

Chapter 2

Sources of Innovation

Prof. Hakyoon Lee
(hylee@seoultech.ac.kr)

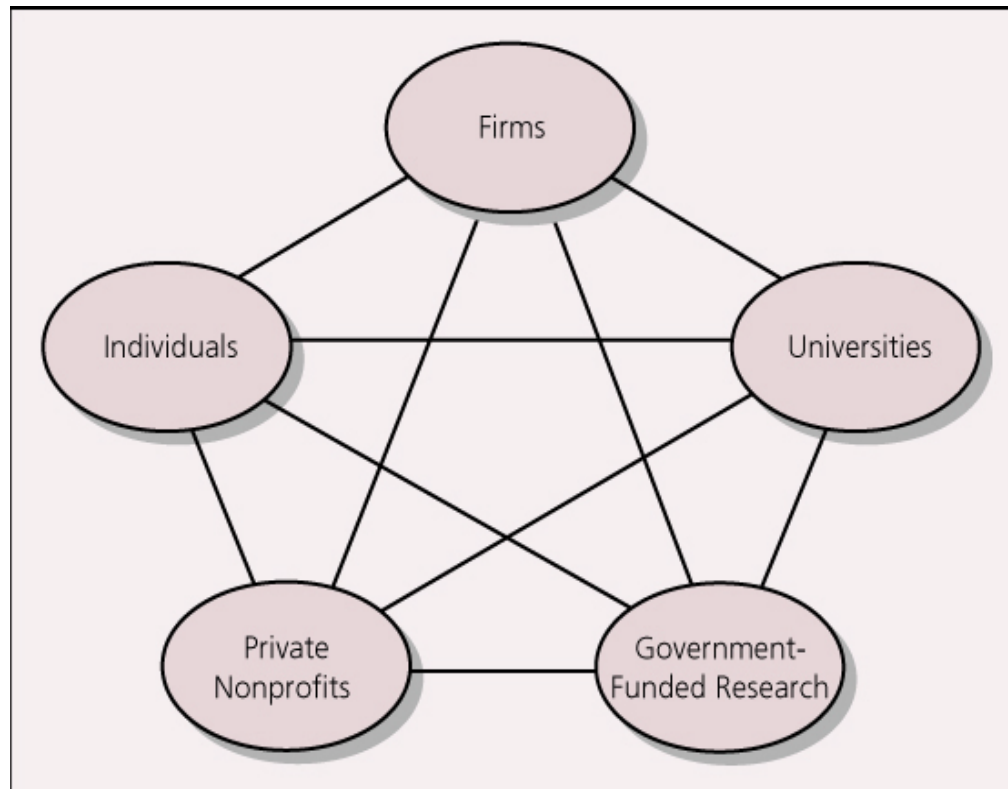
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Overview

➤ Innovation can arise from

- many different sources
- the linkages between them: leveraging knowledge and resources from multiple sources



Creativity

➤ Creativity: The ability to generate useful and novel ideas

- “novel”: a function both of
 - ✓ How different it is from prior work
 - ✓ Audience’s prior experiences

➤ 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)

Creativity

- Organization creativity is a function of:
 - creativity of individuals within the organization
 - social processes and contextual factors that shape how those individuals interact and behave (structure, routines, and incentives)

- Methods of encouraging/tapping organizational creativity:
 - Idea collection systems (e.g., suggestion box)
 - Creativity training programs
 - Culture that encourages (but doesn't directly pay for) creativity

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

- have mastered the basic tools and operations of the field
- are curious, and more interested in problems than solutions
- may develop many new devices or processes but commercialize few

➤ 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

Translating Creativity into Innovation

➤ Research and Development by Firms

- Research

- ✓ Basic research: increasing understanding of a topic or field without an immediate commercial application in mind
- ✓ Applied research: increasing understanding of a topic or field to meet a specific need

- Development: activities that apply knowledge to produce useful devices, materials, or processes

