

## MARKETING IN HIGH-TECHNOLOGY FIRMS

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**Abstract.** This conceptual study addresses the marketing activities of high-technology firms with regard to their marketing approaches and the developing role of marketing as the firm grows. A review of the literature is utilised to assess the role of the marketing function and the importance of developing a marketing capability in high technology firms in order to generate sustainable competitive advantage. It is concluded, *inter alia*, that high technology firms should balance their technology perspectives with the important issues related to market dynamics.

**Keywords:** marketing, marketing orientation, marketing management, high technology firms.

**Jel classification:** M31

### 1. Introduction

The position of Marketing in high-technology (high-tech) firms and the development of their inherent marketing expertise have been the subject of an increasing corpus of research output over the past two decades (Traynor, Traynor 2004; Davis *et al.* 2001), although the marketing approaches of high-tech firms and their marketing orientation had been relatively ignored by commentators (Traynor, Traynor 2004). However, the contemporary economic importance of the dynamic development of high-tech firms in terms of their support for economic growth, productivity gains and their role in developing new industries (Grinstein, Goldman 2006) has contributed to a heightened research interest of late. Furthermore, as Bors (2009) notes, an increasingly knowledge-oriented society is demanding products and services that are technologically intensive, a factor which is attracting significant research interest. This paper contains an exploration of key aspects of marketing approaches in small- and medium-sized high-tech firms and their development of marketing activities as the firm grows.

High-tech firms can be characterized by their high level of technological and market uncertainty and volatility (Mohr 2001) and the increasing difficulties faced by these firms in sustaining competitive advantage through their unique technologies (Roberts 1992; Davis *et al.* 2001), or through their unique products or services. Market uncertainty, for instance, results in increased complexity with re-

gard to product and service innovation and increasingly high development costs complicates decision-making with regard to product and service pricing and advertising (Mohr, Shoostan 2003).

High-tech firms are most frequently established by individuals or groups who possess a high level of technical expertise and who, in their business activities, rely mainly on the development of new products, innovation, highly skilled employees, their trust in new products and their ability to identify gaps in the market-place (Murphy, Ledwith 2007; Oakey, Mukhtar 1999). High-tech firms typically have long lead times for research and development and application to industrial applications and short lead times for commercialization, thus leading both to comparatively high development costs, short product life cycles and the need for successive innovations (Grinstein, Goldman 2006; Oakey, Mukhtar 1999). However, technological goals, it can be argued, can only be transformed into competitive advantage through effective marketing as part of the firm's inherent capabilities. High-tech firms operate in a complex environment, for which sophisticated marketing skills are required – yet often their marketing competences and their ability to assess customer needs, for example are under-developed (Mohr, Sarin 2009). The key question is, what is the level of their skills and competences in economic and managerial disciplines, of which marketing is one, and how do these skills develop as the firm is established and grows in its identified market?

Marketing orientation, for example, is considered a relatively new direction in marketing thinking, which could, amongst others, provide insights into the current discrepancies between academic and practical levels of marketing knowledge, abilities and skills. De Luca *et al.* (2010) for example underline the importance of a businesses' market orientation. The status of the marketing function and the use of marketing knowledge in high-tech firms are in many cases linked to the ability of those firms to assess marketing performance in relation to the firms' success.

The aim of this paper is to assess the role of marketing and the interaction with other innovative processes within high-tech firms and the associated implications for management.

## 2. The marketing function in high-tech companies

Marketing as an activity is claimed to be one of the key functions of a business organization and is generally recognized by commentators as a key contributor to the sustained success of the business. Dutta *et al.* (1999) suggest, in adopting the Resource-Based View (RBV) (Barney 1991), various important marketing concepts and activities such as market orientation, market analysis and marketing strategy and planning are components of a firms marketing capability. This capability, Dutta *et al.* (1999) suggest, helps to deliver competitive advantage, owing to the difficulties competitors face in replicating the combination of resources utilised within the marketing function and its interactions with the firm's other strategically important activities.

The importance of marketing, it has been argued, lies in its contribution to creating and appropriating value from products and/or services (Mizik, Jacobson 2003), however the role of marketing in high-tech companies may be limited by a concentration on developing technological knowledge as opposed to developing marketing knowledge and on innovation as opposed to market orientation (Workman 1993); an issue which is addressed later in this paper.

