Linking Technology with Market - An Exploration

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"Any business enterprise has two, and only two, basic functions: marketing and innovation. These are the entrepreneurial functions" – Peter F. Drucker

Abstract

Technology has been gaining importance as a competitive tool in the hands of enterprises, be it small, medium or large and across sectors, in manufacturing as well as services. Indian industry is also beginning to feel the pressures of technology-based competition, in domestic as well as global markets. Gaining an appreciation of the role of technology as a source of competitive advantage is no more an option, but a necessity. Conceptually, the competitive advantage resides at the intersection between technology *and the* market. *This paper is an exploratory attempt to uncover the nature of the interactions or linkages between the two at two levels viz. Business unit level and Development Projects level. The key challenge in the strategic management of technology is in aligning the* portfolio *of strategic postures at the business unit level with the* portfolio *of development projects in R&D.*

Key words *: Innovation, technology, strategy, development projects, project portfolio*

Introduction

Innovation is the off-spring of the marriage between technology and marketing. The Japanese invasion of the American automobile and consumer electronic markets in the 1970s was a stunning demonstration of the potent impact of the integration of technological knowledge with the market place understanding. This was also a striking reflection of the manifold levels and layers of interactions between technology function and marketing function. That the interface and the inter-linkages between technology and marketing can have deep implications – both strategic and operational, for any business, spawned a new area of study and practice called 'Management of Technology' (MOT) in the 1980s.

MOT has acquired greater importance, especially for firms engaged in technology – intensive competitive arena – be it information technology or bio-technology. Add to this new challenges arising out of trends such as globalization, time compression and technology integration, the need to gain a sound understanding of the issues and insights embedded in the space bounded by technology and market stands heightened (Narayanan, 2001).

The T-M space can be explored at two interrelated levels – at the business unit level and the (Technology & Product) Development Project level.

Drejer (1996) has classified the evolution of MOT over the last three decades into four schools of thought. The characterization of the scope of each school is presented below:

School of thought	Scope
R&D Management	Manage R&D resources
Innovation Management	Management of innovation in the entire company
Technology Planning	Manage technology across the company
Strategic MOT	Manage and integrate technology with other aspects of business

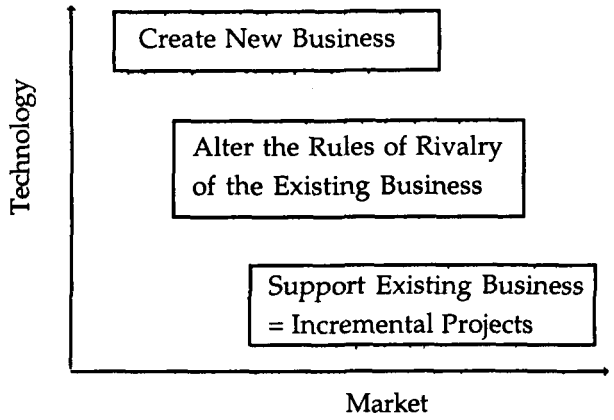
As far back as in the 60s, Ansoff & Stewart (1967) had opined that considerable attention had been directed to the problems of the R&D function such as organization, planning & control, budgeting, management of creativity etc. and that substantial literature existed for the guidance for the leaders of the R&D function. The authors had pointed out the deficiency in the manner the R&D function and its objectives were integrated with the corporate strategy. Even by the 80s, this gap

had not been adequately addressed, as pointed out by Kantrow (1980) when he reminded about the need for 'putting technology into strategy' and declared this as the 'unfinished business of the research literature'. This was, perhaps, the earliest reference to the concept of 'technology strategy'. At the heart of this concept is the integration between the technological capabilities and the competitive advantage in the market place. The interactions between technology and market are most evident in the Innovation Management School and the Strategic MOT School. Paul Trott (1998) traces the evolution of thinking within the innovation management school to conclude that the current state-of-the-art is a model of innovation wherein technology and the marketing functions interact and integrate their respective perspectives. This integration is accorded the greatest importance in the Strategic MOT School. Burgelman & Rosenbloom (1989) have proposed, perhaps, the most comprehensive and integrated framework which not only ties together the technology and business perspectives, but also addresses the execution dimensions such as modes of technology sourcing, development and technical support. This paper proposes to carry this integration forward by attempting a close-up view. It is aimed at the amplification of the interaction between technology and the market, in terms of how the postures at the business unit level are sought to be aligned with the *portfolio* of projects in R&D and also how this interaction manifests when the product is taken to the market. Section A deals with the interaction at the business unit level, Sections B and C deal with the same, at the Development Project and the 'Going to market' levels. The paper attempts integration in Section D and draws certain conclusions.

