

Chapter 2

Strategy Process and the Management of Technology and Innovation

Lecture Outline

- I. Overview: This chapter covers
 - a. The meaning of strategy
 - b. Ways of classifying technology
 - c. Key MTI concerns in strategy
 - d. The strategy process
 - e. How to strategically analyze an industry and a firm's position in that industry

- II. Introduction
 - a. Technology should be approached as a core part of the strategic process—it is not a separate concern

 - b. The strategic process requires that firms couple their planning, implementation, and evaluation and control with their technology. In fact, the strategic process is a process that needs to be reviewed and improved if it is causing the firm to lag behind its competitors.

- III. What Is Strategy?
 - a. Definition: *A coordinated set of actions that fulfill a firm's objectives, purposes, and goals. It is not a single act that occurs.*

 - b. Characteristics of Strategy
 - i. Ongoing
 - ii. Defines the nature of the businesses in which the firm will compete
 - iii. Purposeful
 - iv. Indicates decision making direction
 - v. Defines the firm's contribution to society and other constituent groups

- IV. Centrality of MTI in Strategic Management (See Figure 2.1): MTI affects inputs, throughputs, and outputs for the strategic process of the firm. By examining the strategic process in a systematic manner, it should be easier to see how MTI affects and is affected by the strategic activities in a firm.
 - a. Integrating MTI and Strategy—*Capabilities are skills that a firm develops. They are the building blocks for the firm's strategy. It is at this level that the firm's*

integration of technology with strategic concerns should begin. Competitive advantages are developed from capabilities. Two types of capabilities:

- i. Technical capabilities concern how the firm approaches technology it already has or wishes to have in the future. The approach used relative to technical capabilities can be classified as:
 1. Destroy—usually to replace with better technology. Out with the old, in with the new.
 2. Preserve—the technology may be old but the firm believes it still has utility
 3. Develop—can give the firm a competitive leap over others in the industry.
 - ii. Market capabilities indirectly impact the technology of the firm. Engineers may develop new technical capabilities but if there is no way to distribute or sell the product, then competitive advantage is not likely to appear.
- b. Technology and Competitive Advantage
- i. Competitive advantage—*something the firm does better than any of its competitors.*
 - ii. Sustainable competitive advantage—*a competitive advantage that customers value and other firms cannot easily duplicate.*
- c. Continuous versus Radical Technology—these are ends of the continuum.
- i. Continuous technology—*Changes in technology that while not constant reflect a progression of changes that happen over a relatively short period of time. Example: the personal computer becoming lighter and more mobile.*
 - ii. Radical technology—*Causes a dramatic change in the way things are done. Example: when the computer was introduced, it changed the way information was processed and stored in organizations.*
 - iii. Next-generation technology—*Is between radical and continuous. Example: The personal computer is a next-generation technology from the mainframe computer. It was made possible by the radical technology of the silicon chip.*
 - iv. Disruptive technology—*is closely related to radical technology, but is related to how it affects the market or segments of the marketplace.*
- d. Maturing Process of Technology—There is a life-cycle to technology that follows the *s-curve*. The four phases are embryonic (invention), growth (improvement), maturity (high profit), and aging (decline).

e. Offensive versus Defensive Technology

- i. Offensive technology—*technology is used in a way that is not being used by competitors so that it gains a competitive advantage. The advantage can come from lower costs or from providing value more effectively or efficiently to customers.*
- ii. Defensive technology—*this involves obtaining technology that others already employ in order to maintain competitiveness or to block competitors from gaining the technology.*

V. The Strategic Process in MTI—the strategic management process can be broken down into three principal activities. The activities occur simultaneously and continuously. (See Figure 2.3)

a. Planning—*the systematic gathering of information that leads to the generation of feasible alternatives for the firm, selection of the most appropriate action, and ultimately to setting of direction for the firm.*

i. *The steps in the planning process include:*

1. Data gathering about the external environment and the firm's internal capabilities.
2. Mission generation—from the information, the mission is formed. The mission is a simple statement of the basic purpose or reason for existing.
3. Objective setting—the firm builds on the mission to establish measurable objectives and performance targets that will help it fulfill its mission.
4. Strategy establishment—the strategy helps to ensure that the actions the firm takes will accomplish the objectives and targets. There are three levels of strategy—corporate, business, and functional (see figure 2.4).

