Strategic Management of Technological Innovation 5th edition Schilling Solutions Manual

SKU: 9781259539060-SOLUTIONS

Strategic Management of Technological Innovation 5th edition Schilling Solutions Manual

Strategic Management of Technological Innovation, 4e

Instructor's Manual

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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

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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.

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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, **Toyota produces 21 different passenger vehicle lines, each with several different models** and Samsung introduced 52 unique smartphones in 2014.

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.

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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Show Figure 1.2

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).

Show Figure 1.3

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.

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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 processes** for implementing the innovation strategy.

V) Course Overview

Show Figure 1.4

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

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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

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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?

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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.

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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.

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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.

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CHAPTER 2

Sources of Innovation

SYNOPSIS OF CHAPTER

In this chapter we discuss the role of creativity as the underlying process for the generation of novel and useful ideas. Individual creativity is considered to a function of intellectual abilities, knowledge, thinking styles, personality traits, intrinsic motivation and environment. Firm creativity is more than the sum of member creativity. Firm creativity is also a function of the organizational structure and the strategic management approach employed.

The chapter moves on to explore how creativity is transformed into innovative outcomes by the separate components of the innovation system (e.g., individuals, firms, etc) and the linkages between the different components.

The last part of the chapter focuses on the role of innovation networks in new product/process development. Firms are most likely to collaborate with customers, suppliers, and universities, though they also may collaborate with competitors, producers of complements, government laboratories, nonprofit organizations, and other research institutions. Emphasis is placed on developing an understanding of technological clusters including how they are formed and the benefits associated with them. The role of knowledge transfer in the creation of clusters is demonstrated in the context of Silicon Valley.

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TEACHING OBJECTIVES

1. To help students understand the relationship between creativity and innovation.
2. To explore, quantitatively and qualitatively, the role played by individuals, firms, universities, governments, and non-profits in innovation.
3. The chapter highlights the role of collaborative networks in innovation, including technological spillovers, and technology clusters.

LECTURE OUTLINE

VI) Overview

a. Innovation can arise from **many different sources** including individuals, firms, universities, government laboratories and incubators, and private non-profit organizations.

b. **Firms are well suited to innovation activities** because they are **highly motivated** by the need to remain competitive and because have the **management systems needed to organize their resources** to achieve an organizations' objectives.

c. An **even more important** source of innovation is the **networks that link innovators** together. These networks leverage a **broader range of knowledge and resources** than an individual entity could.

VII) Creativity

a. **Creativity** is defined as the ability to produce work that is **useful** and **novel** (i.e. different and surprising when compared to prior work). The most creative works are novel at the individual producer level, the local audience level, and the broader societal level. When a product is novel to its creator but know to everyone else it is referred to as a **reinvention**.

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b. **Individual creativity** is a function of **intellectual abilities**, **knowledge**, **style of thinking**, **personality**, **motivation**, and **environment**. Researchers have argued that the most important capability is the ability to look at problems in **unconventional** ways.

   i. **Too much knowledge** can result in an **inability** to think beyond the existing logic and paradigms of a field while **too little knowledge** can lead to **trivial** contributions

   ii. The most creative individuals can **distinguish important problems from unimportant** ones.

   iii. **Self-efficacy**, **tolerance for ambiguity**, and a **willingness to overcome obstacles** and **take reasonable risks** are the personality traits most important for creativity.

   iv. **Intrinsic motivation** has also been shown to be very important for creativity.

c. **Organizational creativity** is a function of creativity of the **individuals** within the organization and a variety of **social processes and contextual factors that shape the way those individuals interact and behave**.

   i. The creativity of individuals can be amplified or thwarted by an organization's **structure**, **routines**, and **incentives**. Common methods of tapping employee creativity include 1) the suggestion box, 2) idea management systems (Google, Honda, BankOne).

d. **Idea collection systems** such as suggestion boxes, or idea management systems are only a **first step**. Managers can be **trained** to signal (through verbal and nonverbal cues) that each employees **thinking and autonomy is respected**. Employees can also be trained to use creativity tools such as using analogies or developing alternative scenarios. You may want to discuss the various ways that Google inspires creativity as described in the Theory in Action box.