Research relating to the organization of marketing activities within high-tech firms suggests that various models of marketing operations have been utilized by these organizations, depending on, for example the newness or the extent of internationalization of the company. In the case of new businesses, the presence of marketing competence, although desirable, is often not present in high-tech firms; such new businesses may have to depend on outside sources of marketing competence (Roberts 1992), for example through governmental

and non-governmental support agencies, consultants or professional marketing firms. In studying 138 new spin-off companies in the Boston area, he found a great deal of variance in the level of marketing knowledge held by their founders. He suggests that a post-founding essential is the development of marketing knowledge, organization and practices, a view supported by Prabhu (2005)

A further feature of new high-tech firms is the commonly held confusion between marketing and sales/distribution. Whereas both these latter functions are important, it is necessary for new high-tech firms to widen their perspectives to include the many other activities that are important in developing a market presence.

The development of a specialist marketing function it is more likely as firms expand in terms of scope and scale of operations. The presence of a marketing function does not in itself necessarily give rise to an increase in organizational performance; this depends to a great deal on how the marketing resources are marshaled in combination with other corporate resources. This utilization of resources will depend, for example, on management's ability to foster team working (Harris, Ogbonna 2001) and the integration of marketing resources across relevant corporate activities, a feature which is discussed in more detail below.

## 3. Characteristic features of high-tech products

High-tech products can be characterized by four typical features according to Viardot 1998):

- these products have the latest research findings and sophisticated technologies built into them (examples of such a complex of technologies include engineering, plasma techniques, multiprocessor computer architecture, recycling of nuclear flammables, etc.);
- the products are developed and rapidly replaced through new innovation (microprocessors are a typical example of such products);
- they are characterized by their innovative quality and value and bring radical changes in the product life cycle i.e. shortening the period between products being replaced by others;
- they are characterized by significantly high investment into research and development.

## 4. The utilization of marketing resources in high-tech companies

Within marketing, there exist a number of related but conceptually different procedures and practices which are a significant part of the marketing resource. Market orientation, for example, has attracted a good deal of research attention since the

publication of articles by Kohli and Jaworski (1990) and Narver and Slater (1990) who argued that key elements of market orientation were the acquisition, distribution and response of market information: more recently, the construct has been extended to include stakeholders (see, for example Helfert *et al.* 2002). A marketing orientation provides management with a means to focus on internal and external factors which affect company performance. An extensive literature positively linking marketing orientation and firm performance has evolved; see, for example Ellis (2006) for a review of the relevant literature.

A key feature of an external perspective that can impact internal processes is that of customer service. According to Mohr and Savin (2009) high technology firms' interactions with their customers are complex and/or unfocussed. Often this is due to the fact that customers find articulation of their needs complex owing to the technology and as a result, high-tech companies find it difficult to develop a competency in working with customers (Roberts 1992) and thus perhaps losing opportunities to gather market intelligence for product development (Reid, de Brentan 2004), as well as the provision of after-sales support.

While an external perspective is a crucial factor in developing marketing capability, internal aspects also require consideration, for example the organization of the marketing function, marketing strategies and how, for example, market intelligence gained from the external perspective can be shared with other functions, with R&D (research and development) and new product development, for example.

### **5. Evolving a marketing capability in high-tech companies**

A firm's marketing capability strongly influences the width of applicability of innovations i.e., a firm's marketing capability enhances its ability to generate innovative technologies that have applications across a range of industries". As Jaworski and Kohli (1993) explained, "A firm with a strong marketing – exhibiting superiority in identifying customers' needs and in understanding the factors that influence consumer choices behavior 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 enjoy higher margins".

As firms grow, so should its marketing capability through the acquisition of know-how and the engagement of specialised marketing personnel. However, making the transition between a technologically – driven organization to a marketing-

aware one is not without its complexities. As long ago as 1988, Shanklin and Ryans contended that firms can move from a technology-perspective to a marketing perspective by combining R&D and marketing capabilities. This can be achieved through the setting up of project teams or other infra-organizational structures. However, they warn against the development of animosity between R&D and marketing personnel, given their different cultures and often different strategic perspectives. Dutta *et al.* (1999) also advocate a cross-functional approach with marketing working alongside other specialist functions such as research and development, to both speed time to market and new product development. Thus they suggest that a strong interaction between technological and marketing capabilities of the firm not only favours the current product offerings but also paves the way for subsequent innovation through the utilization of market intelligence.