A. T-M Linkage at the Business level

The two key drivers of any business are technology and market. The nature of the linkages between the two and the resulting impact has been captured in Fig1.

Fig.1 Technology – Market – Business Level Drivers



Source: Adapted from Narayanan V.K. "Managing technology and innovation for competitive advantage", 2001, Pearson Education, New Delhi

A business enterprise, as it grows, encounters competitive pressures to which it responds in three fundamentally different ways:

1. Exploit new business opportunities by creating a new market
2. Try to change the rules of the competitive game and thwart the rivals , in the current markets
3. Defend its existing positions in the current markets

The resources and capabilities that the enterprise invokes to execute each of them would reflect a mix of technological and market knowledge and competence.

The business enterprise would have to develop a major technological breakthrough, in order to be able to open a new market. Motorola, in the 1970s, pioneered GSM cellular communication technology to usher in the mobile communication market. The company is also credited with technological breakthroughs in IC technology spawning new business opportunities for the firm. A less technologically dramatic innovation would be the 'Post-it Notes' developed by 3M which again created a multi-billion dollar market for the company. Research In Motion (RIM) is yet another recent example of a start-up which had broken new ground with its mobile

internet Blackberry 'Push' technology, to spawn new on-the-go applications for both individuals and businesses. The common thread knitting these examples is a deep commitment to technological competence and providing the technology function a major voice in strategic decision-making. This is, therefore, called a Technology-Push approach.

The same business enterprises would face very different challenges as the new product markets grow and mature over a period of time. The response to these challenges could be in the form of technological innovations which seek to change the basic rules of the game – the basis of the competitive advantage. Time to market or speed of new product development and cost, have been gaining significance as the new basis of competitive advantage in many industries. Globalization of R&D efforts and Business Process Outsourcing are the manifestations of these responses. These could be categorized as Value Chain technological innovations. For example, MOTOROLA is also credited with the development of 'Six-Sigma' as an approach to management of quality. Both technology and the market functions within the organization play a role in this endeavor.

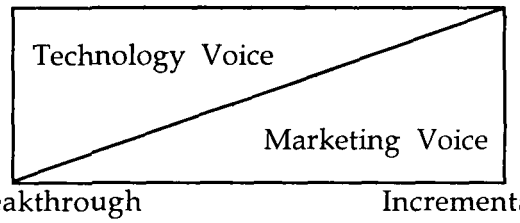
As the business environment matures further, the firms are increasingly pressured to defend the positions they had originally created in the markets. The response is to enhance the features and functionalities in the current product portfolio in order to maintain competitive edge. MOTOROLA has been under attack from followers such as Nokia in the mobile telephony markets. The response of the company has been to develop a range of products with new-fangled features. Here, marketing function tends to command a strident voice in strategic decision-making. This is known as the Market-Pull approach.

The three strategic responses, over the life cycle of the Product Market, exhibit different thrusts in terms of technology and market considerations. The intensity of the competitive pressures would have an important bearing on the effectiveness of the response. How do these firms execute these strategic responses? What is the mix of technological and market activities undertaken as part of the execution? We turn to these issues now.

B. Technology – Market Linkages at the Development Project level

The strategic choices – Create a new business, Change the rules of the game or Support or defend the current market positions, are implemented and manifest as development projects undertaken by R&D. These projects could be broadly characterized as technology development and product development. The former is considered a precursor to the latter. The product development projects seek to deploy the technologies already developed. These projects are, in a conceptual sense, again bounded by the same two overarching dimensions – Technology and Market. The relative emphasis between the two varies depending on the type of project. Even within the Product Development category of projects, it would be useful to distinguish between Breakthrough projects and Incremental projects. These, again, are characterized by varying degree of dominance of the Voice of technology and Voice of the Customer. This is depicted in Fig. 2.

Fig 2- Task Emphasis

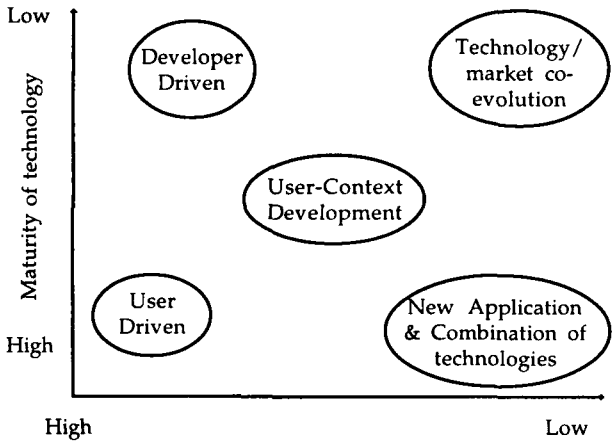


Source: Kasturi Rangan V. and Bartus K. "New Product Commercialization: Common Mistakes", HBS Note: 594-127.