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III. Translating Creativity Into Innovation

a. Innovation occurs when new ideas are **implemented** into some useful form (e.g. new product or process).

b. **The Inventor** has been the focus of much study and there is **significant disagreement** over whether inventors are **born or made**. It is also important to note that the qualities that make an individual inventive do not necessarily make that individual entrepreneurial.

i. Inventors are often portrayed as **eccentric and doggedly persistent scientists**. One ten-year study of inventors showed that the most successful inventors:

1. Have **mastered the basic tools** and operations of the field in which they invent, but have **not specialized** solely on that field.

2. Are curious, and **more interested in problems than solutions**.

3. **Question the assumptions** made in previous work in the field.

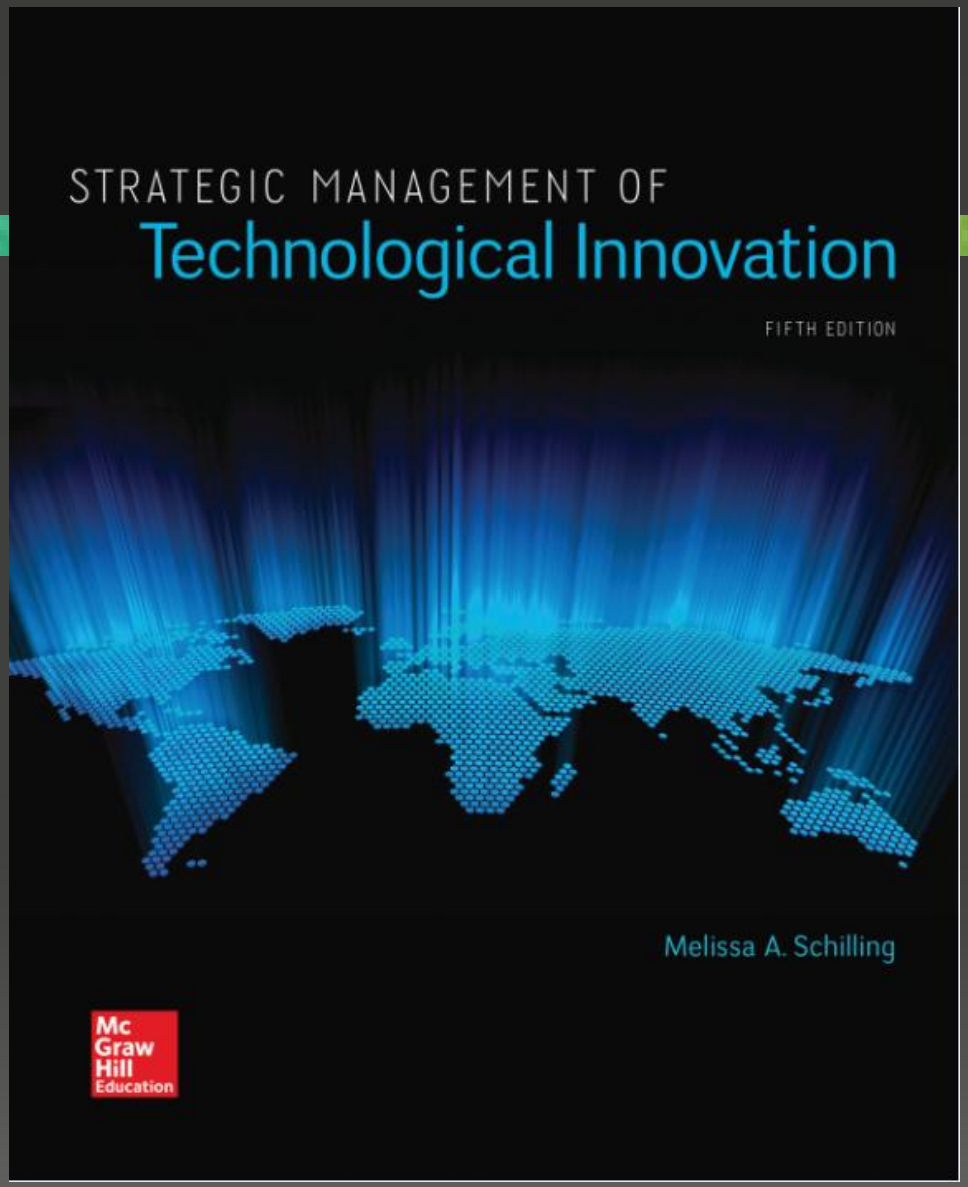
4. Often have the sense that all knowledge is unified. They will s**eek global solutions** rather than local solutions, and will be **generalists** by nature**.**

