

Strategic Innovation Management



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Lecture 2. Sources of innovation

- ▶ 1. The role of creativity as the underlying process for the generation of novel and useful ideas
 - ▶ 2. Transformation of creativity into innovative outcomes: components
 - ▶ 3. Transformation of creativity into innovative outcomes: linkages between different components
 - ▶ 4. Creativity techniques
- ▶ The main **objective** of this lecture is to understand the process of transforming ideas into innovation.

Overview

Innovation can arise from many different sources. It can originate with individuals, as in the familiar image of the lone inventor or users who design solutions for their own needs. Innovation can also come from the research efforts of universities, government laboratories and incubators, or private nonprofit organizations.

One primary engine of innovation is **firms**. Firms are well suited to innovation activities because they typically have greater resources than individuals and a management system to marshal those resources toward a collective purpose. Firms also face strong incentives to develop differentiating new products and services, which may give them an advantage over nonprofit or government-funded entities. An even more important source of innovation, however, does not arise from any one of these sources, but rather the **linkages** between them. Networks of innovators that leverage knowledge and other resources from multiple sources are one of the most powerful agents of technological advance.

We can thus think of sources of innovation as composing a complex system wherein any particular innovation may emerge primarily from one or more components of the system or the linkages between them.

CREATIVITY

Innovation begins with the generation of new **ideas**.

Idea is something imagined or pictures in the mind.

The ability to generate new and useful ideas is termed **creativity**.

Creativity is defined as the ability to produce work that is useful and novel.

Novel work must be different from work that has been previously produced and surprising in that it is not simply the next logical step in a series of known solutions.

The degree to which a product is novel is a function both of how different it is from prior work (e.g., a minor deviation versus a major leap) and of the audience's prior experiences. A product could be novel to the person who made it, but known to most everyone else. In this case, we would call it reinvention. A product could be novel to its immediate audience, yet be well known somewhere else in the world.

The most creative works are novel at the individual producer level, the local audience level, and the broader societal level.



Individual creativity



Function of his or her intellectual abilities, knowledge, style of thinking, personality, motivation, and environment.

- Unconventional ways of thinking, ability to analyze, choose and convince others
 - Double-edged impact of knowledge
- Personality traits \ Intrinsic motivation \ Environment

Organizational creativity



The organization's structure, routines, and incentives that could decrease individual creativity or amplify it.

- Suggestion box

Idea management system - Google

Employee-driven idea system - Honda of America

Enterprise-wide innovation competitions

Creativity training programs (Intel, Motorola, 3M, and Hewlett-Packard)

Case: Inspiring Innovation at Google

Google is always working on a surprising array of projects, ranging from the completely unexpected (such as autonomous self-driving cars and solar energy) to the more mundane (such as e-mail and cloud services).^a In pursuit of continuous innovation at every level of the company, Google uses a range of formal and informal mechanisms to encourage its employees to innovate:^b

20 percent Time: All Google engineers are encouraged to spend 20 percent of their time working on their own projects. This was the source of some of Google's most famous products (e.g., Google Mail, Google News).

Recognition Awards: Managers were given discretion to award employees with "recognition awards" to celebrate their innovative ideas.

Google Founders' Awards: Teams doing outstanding work could be awarded substantial stock grants.

Some employees had become millionaires from these awards alone.

AdSense Ideas Contest: Each quarter, the AdSense online sales and operations teams reviewed 100 to 200 submissions from employees around the world, and selected finalists to present their ideas at the quarterly contest.

Innovation Reviews: Formal meetings where managers product ideas originated in their divisions directly to founders Larry Page and Sergey Brin, as well as to CEO Eric Schmidt.^c

^a Bradbury, D. 2011. Google's rise and rise. *Backbone*, Oct:24-27.

^b Groysberg, B., Thomas, D.A. & Wagonfeld, A.B. 2011. Keeping Google "Googley." *Harvard Business School Case 9-409-039*.

^c Kirby, J. 2009. How Google really does it. *Canadian Business*, 82(18):54-58.

