

TECHNOLOGY STRATEGY

Technology strategy involves:

- The technological choices that firm make
- The criteria by which technologies are embodied into new products and production processes
- The organizational practices and managerial processes for the deployment of technological resources

Objective of technology strategy:

- Maintaining technological capabilities in existing business through the incremental improvement of products and processes.
- Expanding markets in existing business or launching new business through product and/or process innovation
- Securing distinctive technological capabilities from external sources (i.e., strategic sourcing)

Superior Performance Characteristics of Technology Strategy:

- Effective mechanisms are in place to integrate technology and business strategy
- Effective mechanisms are in place to coordinate the activities of technology-related organizations and work groups
- All affected functions are involve in the technology strategy formulation process
- The interconnections between key decision elements and the need to manage these elements as a collective entity are understood
- The appropriate skill mix is available to develop and implement strategies effectively. This means that the process is not dominated by technocrats and adequate levels of technical competence are found at the executive management level
- Clear responsibility for technology management is allocated
- Organizational structures are aligned to support the business and technology strategies identified
- Effective mechanisms are in place to commercialize new technology
- There is substantive characterization of core technologies and posture is defined with respect to each
- A long term understanding exists regarding how technology contributes to shaping the business
- Metrics are tied to strategic objectives and are recognized and accepted both within the technical function and throughout the business
- Clear criteria exist for make versus buy versus license out decisions
- Effective dual ladder (technical and generalist management) career progression systems exist
- A mix of individual and team rewards and incentives for entrepreneurial behavior exist
- There are clear links between project selection criteria and business and product line strategy
- Specialist are multiskilled and there is an awareness and respect of other functions, developed by systematic cross-functional assignments and job rotation
- There is regular assessment of technical capabilities and technology management processes via the benchmarking of products and processes
- There is a proactive long-term management of technology and technical functions
- Opportunities and threats are actively explored, using a well-developed network of customer, suppliers, universities, government agencies and rivals

DEVELOPMENT OF TECHNOLOGICAL CAPABILITIES

Technological capabilities refer to those technological assets possessed by a firm that have strategic significance, as well as the processes and practices by which these assets are developed and exploited.

A firm's core technological capabilities are composed of a set of differentiated skills (which reside in human capital), organizational routines (which operate at firm level), and specific assets (advanced manufacturing technologies, information systems, computer aided manufacturing, etc.) that underline competitive advantage (Hamilton, 1992)

A firm's technological assets may be developed by mechanisms:

- Introducing and diffusing a new technology
- Upgrading the technical skills and knowledge of employees
- Improving the organizational routines, structures, processes, and values through which work is performed
- Enhancing relationships with suppliers, customers, company affiliates, and other organizations

Organization's development of process technologies

1st phase: 5 stages:

1. Recognition of prototypes: the general state of knowledge is quite low and although it is possible to make a distinction between good processes and bad ones, intuitive judgments are relied upon, rather than scientific or analytical understanding
2. Recognition of attributes within prototypes: common properties and qualitative characteristics of processes are identified, and a distinction between processes based on these criteria can be made.
3. Discrimination across attributes: it becomes possible to distinguish between attributes, and more scientific approach to these distinguishing features emerges. It is also possible to communicate this knowledge, since it can be described in terms of measurable dimensions
4. Discrimination within attributes: characterized by the establishment of quantitative measurement and accurate theoretical bases and although full process control has not yet been established, the knowledge for doing so has been generated.
5. Local control of attributes: full control over stable processes has been achieved and process optimization through experimentation can be undertaken. However, the level of understanding required to solve problems successfully does not exist, although process control has been properly documented.

2nd phase: 1 stage:

6. Fine-tuning the system and developing and considering the reaction of the system to changes. These may be the market, technical, or economic change or any other forms of change to the input of a system. This stage involves developing the ability to understand and respond adequately to those changes.

3rd phase: 2 stages:

7. Remaining in control of the process under changing conditions. Computerized process control is an example of stage 7 knowledge, where sophisticated. automated code is able to anticipate and routinely respond in a programmed way to changing conditions. At this stage, automated process control is used to deal with normal contingencies, but people are still required to deal with unanticipated contingencies
8. Having complete understanding and knowledge of all possible contingencies. Stage 8 knowledge includes having programmed control systems that are able to deal with the fully described set of possible events.