You may want to raise the example of **Dean Kamen** (from the Theory in Action) here and ask students how he illustrates these characteristics.

c. **Users** are another important source of innovation. Users are keenly aware of their unmet needs and have the greatest motivation to find ways to meet those needs. You may want to bring up how doctors started using Superglue to repair skin in emergency situations as discussed in text. Innovation by users can blossom into wholly new industries, as demonstrated by the snowboarding example provided in the Theory in Action box.

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Chapter 2

Sources of Innovation

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Getting an Inside Look: Given Imaging's Camera Pill

- The Camera Pill: A capsule that is swallowed by patient that broadcasts images of the small intestine
- Invented by Gavriel Iddan & team of scientists
  - Iddan was a missile engineer – no medical background
  - Project initiated by Dr. Scapa, a gastroenterologist
  - Iddan applied guided missile concept to problem of viewing the small intestine
- Developing the Camera Pill
  - Many hurdles to overcome: size, image quality, battery life
  - Formed partnership with Gavriel Meron (CEO of Applitec) for capital to commercialize
  - Formed partnership with team of scientists lead by Dr. C. Paul Swain to combine complementary knowledge
  - Resulted in highly successful, revolutionary product.

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Getting an Inside Look: Given Imaging's Camera Pill

Discussion Questions:

1. What factors do you think enabled Iddan, an engineer with no medical background, to pioneer the development of wireless endoscopy?

2. To what degree would you characterize Given's development of the camera pill as "science-push" versus "demand-pull"?

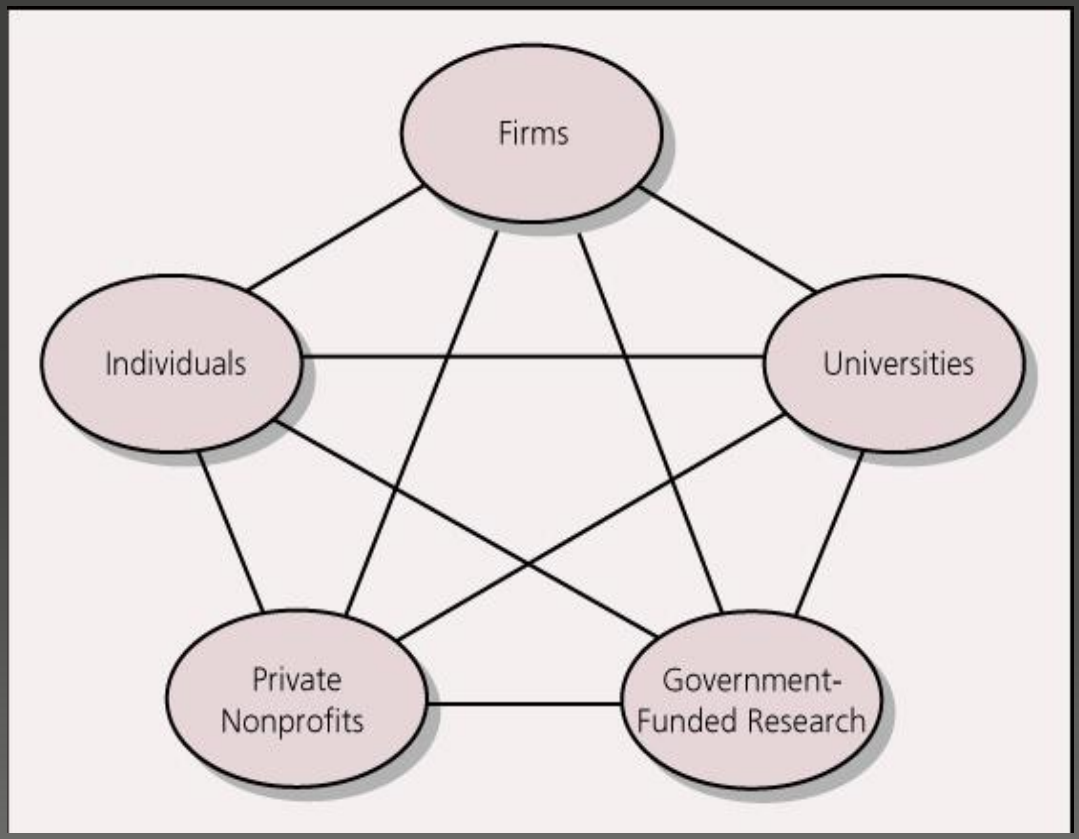
3. What were the advantages and disadvantages of Iddan and Meron collaborating with Dr. Swain's team?

