

The role of innovation in modern economy



Product versus Process Innovation



Product innovations are embodied in the *outputs* of an organization – its goods or services.

Process innovations are innovations in the way an organization conducts its business, such as in techniques of producing or marketing goods or services.

Product innovations can enable *process innovations* and vice versa.

What is a *product innovation* for one organization might be a *process innovation* for another.

- For example, U P S creates a new distribution service (*product innovation*) that enables its customers to distribute their goods more widely or more easily (*process innovation*).



Radical versus Incremental - 1

The *radicalness* of an innovation is the *degree to which it is new and different* from previously existing products and processes.

Incremental innovations may involve only a minor change from (or adjustment to) existing practices.

The radicalness of an innovation is relative; it may change over time or with respect to different observers.

- For example, digital photography a more radical innovation for Kodak than for Sony.



Radical vs. Incremental - 2



Incremental innovation	Radical innovation
continuous (linear improvement of value acquired by the customer)	discontinuous (with or without predecessor; essential, nonlinear improvement obtained by the customer)
based on old technology	based on new technologies
dominant design unchanged	leads to a new dominant design
does not lead to a paradigm shift	can lead to a paradigm shift
implies a low level of uncertainty	implies a high level of uncertainty
improvement of existing characteristics	introduces a whole new set of performance features
existing organization and qualifications are sufficient	requires education, new organization and skills
the result of a rational response or necessity	result of chance or R & D policy, not necessity
driven by market pull (important in the advanced stage of technology)	driven by technology (important in the early stage of technology)

At the heart of capitalism
is creative destruction.

Joseph A. Schumpeter

Competence-Enhancing versus Competence-Destroying Innovation

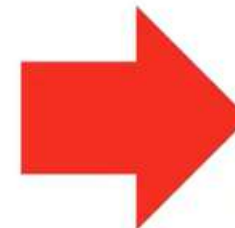


Competence-enhancing innovations build on the firm's existing knowledge base.

- For example, Intel's Pentium 4 built on the technology for Pentium III.

Competence-destroying innovations renders a firm's existing competencies obsolete.

- For example, electronic calculators rendered Keuffel and Esser's slide rule expertise obsolete.



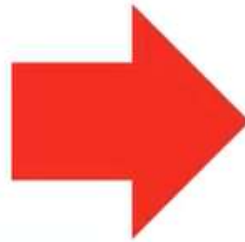
Whether an innovation is competence enhancing or competence destroying depends on the perspective of a particular firm.

Architectural versus Component Innovation



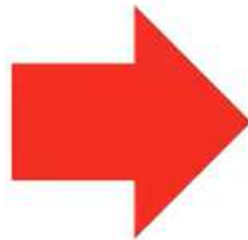
A **component innovation** (or modular innovation) entails changes to one or more components of a product system without significantly affecting the overall design.

- For example, adding gel-filled material to a bicycle seat.



An **architectural innovation** entails changing the overall design of the system or the way components interact.

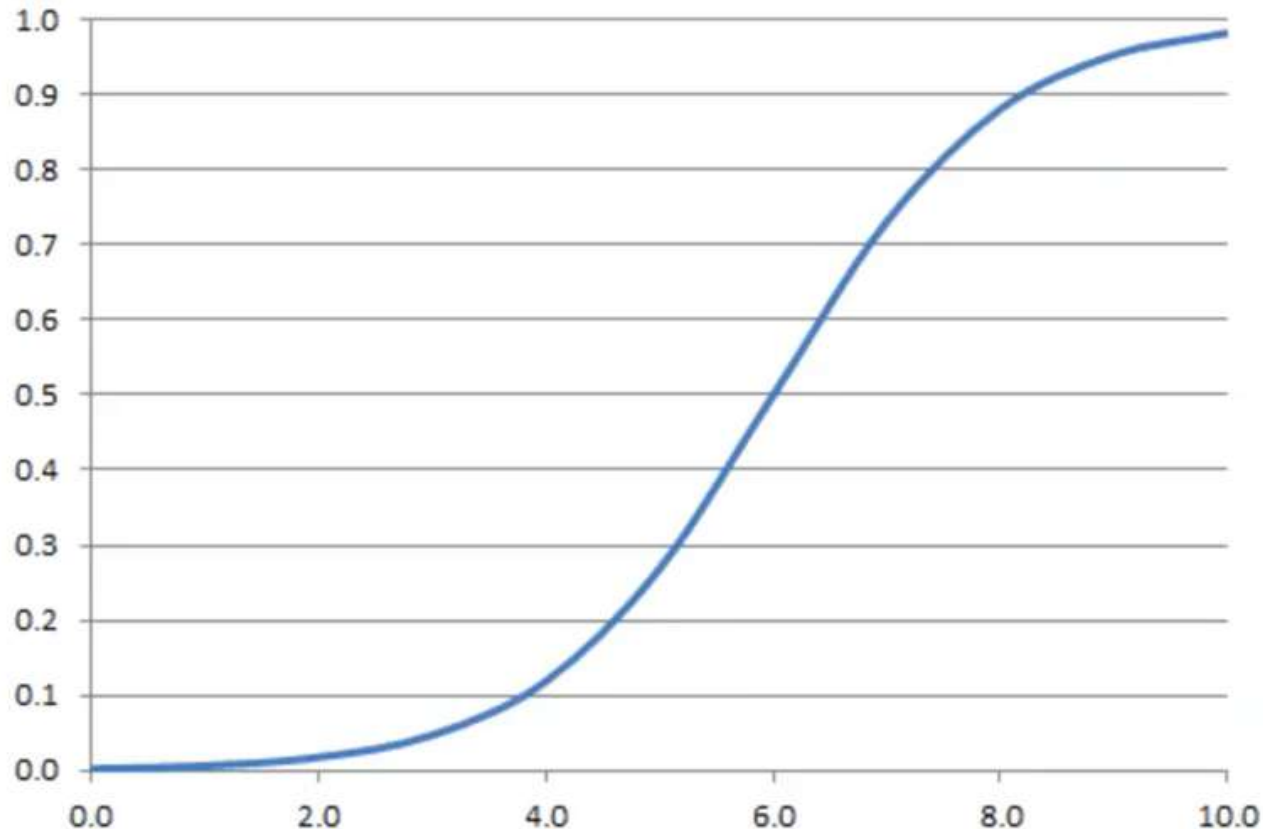
- For example, transition from high-wheel bicycle to safety bicycle.