ii. *Financial Analysis*

1. Income statement and retained earnings
2. Balance sheet and reallocating resources
3. Interpreting Financials
 - a. Profit ratios
 - b. Liquidity ratios
 - c. Efficiency ratios
 - d. Other ratios

- iii. Information Gathering as Part of Planning
 - 1. General External Information (see figure 2.5)
 - 2. Porter's Five Forces Model (see figure 2.6) is an industry level tool. An important point to remember is to stay focused on one industry. Definition of the industry determines many of the key elements.
 - a. Bargaining power of buyers
 - b. Bargaining power of suppliers
 - c. New entrants threat
 - d. Substitutes
 - e. Intensity of rivalry
 - f. Complementors—products that sell well with another product
 - 3. Strategic Group analysis—*a group of firms that competes in a similar manner. This can be determined in a number of ways.—customer base, geography, product, combination of factors, etc.*
- b. Implementation—after planning, the firm must put the plan into action. (figure 2.7)
 - i. Key actions in implementation:
 - 1. What to do—execute the plan
 - 2. When to do it—when priorities dictate
 - 3. How to do it—make or buy
 - 4. Who will do it—us, them or combination
 - ii. Common implementation concerns
 - 1. Structure
 - 2. Personnel issues such as hiring, job assignments, training, development
 - 3. Decision making
 - 4. Communication to whom, how, when, etc.
 - 5. Culture of the firm—norms and values
 - 6. Employee incentives—rewards, awards, etc.
 - iii. Tool to conceptualize elements of the implementation process—value chain analysis which breaks down the firm's activities into primary and support activities (see figure 2.8)

- c. Evaluation and Control—is concerned with how well the firm’s strategies are working and making adjustments to meet changing conditions.
 - i. Evaluation—*comparison of actual outcomes with expected outcomes*
 - ii. Control—*adjustments, as needed to either the plan or the implementation*
 - iii. Balanced Scorecard is a tool for evaluation and to define issues to be considered for adjustment. (see figure 2.9)
 - iv. Net Present Value

VI. The Next Steps in Integrating MTI and Strategy

- a. Major Questions—Two questions for managing technology strategically
 - i. Should a firm create its own new technology and innovations within the firm?
 - ii. Or, should technology be acquired from others through acquisitions or strategic alliances?

VII. Guidelines (see overhead)

To successfully navigate the strategic processes involved in MTI, certain actions must be kept in mind. These include:

- a. Forget traditional organizational functions—judge ideas, not positions.
- b. Know where the firm is in the life cycle of its technology and where its competitors are.
- c. Be willing to assume risk if the potential long-term reward is great.
- d. Utilize all resources in the environment.
- e. Break down communication barriers.
- f. Keep expectations realistic.
- g. Establish processes for new initiative approaches to management.

Supplemental readings from Infotrac:

Keeping up with competition by changing how technology is used.

New AMS users group president seeks to change the way the industry thinks: 'Strategic' technology planning key to agent, carrier productivity, Fox says. (PROFILE) Ara C. Trembly. *National Underwriter Property & Casualty-Risk & Benefits Management* June 27, 2005 v109 i25 p19(2)

Functional Level.

Making a business case for technology innovations. (Strategic Planning in the Payroll Department) *Payroll Manager's Report* April 2005 p15(1)

A different view of the strategic management process and technology.