4. What were the advantages and disadvantages of Given being owned by Medtronic?

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Overview

- Innovation can arise from many different sources and the linkages between them.



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Creativity

- **Creativity:** The ability to produce work that is *useful* and *novel*.
  - Individual creativity is a function of:
    - Intellectual abilities (e.g., ability to articulate ideas)
    - Knowledge (e.g., understand field, but not wed to paradigms)
    - Style of thinking (e.g., choose to think in novel ways)
    - Personality (e.g., confidence in own capabilities)
    - Motivation (e.g., rely on intrinsic motivation)
    - Environment (e.g., support and rewards for creative ideas)

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Creativity

- Organizational Creativity is a function of:
  - Creativity of individuals within the organization
  - Social processes and contextual factors that shape how those individuals interact and behave
- Methods of encouraging/tapping organizational creativity:
  - Idea collection systems (e.g., suggestion box; Google's idea management system)
  - Creativity training programs
  - Culture that encourages (but doesn't directly *pay* for) creativity.

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Theory in Action

- Inspiring Innovation at Google
- Google uses a range of formal and informal mechanisms to encourage its employees to innovate, including:
  - 20% Time (all engineers are encouraged to spend 20% of their time working on their own projects)
  - Recognition awards
  - Google Founders' Awards
  - Ad sense Ideas Contest
  - Innovation reviews

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Translating Creativity into Innovation

- Innovation is the implementation of creative ideas into some new device or process.
- Requires combining creativity with resources and expertise.
- **Inventors**
  - One ten-year study found that inventors typically:
    1. Have mastered the basic tools and operations of the field in which they invent, but they will have not specialized solely on that field.
    2. Are curious, and more interested in problems than solutions.
    3. Question the assumptions made in previous work in the field.
    4. Often have the sense that all knowledge is unified. They will seek global solutions rather than local solutions, and will be generalists by nature
  - Such individuals may develop many new devices or processes but commercialize few.

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Theory in Action

- Dean Kamen
- The Segway HT: A self-balancing, two-wheeled scooter.
- Invented by Dean Kamen
  - Described as tireless and eclectic
  - Kamen held more than 150 U.S. and foreign patents
  - Has received numerous awards and honorary degrees
  - Never graduated from college
  - To Kamen, the solution was not to come up with a new answer to a known problem, but to instead reformulate the problem

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Transforming Creativity into Innovation

- **Innovation by Users**
  - Users have a deep understanding of their own needs, and motivation to fulfill them.
  - While manufacturers typically create innovations to profit from their sale, user innovators often initially create innovations purely for their own use.
  - E.g., Laser sailboat developed by Olympic sailors; Indermil tissue adhesive based on Superglue; early snowboards

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Theory In Action

- **The Birth of the Snowboarding Industry**
  - First snowboards not developed by sports equipment manufacturers; rather they were developed by individuals seeking new ways of gliding over snow
    - Tom Sims made his first “ski board” in wood shop class.
    - Sherman Poppen made a “snurfer” as a toy for his daughter – later held “snurfing” contests
    - Jake Burton added rubber straps to snurfer to act as bindings
  - By 2014 there were approximately 7.3 million snowboarders in the United States

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Transforming Creativity into Innovation

- **Research and Development by Firms**
  - **Research** refers to both *basic* and *applied* research.
    - **Basic research** aims at increasing understanding of a topic or field without an immediate commercial application in mind.
    - **Applied research** aims at increasing understanding of a topic or field to meet a specific need.
  - **Development** refers to activities that apply knowledge to produce useful devices, materials, or processes.

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Transforming Creativity into Innovation

- **Research and Development by Firms**
  - *Science Push* approaches suggest that innovation proceeds linearly:
    - Scientific discovery → invention→manufacturing → marketing
  - *Demand Pull* approaches argued that innovation originates with unmet customer need:
    - Customer suggestions → invention → manufacturing
  - Most current research argues that innovation is not so simple, and may originate from a variety of sources and follow a variety of paths.