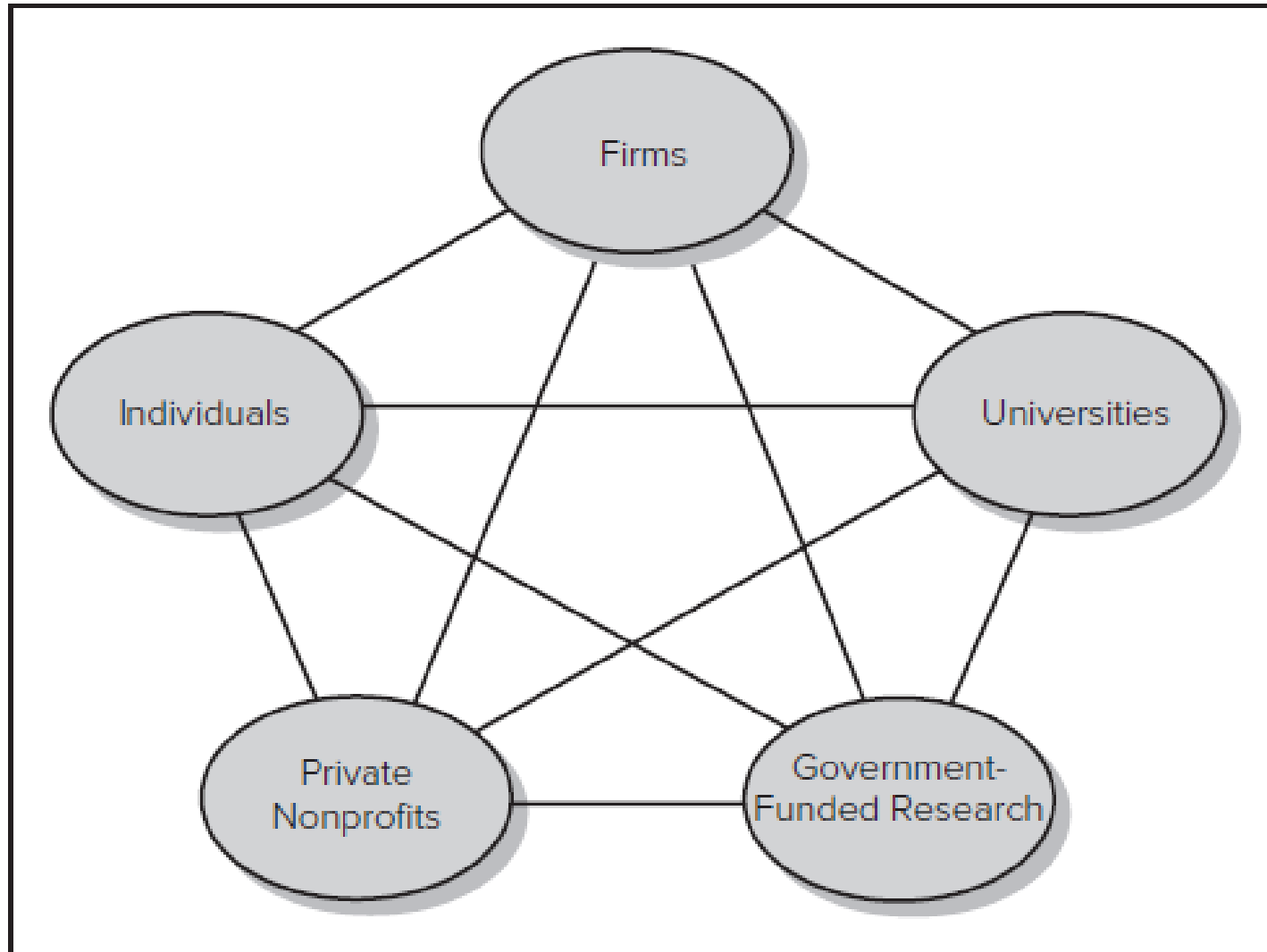
TRANSLATING CREATIVITY INTO INNOVATION

Innovation is more than the generation of creative ideas; it is the **implementation** of those ideas into some new device or process.

Innovation requires combining a creative idea with resources and expertise that make it possible to embody the creative idea in a useful form.

We will first consider the role of individuals as innovators, including innovation by inventors who specialize in creating new products and processes, and innovation by end users. We then will look at innovation activity that is organized by firms, universities, and government institutions.

Sources of Innovation as a System



1. Individuals. **The Inventor**

The most successful inventors possess the **following traits**:

1. They have mastered the basic tools and operations of the field in which they invent, but they have not specialized solely in that field; instead they have pursued two or three fields simultaneously, permitting them to bring different perspectives to each.
2. They are curious and more interested in problems than solutions.
3. They question the assumptions made in previous work in the field.
4. They often have the sense that all knowledge is unified. They seek global solutions rather than local solutions, and are generalists by nature.