→ R&D refers to a range of activities that extend from early exploration of a domain to specific commercial implementations

Translating Creativity into Innovation

➤ Models for Sources of Innovation

▪ Linear model

✓ Technology(Science)-push

- Defining technology(science) as an autonomous factor of innovation
- Basic research → Design → Engineering → Manufacturing → Marketing → Sales

✓ Market(Demand)-pull

- Pointing to market needs as the main determinants of innovation
- Market needs → Development → Manufacturing → Sales

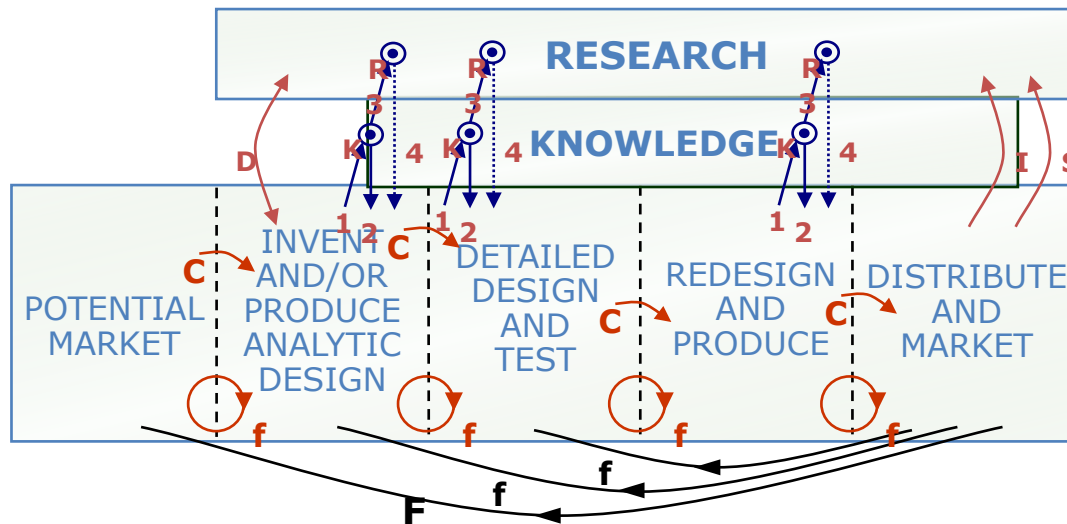
✓ Limitations

- Distorting the reality: Both are wrong!
- Assuming the innovation process is linear: no feedback!
- Neglecting interactions with external networks and importance of the cumulated knowledge

Translating Creativity into Innovation

➤ Models for Sources of Innovation

▪ Non-linear model: chain-link model



C: central chain of innovation

F: feedback loops

D: use of science (radical innovation)

K-R: use of knowledge or calling for research

I: feedback from innovation

Translating Creativity into Innovation

- Firm Linkages with Customers, Suppliers, Competitors, and Complementors
 - Collaborations occur in the form of alliances, consortium, licensing agreements, joint ventures, etc.
 - Most frequent collaborations are between firm and their customers, suppliers, and local universities
 - Firms may also collaborate with competitors and complementors
 - ✓ Complementor: organizations that produce complementary goods
 - ✓ e.g. Kodak and Fuji: competitors? or complementors?

Translating Creativity into Innovation

➤ Universities and Government-Funded Research

▪ Universities

- ✓ Many universities encourage research that leads to useful innovations
- ✓ If successful, the university shares the income with the individual inventors
- ✓ 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

▪ Governments invest in research through:

- ✓ their own laboratories
- ✓ science parks and incubators
 - Science parks: regional districts, typically set up by government to foster R&D collaboration between government, universities, and private firms
 - Incubators: institutions designed to nurture the development of new businesses that might otherwise lack access to adequate funding or advice
- ✓ grants for other public or private research organizations