A more concrete understanding the difference in the manner in which the projects are required to be executed, which also reflects the kind of linkages between the technology

and market functions is presented in the following matrix (Fig 3). This captures the degree of involvement of the developer versus the customer-user, across different settings characterized by the maturity of technology and the fit with the existing customers.

Fig 3- New Product Development on the T-M Matrix

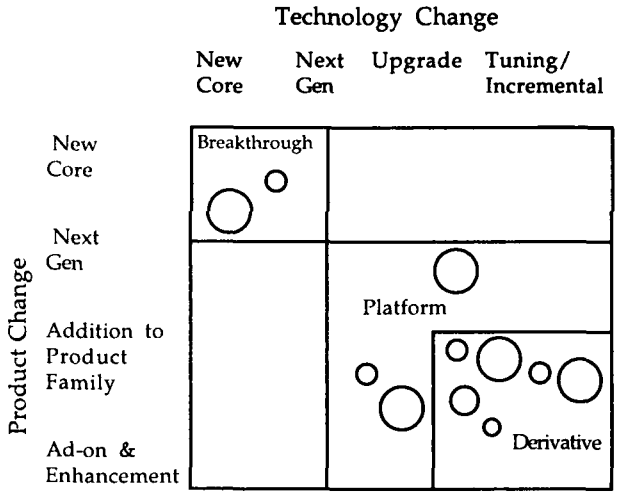


Source: Dorothy Leonard-Burton. 'Wellsprings of knowledge', 1995, Boston, MA. HBS Press.

As one can visualize, any established business would engage in, at any point in time, in a portfolio of product markets which encounter varying competitive pressures and hence strategic challenges. This translates into a corresponding portfolio of responses and, in turn, into a portfolio of development projects. Hence, the mix of development projects can be conceptualized as, once again, bounded by technology – market dimensions. The alignment between the portfolio of strategic responses and the set of development projects is a measure of the state of strategic preparedness which represents the ultimate depth of the linkage between the technological capabilities and the market opportunities and threats.

The following template serves as a useful tool to map the development projects in a manner that addresses the technology and market issues facing the company. This is portrayed in Fig. 4.

Fig 4 - Mapping the R&D Projects on degree of innovation



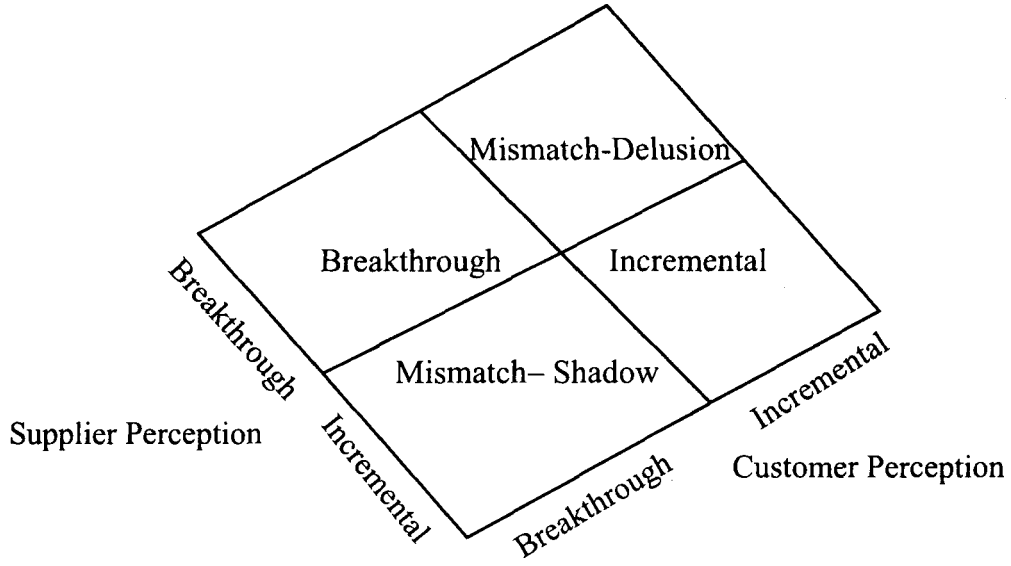
Source: Adapted from Steven C.Wheelwright and Kim B. Clark, "Creating Project Plans to Focus Product Development", Harvard Business Review, March-April, 1992.

The portfolio is examined for its balance in terms of various parameters such as resource requirements (the size of the circles in Fig4 represents this parameter), risk-reward trade-offs short-term and long-term perspectives etc.