Such individuals may spend a lifetime developing numerous creative new devices or processes, though they may patent or commercialize few. The qualities that make people inventive do not necessarily make them entrepreneurial; many inventors do not actively seek to patent or commercialize their work. Many of the most well-known inventors (e.g., **Alexander Graham Bell, Thomas Alva Edison, Albert Einstein, and Benjamin Franklin**), however, had both inventive and entrepreneurial traits.

1. Individuals. **Users**

Innovation often originates with those who create solutions for their own needs. Users often have both a deep understanding of their **unmet needs and the incentive to find ways to fulfill them.**

While manufacturers typically create new product innovations in order to profit from the sale of the innovation to customers, user innovators often have no initial intention to profit from the sale of their innovation - **they create the innovation for their own use.**

Users may alter the features of existing products, approach existing manufacturers with product design suggestions, or develop new products themselves.

Cases: Super Glue for a skin, Snowboarding, Linux software, Detroit cars

2. Firms

One of the most obvious sources of firm innovation is the firm's own research and development efforts. Though the terms **research and development** are often lumped together, they actually represent different kinds of investment in innovation-related activities. *Research* can refer to both basic research and applied research.

Basic research is effort directed at increasing understanding of a topic or field without a specific immediate commercial application in mind. This research advances scientific knowledge, which may (or may not) turn out to have long-run commercial implications.

Applied research is directed at increasing understanding of a topic to meet a specific need. In industry, this research typically has specific commercial objectives.

Development refers to activities that apply knowledge to produce useful devices, materials, or processes.

Thus, the term *research and development* refers to a range of activities that extend from early exploration of a domain to specific commercial implementations.

2. Firms. Firm Linkages with Customers, Suppliers, Competitors, and Complementors

Firms often form alliances with customers, suppliers, complementors, and even competitors to jointly work on an innovation project or to exchange information and other resources in pursuit of innovation. Collaboration might occur in the form of **alliances, participation in research consortia, licensing arrangements, contract research and development, joint ventures, and other arrangements**. Collaborators can pool resources such as knowledge and capital, and they can share the risk of a new product development project.

The most frequent collaborations are between firms and their customers, suppliers, and local universities. Several studies indicate that firms consider users their most valuable source of new product ideas. The use of such collaborations is consistent across North America, Europe, and Japan, though Japanese firms may be somewhat more likely to collaborate extensively with their customers. Firms may also collaborate with competitors and complementors.

Complementors are organizations (or individuals) that produce complementary goods, such as lightbulbs for lamps, or DVD movies for DVD players.

Universities and Government-Funded Research

Another important source of innovation comes from public research institutions such as universities, government laboratories, and incubators. A significant share of companies report that research from public and nonprofit institutions enabled them *to develop innovations that they would not have otherwise developed*.

3. Universities

Many universities encourage their faculty to engage in research that may lead to useful innovations. Typically the intellectual property policies of a university embrace both patentable and unpatentable innovations, and the university retains sole discretion over the rights to commercialize the innovation. If an invention is successfully commercialized, the university typically shares the income with the individual inventor(s). To increase the degree to which university research leads to commercial innovation, many universities have established **technology transfer offices**. In the United States, the creation of university technology transfer offices accelerated rapidly after the Bayh-Dole Act was passed in 1980.

4. Government-Funded Research

- ▶ Governments of many countries actively invest in research through their own laboratories, the formation of **science parks** and **incubators**, and grants for other public or private research entities.
- ▶ **Science parks** are regional districts, typically set up by government, to foster R&D collaboration between government, universities, and private firms.
- ▶ **Incubators** are institutions designed to nurture the development of new businesses that might otherwise lack access to adequate funding or advice.
- ▶ Since the 1950s, national governments have actively invested in developing science parks to **foster collaboration between national and local government institutions, universities, and private firms**. These science parks often include institutions designed to nurture the development of new businesses that might otherwise lack access to adequate funding and technical advice. Such institutions are often termed *incubators*. Incubators help overcome the market failure that can result when a new technology has the potential for important societal benefits, but its potential for direct returns is highly uncertain.

5. Private Nonprofit Organizations

Private nonprofit organizations, such as **private research institutes, nonprofit hospitals, private foundations, professional or technical societies, academic and industrial consortia, and trade associations**, also contribute to innovation activity in a variety of complex ways.

Many nonprofit organizations perform their own research and development activities, some fund the research and development activities of other organizations but do not do it themselves, and some nonprofit organizations do both in-house research and development and fund the development efforts of others.