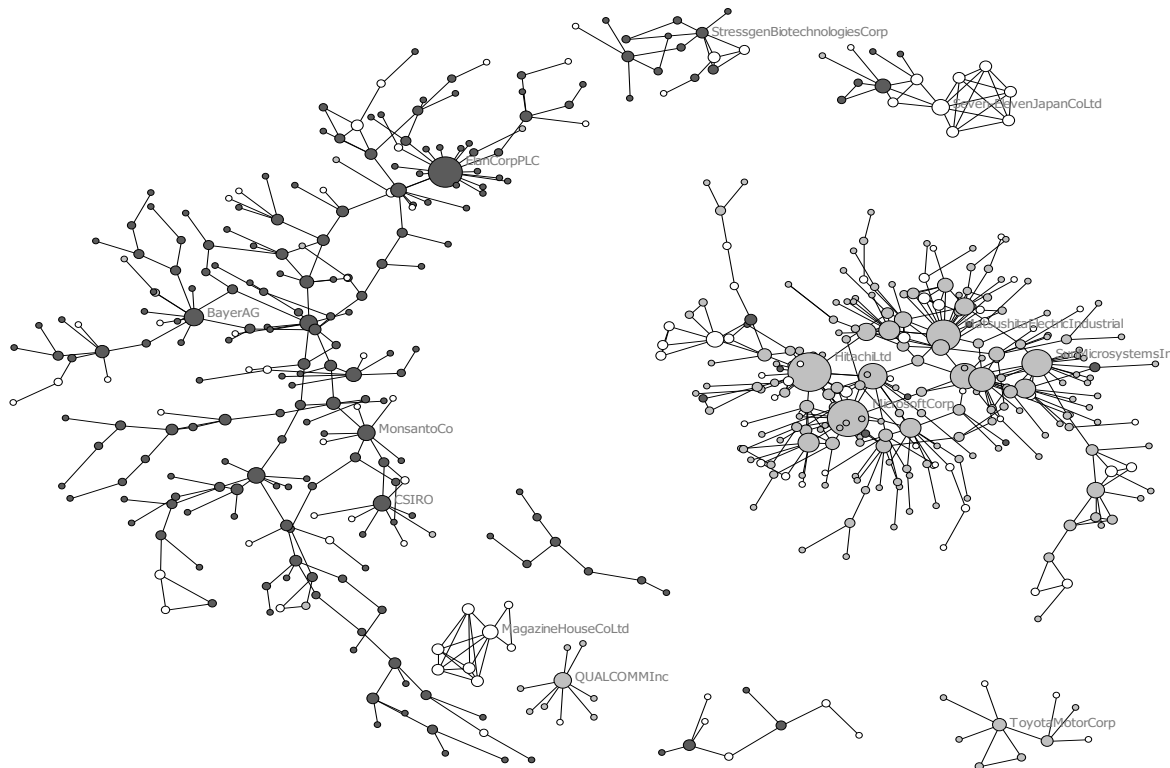
Innovation in Collaborative Networks

- 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

Innovation in Collaborative Networks

➤ Collaborative networks

- are especially important in high-technology sectors where individual firms rarely possess all necessary resources and capabilities
- can enable firms to achieve much more than they could achieve individually



Innovation in Collaborative Networks

➤ Technology Clusters

▪ Definition

- ✓ 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: Tacit knowledge, Willingness to 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

▪ Downsides

- ✓ Leading to competition that reduces the pricing power with buyers and suppliers
- ✓ Facing a risk of competitors gaining access to a firm's proprietary knowledge

Innovation in Collaborative Networks

➤ Technology Clusters

- Likelihood of innovation activities being geographically clustered depends on:
 - ✓ The nature of the technology, such as 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, such as 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, such as population density of labor or customers, infrastructure development, national differences in how technology development is funded or protected.

Innovation in Collaborative Networks

➤ Technological Spillovers

- Occur when the benefits from the research activities of one entity spill over to other entities
- A positive externality from R&D resulting from the spread of knowledge across organizational or regional boundaries
- 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