

CHAPTER 1

The Importance of Technological Innovation

SYNOPSIS OF CHAPTER

The purpose of this chapter is to set the stage for the course by establishing the importance of managing technological innovation strategically.

First the chapter overviews the importance of technological innovation for a firm's competitive success and the advancement of society in general. The chapter points out that 1) many firms are relying on products developed in the previous three to five years for large portions of their sales and profits; 2) globalization has increased competition putting more pressure on firms to compete through innovation; 3) advances in information technology have enabled both process improvements and the efficient generation of product variants which facilitates the execution of a differentiation strategy at a reasonable cost; and that 3) the residual growth in the GDP can be attributed to technological change. Both the positive and negative effects of technological innovation are described. Advances in food production are an example of the first and pollution is an example of the latter. Next the innovation funnel is introduced to show students that on average 3,000 raw ideas must enter the funnel in order to arrive at 1 successful new product launch.

Second, the chapter discusses the risks and cost of innovation. On average, many more innovation projects fail than succeed. Firms are much more likely to be successful if they have a well-crafted strategy for technological innovation. The book is organized to follow the chronological sequence of developing and deploying a rigorous technological innovation strategy, leading the students through each of the primary aspects that should be considered. The final section of the chapter outlines the layout of the book, reviewing the contribution each chapter makes to our understanding of the innovation process.

TEACHING OBJECTIVES

1. Introduce students to the role technological innovation plays in the competitive dynamics of industries and how technological innovation affects society both positively and negatively.
2. Identify the drivers of technological innovation.
3. Discover the attributes of successful innovation strategies including an in-depth understanding of the dynamics of innovation, a well-crafted innovation strategy, and a well-developed process for implementing the innovation strategy.

LECTURE OUTLINE

I) Overview

- a) In many industries technological innovation is now the **single most important driver of competitive success** and because the **pace** of innovation has increased many firms now rely on **products developed within the prior five years** for a large

portion of their sales and profits. This period is reduced to **three years** for firms in **fast-paced industries** such as computers, software and telecommunications.

- b) Innovation is also a very powerful driver of **increased effectiveness and efficiency** in producing goods and bringing them to market; firms that do not constantly innovate to make their development, production, and distribution processes more effective and efficient are likely to fall behind their competitors.
- c) The **globalization of markets** has played a significant role in increasing the importance of innovation as a competitive strategy by increasing competitive pressure.
- d) **Advances in information technology** have also played a role in driving up the pace of innovation. These technologies also help firms to develop and produce more product variants enabling them to **out-focus** their competitors.
 - i) For example, Nokia produces almost **80 models of wireless phones** and Sony produces over **50 models of its portable audio players**.
- e) Adoption of these new technologies has triggered industry-wide shifts to **shortened development cycles and more rapid new product introductions**.
- f) The **proportion of funds** for technological innovation **provided by firms** relative to government funding has been **increasing** but **governments do play a significant role** in the innovation process.

Show Transparency 1

II) The Impact Of Technological Innovation On Society

- a. Technological innovation **increases the range of goods and services available** to a society, and the **efficiency of providing them**. For example, innovation has

increased the development of new medical treatments and the efficiency of food production.

- i. The **Solow residual** is the GDP growth represented by technological change. Average world GDP per capita has risen steadily since 1971 and cannot be attributed solely to the growth of labor and capital inputs.

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- b. The **story is not all positive**, however... Sometimes technological innovation results in **negative externalities** such as pollution and medical technologies can have unanticipated consequences.

III) Innovation By Industry: The Importance Of Strategy

- a. Successful innovators have **clearly defined innovation strategies and management processes** that result in a greater percentage of successful products and shorter development cycles.
- b. **How Long Does New Product Development Take?** Cycle time varies with the “innovativeness” of the project. Incremental improvements take less time than next generation improvements while new-to-the-world products or technologies take the longest.
- c. **The Innovation Funnel** depicts the new product development process as beginning with many new product ideas going in the wide end and ending with very few projects making it through the development process (the bottom of the funnel).

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IV) The Strategic Management of Technological Innovation

- a. A firm's **innovation projects** should **align** with its **resources and objectives**, leverage its **core competencies** and should help the firm achieve its **strategic intent**.
- b. A firm's **organizational structure and control systems** should encourage the generation and efficient implementation of innovative ideas and a firm's **new product development processes** should maximize the technical and commercial success of each project.
- c. To achieve these goals, a firm needs
 - i. An **in-depth understanding of the dynamics of innovation**,
 - ii. A **well-crafted innovation strategy**,
 - iii. A **Well-designed process** for implementing the innovation strategy.

V) Course Overview

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- a. **Part I** focuses on **how and why innovation occurs in an industry** and **why some innovations rise to dominate others**.
 - i. **Chapter 2** focuses on the **sources of innovation**. The questions addressed include: Where do great ideas come from? How can firms harness the power of individual creativity? What role do customers, government organizations, universities, and alliance networks play in creating innovation?
 - ii. **Chapter 3** considers the **types and patterns of innovation**. The questions addressed include: Why are some innovations much harder to create and implement than others? Why do innovations often diffuse slowly even when

they appear to offer a great advantage? What factors influence the rate at which a technology tends to improve over time?

