framework, internal environment of the organizations i.e. organization design becomes a significant factor for the implementation of new technological process. It is quite true in the Indian environment where increase in productivity by the reduction of the overhead cost is a challenging task and also maintain a favorable internal environment for technology change. The societal perspective of technology innovation, up gradation and re- skilling of the employees has come up with major issues in the Indian context.

7. Conclusions

The paper contributes in the study of interrelationship between technology and marketing in the specific firm in the business environment of India. As the relationship is quite varies and complex, an individual organization study would lead to draw a roadmap for the future research in this regard. This study on Siemens India, a technology giant has given a clear idea regarding the critical success factors of the organizations in the technology driven markets. Marketing capability, a strong integration between marketing and R& D, integrated product design for marketability and favorable internal environment has identified as most critical success factors.

The present research is the part of ongoing research to explore the co-alignment of technology and marketing for the success of the firm in the Indian business context. We will consider more firms of varied sector to understand the complex strategic issue of technology-marketing relationship in our future study.

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