The strategic management process in e-business. (analysis) Louise Cote, Michel Vezina, Vincent Sabourin. *Ivey Business Journal Online* May-June 2005 p1(7)

Answers to Chapter 2 Questions

2.1 REAL WORLD LENS –Linux

1. *What type of technology does Linux represent—continuous, disruptive, or next generation? Explain what such a classification of type of technology would mean for competitors and consumers.*

Disruptive – the technology has the potential to make computer operating system available for free which would put many existing firms which charge for that software in deep financial trouble. The technology has the potential to provide more options for consumers and lower their costs significantly but may also result in many competitors going out of business.

2. *If your competitor acquires a firm that owns an application that is key to your business, what issues would you face? What would happen to the value of the acquired firm?*

Through the acquisition of the firm your competitor will gain supplier power. By holding a key application in which your firm depends, the competitor will have several options in which they may use this new power. If you currently license the application, the fee may be raised, or in an even worse scenario they may not provide you access to the application causing difficulty in the short term as you search for a replacement. As far as the acquired firm, following acquisitions the target firm's value usually increases in general, but in this case their value may depend on the acquiring firm's decisions in regards to how to manage their new found supplier power. If they raise the licensing fee the value may increase but if they end the relationship there may be a negative effect on firm value.

2.2 REAL WORLD LENS – IBM

1. *Do you think these approaches will help IBM create a competitive advantage? Why or why not?*

IBM has shifted its innovation process in an effort to make the process more effective. These changes should help the firm get in touch with customer wants and needs in order to make products more user friendly as well as providing an avenue for customers to maximize usage of IBM equipment through deeper understanding of the technology.

2. *If you were with a competitor, how would you respond to IBM's two-pronged strategy?*

The students should recognize that competition is not a static process but one that has continual changes. Therefore as a competitor to IBM, I would be motivated to offer a similar program enhanced by providing a mechanism for consumers to provide input regarding desired improvements etc. For example, having my programmers also go to the customer rather than require the customer to come to the programming center in order to better understand their needs so the product designed is more appropriate.

Case 2.1 THE REAL WORLD – UPS Store

1. *What other areas do you think UPS would align to ensure that technology was fully integrated into the firm's strategy?*

Strategy in a technology focused firm is not one-dimensional. Typically, a major concern will also be the training & development that is associated with the implementation of the new technology.

2. *UPS has two major competitors—the U.S. Postal Service and Federal Express. How does UPS' lead in technology mean for them?*

The students should recognize that the lead in technology by UPS directly impacts USPS and Federal Express' need to monitor the environment for new technological or market opportunities. Without adaptation to the technological lead by UPS, the market share and advantages of these two competitors will dwindle.

CRITICAL THINKING

1. *Stages of product life cycle are: start-up, growth, maturity, decline. The issues the firm needs to address during each of these stages are different. Identify potential strategic issues your firm would need to address in each of these stages.*

Start-up: The firm must recognize the domain they are filling and how their specific competencies provide them success in that domain. The firm needs to align their personnel and strategies in order to move towards the growth stage. In new product areas which technology will dominate have not be clearly established. The firm needs to seek to ensure the technology it is relying will be the dominate one as the industry matures.

Growth: In this stage, the technology which will dominate in the industry becomes clearer. The firm must establish their competitive advantage through marketing techniques and incremental advancements to create sustained competitive advantage. Bringing their product or service into new markets and reaching new customers is vital during this cycle.

Maturity: As the industry matures the focus on costs begins to dominate. The firm will seek mergers and acquisitions as it seeks to establish economies of scale in order to reduce costs. The firm must begin to make the difficult decisions centered on technological changes that may be impending. To engage in radical change or continuous technology and how to combat disruptive technologies in the marketplace are all decisions that my face a firm in this stage of the technology lifecycle.

Decline: This is the cycle in which the technology has likely been surpassed or slightly outdated by other technologies. The firm must decide if they will continue to produce the product or service and if so, how they will integrate with the new technologies. If the firm has diversified into other areas of technology or products, this may simply become a

cash cow part of the firm or be deleted. If this is the sole product of the firm, bankruptcy may be in the cards unless the firm makes a move to something new.