INNOVATION IN COLLABORATIVE NETWORKS

- ▶ **Technology clusters** are regional clusters of firms that have a connection to a common technology, and may engage in buyer, supplier, and complementor relationships, as well as research collaboration. Technology clusters may span a region as narrow as a city or as wide as a group of neighboring countries
- ▶ **Technological spillovers** are a positive externality from R&D resulting from the spread of knowledge across organizational or regional boundaries. Technological spillovers occur when the benefits from the research activities of one firm (or nation or other entity) spill over to other firms (or nations or other entities).

Where do innovations come from?

Knowledge-push

Demand-pull

Crisis driven
innovation

Mass
customization

Watching others -
imitating or
extending what
others do

Recombinant
innovation -
transferring or
combining old ideas
into new contexts

Regulation -
changing rules of
the game \
counter-
innovation

Future and
forecasting

Design-driven
innovation

Accidents -
unexpected and
surprising things
which offer new
directions

Inspiration - the
Archimedes
moment

Summary

1. Creativity is the underlying process for innovation. Creativity enables individuals and organizations to generate new and useful ideas. Creativity is considered a function of intellectual abilities, knowledge, thinking styles, personality traits, intrinsic motivation, and environment.
2. Innovation sometimes originates with individual inventors. The most prolific inventors tend to be trained in multiple fields, be highly curious, question previously made assumptions, and view all knowledge as unified. The most well known inventors tend to have both inventive and entrepreneurial traits.
3. Innovation can also originate with users who create solutions to their own needs.
4. Firms' research and development is considered a primary driver of innovation.
5. Firms often collaborate with a number of external organizations (or individuals) in their innovation activities. 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.
6. Many universities have a research mission, and in recent years universities have become more active in setting up technology transfer activities to directly commercialize the inventions of faculty. Universities also contribute to innovation through the publication of research findings.
7. Government also plays an active role in conducting research and development (in its own laboratories), funding the R&D of other organizations, and creating institutions to foster collaboration networks and to nurture start-ups (e.g., science parks and incubators). In some countries, government-funded research and development exceeds that of industry-funded research.
8. Private nonprofit organizations (such as research institutes and nonprofit hospitals) are another source of innovation. These organizations both perform their own R&D and fund R&D conducted by others.
9. Probably the most significant source of innovation does not come from individual organizations or people, but from the collaborative networks that leverage resources and capabilities across multiple organizations or individuals. Collaborative networks are particularly important in high-technology sectors.
10. Collaboration is often facilitated by geographical proximity, which can lead to regional technology clusters.
11. Technology spillovers are positive externality benefits of R&D, such as when the knowledge acquired through R&D spreads to other organizations.

Creativity techniques

Creativity techniques are methods that encourage creative actions, whether in the arts or sciences. They focus on a variety of aspects of creativity, including techniques for idea generation and divergent thinking, methods of re-framing problems, changes in the affective environment and so on. They can be used as part of problem solving, artistic expression, or therapy.

Some techniques require groups of two or more people while other techniques can be accomplished alone. These methods include word games, written exercises and different types of improvisation, or algorithms for approaching problems.

Let's play a game!

IWM-1. Activity: Using creativity tools

- ▶ Fishbone (cause and effect) diagrams
- ▶ Levels of abstraction
- ▶ How to statements

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?
- ▶ Provide an example of a firm that does a particularly good job at nurturing and leveraging the creativity of its individuals.
- ▶ 5. Several studies indicate that the use of collaborative research agreements is increasing around the world. What are some reasons collaborative research is becoming more prevalent?
- ▶ 6. What are the sources of innovation as a system?
- ▶ 7. Where do innovations come from? Use a relevant example to justify your answer.
- ▶ 8. Give an example of companies which encourage creativity at a systemic level.

- ▶ **Literature:**
 1. Melissa Schilling: Strategic Management of Technological Innovation, McGrawHill, International Edition 2011.
 2. Tidd, J., Bessant, J.R. 2014. Strategic innovation management. Wiley, Hoboken.
 3. Innovation management / authors Boruž Likar ... [et al.] ; editor Boruž Likar, co-editors Peter Fatur, Urška Mrgole ; translation Arslingue K. Žontar, TEFL, TBE. - 1st. ed. - El. knjiga. - Ljubljana: Korona plus - Institute for Innovation and Technology, 2013
 4. Kupeshova S. Innovation Management. Almaty, "Kazakh universiteti". 2011. - 160 c.

Thank you for your attention!