C. Going to the market

When the development projects reach fruition and are ready for launch in the market, a challenge of a different kind is encountered. Interestingly, this situation can also be portrayed as a T-M interaction. Suppliers have a perception of the nature of the new product in terms of its degree of innovation – technologies, features and functionalities. The customers, when they are exposed to the new product, in the form of both communication as well as actual product experience, may or may not align with the supplier's perception. This affects favorably (if aligned) or adversely (if misaligned) the positioning of the product in the market place. This is captured in Fig. 5.

Fig 5-Perceptual Alignment

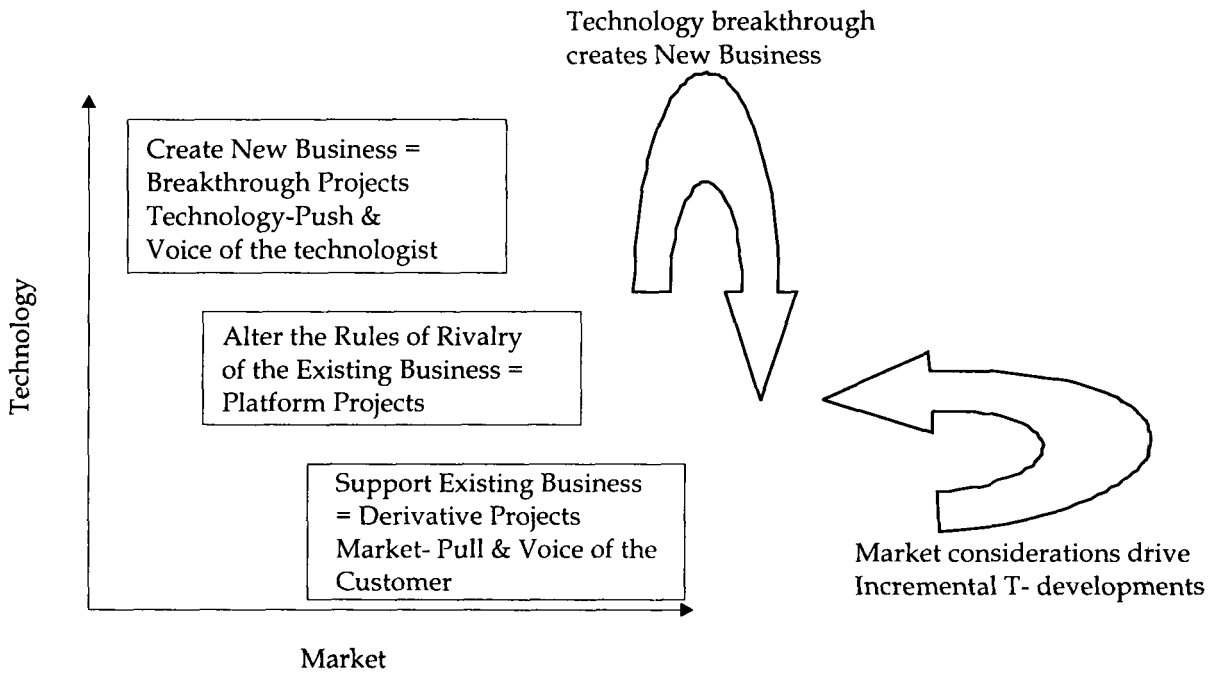


Source: Kasturi Rangan V. and Bartus K. 'New Product Commercialization: Common Mistakes', HBS Note: 594-127.

D. An Integrated Perspective

In this section we present an integrated perspective of the linkages between technology and the market, by pulling together the strands of discussion presented till now. This reflects the need for alignment between the portfolio of strategic postures and the corresponding portfolio of developmental projects. The integrated view also portrays the relative emphasis on the voice of technology versus the voice of the market, in supporting the decision-making process.

Fig 6- An Integrated Perspective of T-M Linkage



Conclusion

An exploration of the interac-tions and linkages had been attempted at two levels. At the first level, which is played out at the macro level, the T-M linkage enables the business to create new business opportunities, change the basic rules of the competitive game by altering the basis of competitive advantage and defend the competitive positions in the current product markets. The T-M mix varies across these three strategic postures – from technology –push to market-pull. At the micro level, which is enacted at the level of technology and product development, the portfolio of projects reflects the mix of T-M interactions – breakthrough projects, platform projects and derivative projects. The T-M mix varies across different types of projects. The idea of a portfolio of development projects serves as the link between the two levels of T-M interactions, by ensuring an alignment between the strategic postures adopted at the business unit level and the corresponding development projects through which the postures are actualized. Interestingly, the interplay between technology and the market is also reflected in the alignment or lack of it, between the perception of the supplier (breakthrough or incremental) and that of the customer.

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