2. *How should managers develop buy-in from the various groups and areas within the organization? Does getting the support of employees and other stakeholders require strategic planning? Explain your answer.*

In order to ensure “buy-in” from the various stakeholders of the organization, managers and strategic planners need to make the overall organizational strategy systemic in nature and widely visible. By remembering the levels of strategy when establishing and planning the firm’s strategic approach, the planning group will be able to best construct the appropriate explanations of the strategy at a level that is comprehensible for the audience they wish to obtain “buy-in” from. Obtaining the “buy-in” will most likely be an issue of level of detail included and positioning. The same overarching strategy is simply implemented differently by different departments and levels of the organization. As in the chapter see figure 2.4. “Functional strategies are those of the different departments, such as accounting, engineering, and marketing, that act in support of the given business strategy.”

3. *Develop a strategic plan for your life. Using the definition of technology and the management of technology we have learned, how would you expect the technologies in your life to change as you implement your strategic plan?*

During an undergraduate program [the start-up stage of the cycle], the technology and technology management would likely include computing and telephonic devices as well as possibly laundry facilities etc. Engineering students and architecture students will include programs such as Java, C++ and AutoCAD as well as other programs of study as technology capabilities that must be acquired in order to remain viable and in the growth stage. As we move into the maturity stage of the cycle, when we are middle aged and likely have a family we may be sitting comfortably in a job and headed toward decline if we don’t continue to expand our arena of knowledge and try to stay on top of the curve or create another S-curve for ourselves. Retirement might be seen as the decline stage of our cycle.

WWW EXERCISES

1. *Identify a company that is well known for its excellence in the management of technology and innovation. Go to that company’s website and track how many times they mention technology and innovation. How many articles or comments about the company can you find that relate MTI to the company’s strategy?*

Two firms that the students may wish to look at are Intel and Nokia.

<http://www.intel.com/>

On every page of the website there is a mention of technology and innovation

Just in the last 2 yrs, there have been over 200,000 articles regarding Intel that relate to management of technology and innovation. This, of course is not surprising.

<http://www.nokiausa.com/business/main/1,8187,00.html>

Again, on nearly every page, there is mention of technology and innovation. In the last 2 yrs, there are hundreds of articles involving the Nokia organization and its innovations in the digital camera/telephonic arena.

2. *Find a website that addresses the MTI issues for a specific industry. Then select two or three companies in the industry and visit their websites. How does the industry website differ from those devoted to company issues? Are the issues different? Why or why not?*

One potential industry that is now in the news extensively is the energy industry. This industry may seem like a low tech industry. However, the students can quickly see that the industry is a very technological reliant industry with ever increasing sophistication as the world seeks to find oil in ever more remote and environmentally challenging domains.

Website addressing MTI issues for the energy industries

<http://www.fe.doe.gov/programs/fuels/hydrogen/hydrogen-from-gas.html>

Company websites

<http://www.conocophillips.com/index.htm>

<http://www.diamondoffshore.com/>

<http://www.natoil.com/>

The industry website [actually a government site] focuses on education and service to industry and general public. The individual organization websites focus on marketing their products and services to the public. The information is mostly the same, but the focus is slightly different.

3. *Find an article or website that provides guidelines for the strategic management of MTI. What do you think of the advice? Compare the advice you find to the advice your classmates find.*

Website

<http://www.commerce-database.com/innovation-management.htm>

http://www.niku.com/products.asp?id=42&source=ad_q306_goog_npd&paidkeyword=innovation

Articles

http://sloanreview.mit.edu/smr/topic/mgmt_tech_innovation/index2.php

The websites listed here are basically for service providers who will hire out to help you manage your technology and/or innovation either through consulting or software solutions.

The articles link is to the Sloan Review at MIT and leads to several articles regarding the management of technology and innovation. For the most part, the information given in these articles is in line with that presented in this text.

AUDIT EXERCISE

The audit exercises provide two scenarios and then ask a series of questions on those scenarios.