Oakey (1991) placed marketing in the innovation process itself arguing that a view of the market was essential in resourcing and evaluating the latter stages of innovation, including the launch of the product. It could be argued that this is a restrictive view of the role of marketing since the evaluation and resource allocation processes should be informed by at least relevant market intelligence. It has been argued by some that marketing should even be considered as an antecedent to the innovation process (Baker, Sinkula 2005; Gotteland, Boule 2006)

On the other hand, some firms have moved away from a functional organization structure and combined marketing resources with other sources in, interdisciplinary teams. Moller and Rajala (1999) for example, have suggested that many larger high-tech companies had dismantled traditional centralized marketing units in favour of highly inter-connected but separate organizational units. They further suggest that extent of internationalization, a common feature of even the newest high-tech companies, brings with it centralization versus decentralization decisions in addition to the geographic location of marketing and its operations and procedures

Borg (2009) favours a network approach to construct links and relationships between marketing and other organizational functions, noting the importance of personal relationships and social capital in fostering working relationships. The network approach can also contribute to the building of external relationships and also to the processes of segmentation, targeting and the positioning of high-technology products (Easingwood, Koustelos 2000).

A rather newer perspective, that of market driving as opposed to market-driven has emerged, particularly in the context of high-tech companies, see, for example Jaworski and Salway (2000). This takes marketing into a more proactive area of organizational processes, especially in the formation of marketing strategies discussed below.

## 6. Some factors inhibiting the development of marketing in high-technology companies

The initial innovation through which the business was created and the technological and engineering processes that brought the innovation to market has a huge impact on the development of the culture of the business; the result is often that R&D and engineering take precedence in the allocation of resources through commanding a higher status than marketing (Leonard-Barton 1992), thus inhibiting the possibility of developing marketing talent and expertise. A similar view is taken by Atrahene-Gima and De Luca (2008) who suggest that in high-tech companies, marketing has to strive for position and adopt strategies to influence decision-makers. In particular, within the new product development process, the interface between marketing and R&D can suffer due to the different cultures within the functions. As a consequence, Datta *et al.* (1999) suggest that high-tech firms often fail to provide adequate resources or support for marketing thus reducing its effectiveness in making a contribution to the firm's success.

Various commentators have addressed the difficulties that can face organizations in integrating their R&D and marketing capabilities. Li and Atrahene-Gima (2009) note the differing perspectives of engineers and marketers and support the engineering focus of the original founding carry a greater influence over what is seen as a less important need to market the firm's products.

## 7. Implications for practice

It is apparent that marketing is a critical capability in high-tech firms but it is a capability that depends on both the marketing resources utilised by the firm at the start-up stage and how these resources evolve during the firm's life-cycle. In particular, it is important for firms to recognise the critical nature of marketing and its relationship with the technological trajectories of the company.

In many new high-tech firms, marketing is part of all of the firm's departments, rather than being the concern of the marketing department only. Marketing oriented to the market and the customer emphasizes that the product's key factor lies in the value it gives to its user. Firms that are more orient-

ed towards the product's physical attributes, its logistics or financial profit tend to forget that the customer will buy their product only if that product resolves his problem. To be well-prepared and ready to enhance the customer's satisfaction is by far the best philosophy. The guiding principle is that all of the firm's employees including the management are involved in the process and are responsible for the quality of customer relationships. In high-tech firms, the customer should be the centre of attention and deserves attention at all times. This perception of marketing used by high-tech firms has brought considerable success (e.g. Silicon Graphics, Oracle, Canon, etc.).

The inter-relationship between marketing and R&D is not a straightforward managerial issue, for example, the integration of marketing with the new product development process. As Oakey (1991) suggests, marketing is seen by some high-tech firms as a mere "bolt-on" activity or as a 'necessary evil'. If the firm is to survive and even grow, the role of marketing should be given appropriate attention by senior management.

The effective use of marketing practices can also show good financial performance (Day 1994). Despande *et al.* (1993) reported, "This ability to obtain high quality customer feedback requires skills at monitoring the environment and building strong relationships with customers, which is complex understanding". According to Day (1994) once the capability is built then it cannot be copied or transferred easily because of its firm-specific characteristic and a high level of tact. Barnhill (1987) stated that little is known about the use of market and competitor research by the Canadian high-tech firms, for example. The issue here is that firms can take advantage of easily accessible customer data if they have the requisite marketing capabilities and insights.

Competitors' strategies make it more difficult as well as customer's expectations add more challenges for the managers to make decision about it. Because technological advances are occurring rapidly; offering both improved technological features and cost reductions. Customers are likely to form expectations based on rates of change and to use them in decision making. Customers may anticipate improved technology and also expect new products to have lower price. Failure to incorporate price expectations in estimation of customer response has been shown to result in miscalculation of price elasticity and leading to non-optimal pricing decision (Doyle, Saunders 1985).