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Transforming Creativity into Innovation

- **Firm Linkages with Customers, Suppliers, Competitors, and Complementors**
  - Most frequent collaborations are between firm and their customers, suppliers, and local universities.

	North America	Europe	Japan
Collaborates with:			
Customers	44%	38%	52%
Suppliers	45	45	41
Universities	34	32	34

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Transforming Creativity into Innovation

- **Firm Linkages with Customers, Suppliers, Competitors, and Complementors**
  - External versus Internal Sourcing of Innovation
    - External and internal sources are complements
      - Firms with in-house R&D also heaviest users of external collaboration networks
      - In-house R&D may help firm build *absorptive capacity* that enables it to better use information obtained externally.

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Transforming Creativity into Innovation

- **Universities and Government-Funded Research**
  - **Universities**
    - Many universities encourage research that leads to useful innovations
    - Bayh-Dole Act of 1980 allows universities to collect royalties on inventions funded with taxpayer dollars
      - Led to rapid increase in establishment of technology-transfer offices.
    - Revenues from university inventions are still very small, but universities also contribute to innovation through publication of research results.

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Transforming Creativity into Innovation

- **Universities and Government-Funded Research**
  - Governments invest in research through:
    - Their own laboratories
    - Science parks and incubators
    - Grants for other public or private research organizations

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Transforming Creativity into Innovation

- **Private Nonprofit Organizations**
  - Many nonprofit organizations do in-house R&D, fund R&D by others, or both.
  - The top nonprofit organizations that conduct a significant amount of R&D include organizations such as the Howard Hughes Medical Institute, the Mayo Foundation, the Memorial Sloan Kettering Cancer Center, and SEMATECH.

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Gross expenditures on R&D for selected countries, by performing sector and funding sources: 2011 or most recent year

	GERD	Share of total (%)			
Country	PPP ($billions)	Business	Government	Higher education	Private nonprofit
	R&D performance				
United States (2011)[a]	429.1	68.5	12.7	14.6	4.3
China (2011)	208.2	75.7	16.3	7.9	0.0
Japan (2011)	146.5	77.0	8.4	13.2	1.5
Germany (2011)	93.1	67.3	14.7	18.0	**
South Korea (2011)	59.9	76.5	11.7	10.1	1.6
France (2011)	51.9	63.4	14.1	21.2	1.2
United Kingdom (2011)	39.6	61.5	9.3	26.9	2.4
	R&D funding sources				
United States (2011)[a, b]	429.1	58.6	31.2	6.4	3.8
China (2011)	208.2	73.9	21.7	NA	1.3
Japan (2011)	146.5	76.5	16.4	6.6	0.5
Germany (2010)	93.1	65.6	30.3	0.2	3.9
South Korea (2011)	59.9	73.7	24.9	1.2	0.2
France (2010)	51.9	53.5	37.0	1.8	7.6
United Kingdom (2011)	39.6	44.6	32.2	6.2	17.0

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Innovation in Collaborative Networks