1. *Factors to monitor*

a. *New technology*

The firm with the existing technology would need to monitor upcoming technologies to determine if they should attempt to shift to the new technology by incorporating it into their own infrastructure and phasing out the technology they are currently using or stick with their current technology and attempt to hold onto their market share in the face of this new technology taking over the general market. [The latter will be a truly difficult, nearly impossible battle to win.]

The firm with the new technology would need to monitor the current market to assess the best method for taking over the market. In some instances, the most efficient method might be to cooperate with existing technologies to provide a smooth transition for customers. For other industries, the best method may be a radical takeover of customer base by storming the market with the new technology and heavy marketing plan that sells customers on the wonder of this new technology, making them dump their current products by the way side.

b. *Sibling curves*

The firm with the existing technology would need to monitor upcoming technologies to understand the best way to incorporate them into existing products and take advantage of the new technology to gain market share quickly and effectively.

The firm with the new technology would need to monitor the current market to assess which products could be enhanced by their technology so that they can effectively market this product to the right firms without wasting time in arenas that will not be receptive to the new technology.

2. *Developing an audit tool to accomplish this?*

The best audit tool to accomplish all the scenarios mentioned above is likely a combination of market analysts and technology experts. There are software tools that can be used to run scenarios to forecast probable events based on probability statistics etc. However, these tools are only as good as the data entered into them and are based solely on historical information. Technology specialists who are working with the technology of the firm and market analysts who are developing plans for marketing the technology that is developed by the firm are in the best position for monitoring the factors associated with these s-curves.

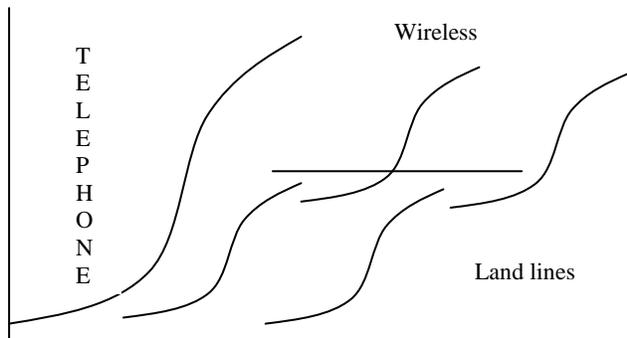
3. *What environmental factors to analyze to transfer a product from a business environment to the home and to the car? What technology breakthroughs moved the telephone from a business tool to a personal, portable necessity? How would you model those S-curves?*

The mobility of the business tasks would be one item of interest when considering the transfer of products from business to home and to the car. Additionally, the time needed to perform the specific task the product assists with and the urgency with which the task may need to be performed.

Technology breakthroughs that made the telephone more portable were primarily the ability to make the units smaller and the ability to make them operable without the use of wiring.

The S-curves would be very similar to the sibling S-curves presented in the Audit Exercise portion of this chapter.

Below is an example of Sibling S-curves indicative of the telephone technology cycle from wired telephones to cordless technology, then on to the wireless larger technology and finally to the small wireless technology that we enjoy today.



Each wave represents new, improved technology—for example, for land lines the improvement from crank, operated assisted to rotary dial to push button could be three sibling waves.

DISCUSSION QUESTIONS

The answers provided here take quotes from the text to indicate how the discussion should progress. It is hope that the students see that managing technology and innovation is more than simply developing a better technology or a new innovation. There must be a strategic core to these efforts. If not those efforts will likely end in failure.

1. *Why are strategy and the management of technology and innovation so interconnected?*

“In establishing its strategy for a technology-focused firm, that firm’s technology is not a minor issue. . . Technology is not a passive component of a firm. Instead, technology is a critical part of a firm’s strategic success that should be actively chosen and constantly evaluated with adjustments made as necessary. . . The fundamental point is that technology is considered throughout the strategic process in multiple places.”

2. *Describe the three stages of the strategic planning process and how they impact the management of technology and innovation.*

The three components of the strategic process of a firm are: planning, implementation, and evaluation & control.