4 inhibitors of technological capability development:

1. Entrenched short-term corporate mindsets
2. Failure to adapt to generational technological change
3. Failure to invest in product and process improvement (firm complacency)

4. Disestablishment of design teams (reassigning teams to other tasks)

Technological capabilities development: via diffusion and adaptation

Technology transfer:

... the process of movement or transfer of information, technical know-how, and people among corporate technical function such as R & D, engineering, and manufacturing, and nontechnical function such as marketing and sales in order to yield innovative products and services that meet corporate business goal and fulfill customer needs.
(Hamilton, 1992)

Barriers to effective technology transfer: technical and attitudinal

Characteristics of American firms:

- A belief that inventing new technology is a necessary and sufficient condition for gaining competitive advantage
- A lack of appreciation for the importance of speed in delivering products to the marketplace
- Excessive emphasis on R & D activity at the end of product life cycles rather than developing new areas
- Lack of balance between research and application
- Inadequate links between R & D and the marketplaces

Reasons for failure in the transfer of technology:

- Inadequate understanding of the role of technology within business strategy and the dynamic nature of technology
- The non technical backgrounds of executive managers and communication inadequacies between business and technical managers
- Failure to apply management by integration to effectively integrate business strategy, R&D strategy, and manufacturing and marketing functions.

Key success of Japanese firms:

- Executive management's recognition that technology transfer is essential for long-term industry competitiveness.
- Direct face-to-face contact for transferring technology
- The capability to commercialize the developments of others and to relate new products and product improvements to specific market needs
- Manager's broad skills and knowledge in key areas of business activity, ensuring demonstrable levels of technical competence within executive management and fostering the ability to work with others
- The carefully controlled diffusion of technology along all links in the products realization chain: from R&D to engineering, engineering to operations, operations to sales and marketing, etc.

The critical characteristics of firms' technological capability and consequential business success are:

- A focus on the development of a defined set of technological capabilities
- An ability to develop a strategic technology culture through routines that facilitate capabilities development and relate technological capabilities to strategic goals
- The recognition that the contribution of technology and technical functions to competitive advantage derives from superior technological capabilities
- An ability to balance short-term operating requirements with longer term goals
- An ability to effectively adapt to generational technological change
- An ongoing commitment to invest in product and process improvement
- An ability to institutionalize the learning of design teams in a way that continuously develops essential technological capabilities
- Adequate levels of technological competence within executive management

TECHNOLOGY MANAGEMENT, OPERATIONAL SYSTEMS STRATEGY, AND BUSINESS COMPETITIVENESS

Technology should be considered in the context of the organization in which it is deployed or being considered.

The value of the technology should be measured in business terms: contribution to revenue, market share/sales; or in terms of a return to society such as an environmental or “quality of life” benefit.

“Intermediate: measure such as operational variables of cost, quality, delivery, and so on are often useful to consider as being constructs that connect technical performance to business and broader measures of performance.

Key question are:

- how much should be invested
- how technology should be organized in order to maximize business goals (such as shareholder wealth creation)

Customer-Supplier and Producer-User Relationships

The effective adoption and implementation of new technology often depend on having strong customer-supplier or producer-user relationship.

Small organizations especially are dependent on the support of a large organization to identify the appropriate performance standards, the necessary technology, and implementation method.

Accountability to Performance Measurements

Organizations should be manage technology benchmark in the areas of productivity, cost, profit, waste, an so son, continuously; with in their own organization and externally against their competitors

DECISION AND IMPLEMENTATION OF NEW TECHNOLOGY

Management issues about implementation new technology:

- Implementing new technology and managing its hand-over from the technology developer
→ should be planned
- Technology ownership
→ users need to develop ownership of the technology, and cannot be passive about its implementation
- User advantage
→ any innovation must offer significant and obvious advantages over the technology it replaces
- Hedger
→ Product managers have to be convinced that current technology cannot provide the necessary features and production costs that are afforded by the new models

When should new technology be introduced?

- Competitive pressure
- Social pressure/implications
- Market considerations
- Corporate culture
- Management and technical preparedness
- Cash flow considerations
- New product introductions
- Recency of the technological innovation

ORGANIZING FOR TECHNOLOGY:

Management issues in new technology introduction