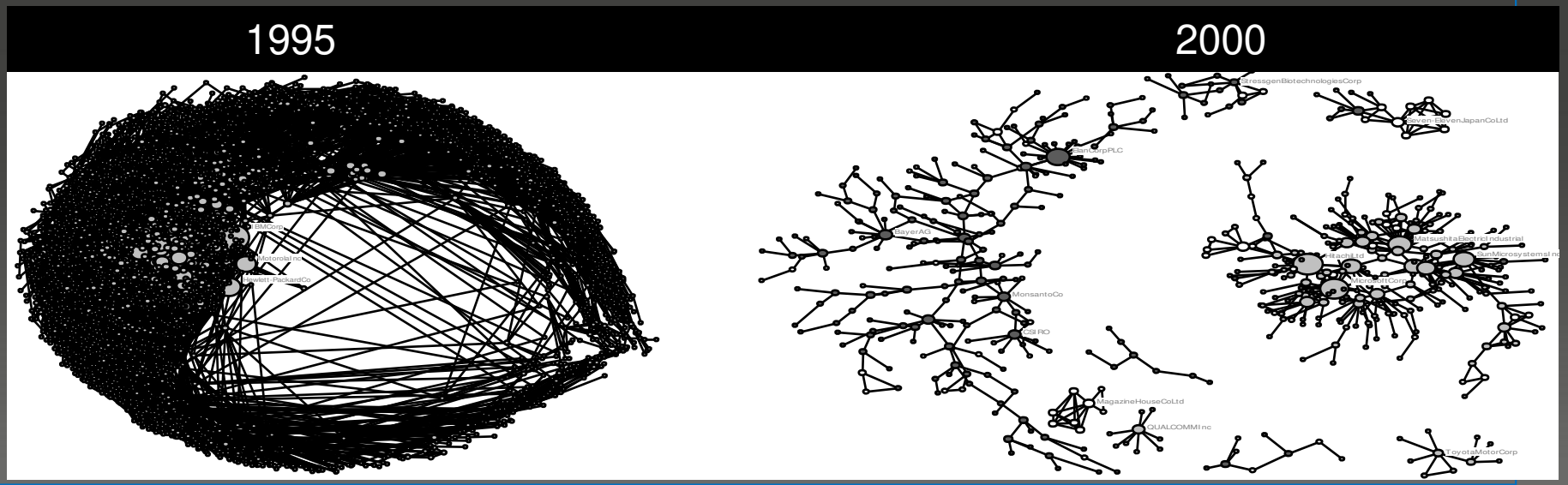
- Collaborations include (but are not limited to):
  - Joint ventures
  - Licensing and second-sourcing agreements
  - Research associations
  - Government-sponsored joint research programs
  - Value-added networks for technical and scientific exchange
  - Informal networks
- Collaborative research is especially important in high-technology sectors where individual firms rarely possess all necessary resources and capabilities

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Innovation in Collaborative Networks

- As firms forge collaborative relationships, they weave a larger network that influences the diffusion of information and other resources.
- The size and structure of this network changes over time due to changes in alliance activity.



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Innovation in Collaborative Networks

- **Technology Clusters** are regional clusters of firms that have a connection to a common technology
  - May work with the same suppliers, customers, or complements.
  - Agglomeration Economies:
    - Proximity facilitates knowledge exchange.
    - Cluster of firms can attract other firms to area.
    - Supplier and distributor markets grow to service the cluster.
    - Cluster of firms may make local labor pool more valuable by giving them experience.
    - Cluster can lead to infrastructure improvements (e.g., better roads, utilities, schools, etc.)

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- Likelihood of innovation activities being geographically clustered depends on:
  - The nature of the technology
    - e.g., its underlying knowledge base or the degree to which it can be protected by patents or copyright, the degree to which its communication requires close and frequent interaction;
  - Industry characteristics
    - e.g., degree of market concentration or stage of the industry lifecycle, transportation costs, availability of supplier and distributor markets; and,
  - The cultural context of the technology
    - e.g., population density of labor or customers, infrastructure development, national differences in how technology development is funded or protected.

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- **Technological spillovers** occur when the benefits from the research activities of one entity spill over to other entities.
  - Likelihood of spillovers is a function of:
    - Strength of protection mechanisms (e.g., patents, copyright, trade secrets)
    - Nature of underlying knowledge base (e.g., tacit, complex)
    - Mobility of the labor pool

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Research Brief

- **Knowledge Brokers**
  - Hargadon and Sutton point out that some firms (or individuals) play a pivotal role in the innovation network – that of *knowledge brokers*.
  - **Knowledge brokers** are individuals or firms that transfer information from one domain to another in which it can be usefully applied. Thomas Edison is a good example.
  - By serving as a bridge between two separate groups of firms, brokers can find unique combinations of knowledge possessed by the two groups.

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Discussion Questions

1. What are some of the advantages and disadvantages of a) individuals as innovators, b) firms as innovators, c) universities as innovators, d) government institutions as innovators, e) nonprofit organizations as innovators?

2. What traits appear to make individuals most creative? Are these the same traits that lead to successful inventions?

3. Could firms identify people with greater capacity for creativity or inventiveness in their hiring procedures?

4. To what degree do you think the creativity of the firm is a function of the creativity of individuals, versus the structure, routines, incentives, and culture of the firm? Can you give an example of a firm that does a particularly good job at nurturing and leveraging the creativity of its individuals?

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