“Planning is defined as the systematic gathering of information that leads to the generation of feasible alternatives for the firm, selection of the most appropriate action among the alternatives, and ultimately to the setting of direction for the firm” Steps in the planning process include: data gathering, mission generation, objective setting, and strategy establishment. “The planning process should gather information about the environment as it is today and as it might be tomorrow. Too often, firms look to the past and assume the patterns of the past will continue. . . Instead, the firm should focus on challenging itself to look beyond what is now does and consider what the future could look like.”

”Implementation of the strategy requires the firm to conduct activities that are consistent with the given strategy. . . It is important to be clear about the need for fit between all of the various actions that the firm takes to implement the strategy. The true impact of a strategy comes from the firm setting a clear direction and taking actions that are consistent with that strategy. . . If a firm develops a strategy that employs a given technology, it needs to have people who understand that technology. To attract those individuals, a different type of compensation system may be required.”

“After the strategy is implemented, the firm must ensure that the goals and objectives are met. If they are not met, then adjustments are required. This process is referred to as evaluation (comparison of actual outcomes with expected outcomes) and control (adjustments, as needed). The firm must determine why it is not meeting its goals and objectives and either change what it is doing or change what it wants to accomplish. . . The strategic process of the firm is active; it is not a process that can be performed automatically with little analysis. The measures of success need to be richer than simply sales or profits.”

3. *What is the role of integration of the different activities in a firm in the strategic management process of technology and innovation?*

“It is at the level of capabilities that the firm’s integration of technology with strategic concerns should begin because the business ultimately develops its competitive advantage over other firms from its capabilities. The capabilities of a firm can be classified as either technical or market. . . Technical capabilities concern how the firm

approaches technology it already has or wishes to have in the future. Therefore, the firm's approach to these capabilities can be classified in one of three ways: destroy, preserve, or develop. The approach to technology is a strategic decision that must be implemented through the firm's choices, including its people, structure, and processes. . . The firm must not only have direct technical capabilities; it must also have market-relevant skills that will indirectly impact the technology of the firm. Engineers may develop tremendous new products but may have ignored issues such as how to distribute them."

4. *What are the major decisions that impact the strategic management of technology and innovation?*

"The major questions, then, for the organization trying to strategically manage its technology become: 1) Should we create our own new technology and innovations internal to the firm: and 2) Or should we acquire technology from others through acquisitions or strategic alliances?"

"The answers should be determined by the costs and the likely outcomes as well as how this approach fits into the goals and future direction of the firm."

5. *What would be some of the strategic issues that a firm like GE would need to focus on as it seeks to improve its strategic management of technology and innovation?.*

"The firm did not simply state, 'we want to take advantage of changes in technology.' Instead, the firm made numerous changes in its organization, including structure, personnel policies, and leadership, to make changes in technology possible."

GE has identified key changes in the environment and then taken advantage of the broad changes in society. This strategic perspective results in the firm's ability to identify broad trends of which to take advantage. . . GE wants to be in the top three in every industry it enters. It cannot simply decide to dominate a particular industry. Instead, it employs a strategic perspective which argues that the firm needs to identify where it wants to go. Then the company takes the necessary steps to move to that position."

OPENING CASE: GE

1. *How has GE combined its technology and strategic management to be successful?*

GE has identified key changes in the environment and then taken advantage of broad changes in society. This strategic perspective results in the firm's ability to identify broad trends of which to take advantage. Once the firm identifies such trends, it then makes substantive commitments throughout the organization to succeed in its efforts. By continuing with research and development and encouraging creativity across business units, GE has been able to seize opportunities to expand technology and take advantage of trends.

2. What strategic concerns would you have for GE in the future? What technology and product changes should it monitor? How well has GE balanced the marketing and technology capabilities within the firm?

As GE moves into the future, they will want to continue to monitor the direction of technology. GE has been able to balance the marketing and technology capabilities well. The differences in the types of airplane engines and ultrasound machines through the years illustrate this. As important as the marketing is, if the technology is not up to specifications or does not meet the consumer needs, the products will not sell well.