- iii. **Chapter 4** focuses on industries characterized by **increasing returns**. The questions addressed include: Why do some industries choose a single dominant standard rather than enabling multiple standards to coexist? What makes one technological innovation rise to dominate all others, even when other seemingly superior technologies are on offer? How can a firm avoid being locked out? Is there anything a firm can do to influence the likelihood of having its technology chosen as the dominant design?
 - iv. **Chapter 5** highlights the importance of **entry timing**. The questions addressed include: What are the advantages and disadvantages of being first to market, early-but-not-first, and late? What determines the optimal timing of entry for a new innovation?
- b. **Part II** focuses on the formulation of **technological innovation strategy**.
- i. **Chapter 6** reviews the basics of how a firm can **assess its current position** and **define its strategic direction**. The questions addressed include: What are the firm's sources of sustainable competitive advantage? Where in the firm's value chain do its strengths and weaknesses lie? What are the firm's core competencies, and how should it leverage and build upon them? What is the firm's strategic intent -- that is, where do we want to be ten years from now?
 - ii. **Chapter 7** examines a variety of **methods for choosing among innovation projects** including both quantitative and qualitative methods.

- iii. **Chapter 8** focuses on the important role **collaboration** can play in the development of new products and processes. The questions addressed include: Should the firm partner on a particular project or go solo? How does the firm decide which activities to do in house and which to access through collaborative arrangements? If the firm chooses to work with a partner, how should the partnership be structured? How does the firm choose and monitor partners?
- iv. **Chapter 9** provides an overview of the options a firm has for **appropriating the returns** to its innovation efforts. The questions addressed include: Are there ever times when it would benefit the firm to not protect its technological innovation so vigorously? How does a firm decide between a wholly proprietary, wholly open, or partially open strategy for protecting its innovation? When will “open” strategies have advantages over wholly proprietary strategies?
- c. **Part III** focuses on **implementation**.
 - i. **Chapter 10** examines how an **organization’s size and structure** influences its overall rate of innovativeness. The questions addressed include: Do bigger firms outperform smaller firms at innovation? How do formalization, standardization, and centralization impact the likelihood of generating innovative ideas, and the organization’s ability to implement those ideas quickly and efficiently? Is it possible to achieve creativity and flexibility at the same time as efficiency and reliability? How do multinational firms decide where to perform their development activities?

How do multinational firms coordinate their development activities towards a common goal when they take place in multiple countries?

- ii. **Chapter 11** highlights a series of “**best practices**” that have been identified in managing the new product development process. The questions addressed include: Should new product development processes be performed sequentially or in parallel? What are the advantages and disadvantages of using project champions? What are the benefits and risks of involving customers and/or suppliers in the development process? What tools can the firm use to improve the effectiveness and efficiency of its new product development processes? How does the firm assess whether its new product development process is successful?
- iii. **Chapter 12** builds on the previous chapter by illuminating how **team composition and structure** will influence project outcomes. The questions addressed include: How big should teams be? What are the advantages and disadvantages of choosing highly diverse team members? Do teams need to be collocated? When should teams be full-time and/or permanent? What type of team leader and management practices should be used for the team?
- iv. **Chapter 13** reviews **innovation deployment** options. The questions addressed include: How do we accelerate the adoption of the technological innovation? How do we decide whether to use licensing or OEM agreements? Does it make more sense to use penetration pricing or a market-skimming price? What strategies can the firm use to encourage distributors and complementary goods providers to support the innovation?

ANSWERS TO DISCUSSION QUESTIONS

1. Why is innovation so important for firms to compete in many industries?

Innovation enables firms to:

-introduce more product and service variations, enabling better market segmentation and penetration;

-improve existing products and services so that they provide better utility to customers;

-improve production processes so that products and services can be delivered faster and at better prices.

Increasing globalization has both expanded the potential markets for many firms while simultaneously exposing them to greater competition; this has resulted in firms putting more emphasis on innovation as a lever of competitive differentiation.

Furthermore, information technology has enabled such process innovations as CAD/CAM, rapid prototyping, and flexible manufacturing, enabling firms to produce more product variants faster and cheaper. This is a double edged sword: it has enabled product lifecycles to shorten (making rapid innovation more imperative) while simultaneously improving a firm's options for innovation.

2. What are some of the advantages of technological innovation? Disadvantages?

Technological innovation increases knowledge, and makes more options available. On the whole, evidence suggests that technological innovation has increased GDP and

standards of living worldwide. Technological innovation also, however, poses some risk of negative externalities, e.g.

-pollution;

-agricultural and fishing technologies can result in the erosion, elimination of natural habitats, and the depletion of ocean stocks;

-medical technologies can result in unanticipated consequences such as antibiotic-resistant strains of bacteria and viruses, or moral dilemmas regarding the use of genetic modification such as externalities.

Students may also suggest that technological innovation may (or has) lead to the loss of diversity in culture and traditions. The instructor may wish to encourage them to debate such risks of innovation versus the ways that innovation has enhanced our lives.

3. Why do you think so many innovation projects fail to generate an economic return?

Innovation is an inherently risky undertaking. Most innovation projects are characterized by both technical uncertainty (will the project result in a technically feasible product or service?) and market uncertainty (what features will customer prefer and what will they be willing to pay for them?) In their eagerness to innovate, firms are at risk of undertaking too many projects, overestimating their potential returns and underestimating their uncertainty. This is compounded by the fact that many people mistakenly believe that creativity can only be tapped through an unstructured process, when in fact

innovation is most powerful and has a greater likelihood of success when it is planned and implemented strategically.