As firms grow and the marketing function develops, it is necessary to consider the role and impact of the function in delivering competitive advantage. The design of a marketing strategy would

therefore seem important as part of the process of effectively marshaling marketing and other firm resources. Just as any other firm, high-tech firms develop their marketing strategy as part of their corporate strategy, which is designed by the executive management to match the identified aims and resources with market opportunities. Specific characteristics of high-tech technologies, however, lead them to also use other tools when developing their strategies. The development and definition of a mission is not marked by anything different or special, but the identification of strategic sectors (segments) is far more important and, from the strategy development point of view, great attention needs to be paid to the evaluation of the firm from the point of view of the contribution of their technologies and their positioning according to the technology's life cycle, linking technology with customer needs and customer groups.

Technical know-how is extremely important for the high-tech sector. Technology can be used as a powerful tool of differentiation between competitors. It is also important from the verification of market synchronization point of view, and it is also unavoidable from the point of view of the readiness for rapid changes in the high tech environment. It is also necessary to evaluate the innovative value of high-technologies from its competitive advantage perspective. The level of mastering future key technologies will certainly have very important competitive impact. After the corporate strategy regarding these key decisions has been approved, managers then can develop marketing strategies for marketing activities. This part of the process does not differ from traditional processes except that it must be integrated with high-tech industry specific characteristics in all of its elements.

The marketing strategy sets up a framework within which the firm's sales activities take place. Firms then develop suitable marketing plans, proceeding in a manner similar to that used for traditional products and services. The four basic steps are:

- *Situation analysis* – its objective is to identify both opportunities and threats; every marketing strategy must include marketing objectives, sales diagrams, profits (methods of their calculation) and target markets.

- *For each target market* the firm defines its *marketing mix*; product – includes also product testing, product portfolio scope management, modifications of existing products, formulation of brand name, developing product warranty and additional services; price – formulation of price policy from the point of view of competitors, customers, price elasticity, discounts, etc.; promotion – includes the identification of goals, selection of

- appropriate media for promotional, formulation of messages, developing advertisement messages, communication programmes; distribution – includes the selection of suitable distribution channels, monitoring distribution expenses; building effective programmes for distributors, etc.

- The development of *action programmes* depends on the fast occurring changes in the high-tech area, for that reason those programmes must be made to allow for their flexible adaptations. Action programmes correspond with the implementation of each individual element of the marketing mix.

- *The plan of monitoring procedures* (checks) should offer possibilities for a quick fix of the marketing strategy should one be needed. Bureaucratic businesses cannot survive on high-tech markets.

There is also need, perhaps, for high-tech firms to focus on marketing the product itself in terms of customer needs rather than producing elegant and cutting edge gadgets. (Thompson *et al.* 2005). But, as Dutta *et al.* (1999) have observed, marketing capability has its greatest impact on (quality adjusted) innovative output for firms that have a strong technological base. In other words, firms possessing a strong R&D base are the ones with the most to gain from a strong marketing capability.

## 8. Conclusions

This conceptual paper has emphasised the crucial role of marketing in high technology firms. Larger firms at least seem to develop a marketing capability as the organization evolves. However, it is also clear that many new high technology firms start without much marketing expertise unless the founder possesses some marketing experience. Marketing can be outsourced by new companies but at some risk. The key management implications are that the role of marketing and its association with the product command attention in all high-tech businesses but the format of the marketing process may differ.

Even with the development of a marketing capability, a significant challenge for management is to integrate this marketing capability with other organizational capabilities (R&D, new product development, strategic planning, etc.) in order to both maintain and sustain a competitive advantage. In high-tech industries in particular, the marshalling of tacit resources such as integration and know-how are key factors in sustaining an advantage in the market-place. A key role of management is to maintain a balance between technological and marketing priorities.

The successful integration of capabilities entails the recognition of the different organizational cultures that exist between the technology side of the business and marketing, especially where the founders do not have conclusions marketing experience. The development of a marketing capability depends on the development of marketing knowledge and talent, such development will be impaired if the marketing function lacks status and their efforts unrecognized by senior management.

The concept of market driving is particularly relevant to high-tech firms in that their innovations can change the nature of the markets and occasionally the industry. Market driving, in particular, requires significant market intelligence to be combined with innovative ability and there is now a significant literature supporting the integration of marketing with new product development, for example. As Roberts concluded, marketing should be integral with the innovation process for organizations to deeply these resources successfully. However, it seems from recent research in this area that this idea is still to be fully recognized.

This conceptual paper has set out the main arguments for the critical role of marketing in high-technology businesses. The aim of the paper also included the interaction of marketing with other innovative processes within high-tech firms and the associated implications for management. Both factors have been the subject of detailed discussions but it is the balance between marketing activities and the technological basis of the firm that often leads to difficulties of prioritization for management, particularly in the early stages of a firm's life-cycle. There are implications for policymakers here in assisting new high-technology firms to develop appropriate marketing competences.

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