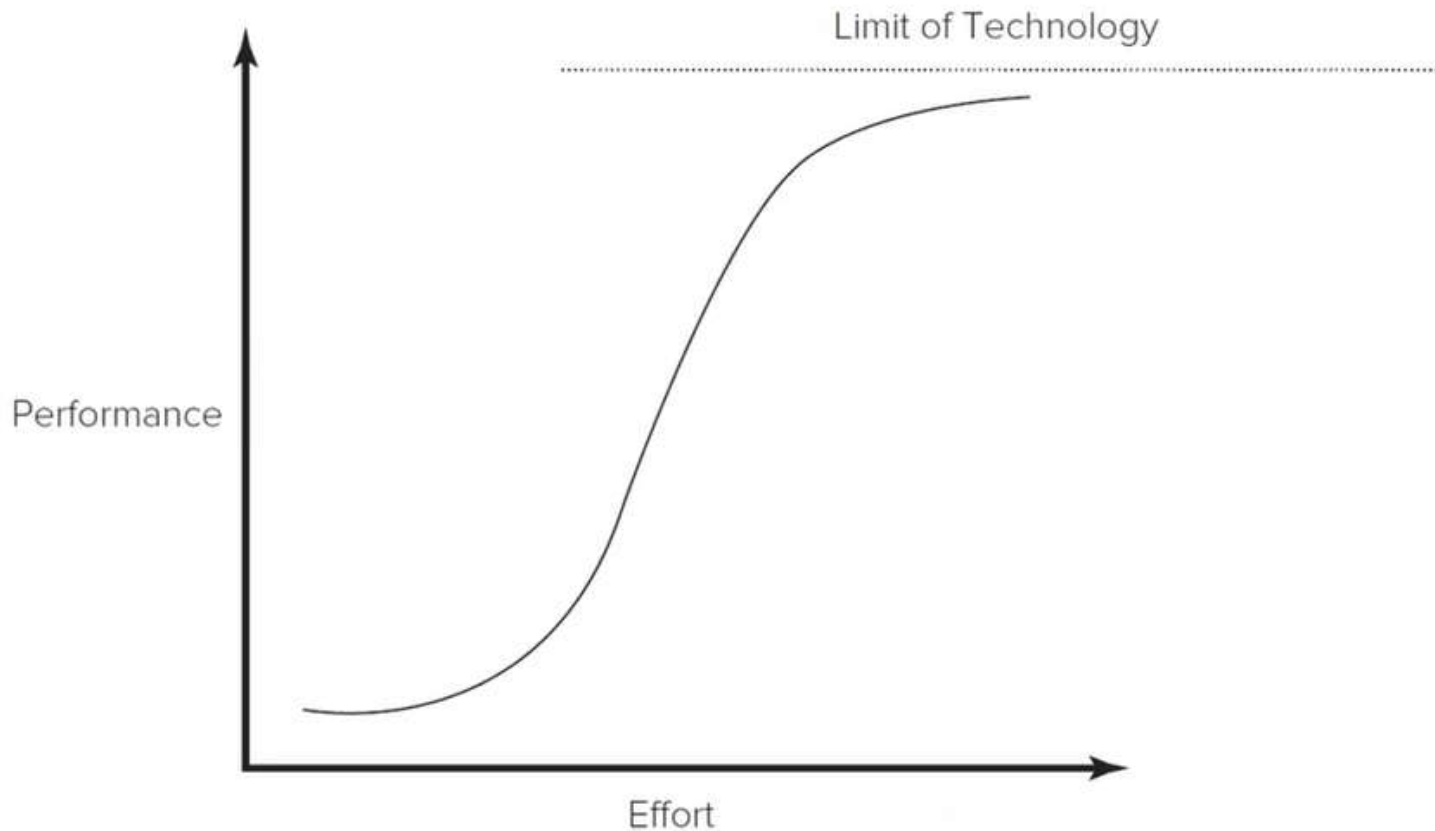
Most architectural innovations require changes in the underlying components also.

S-curves

Both the rate of a technology's improvement, and its rate of diffusion to the market typically follow an s-shaped curve.



S-curves in Technological Improvement



Technology improves slowly at first because it is poorly understood.

Then accelerates as understanding increases.

Then tapers off as approaches limits.

S-Curves in Technology Diffusion.

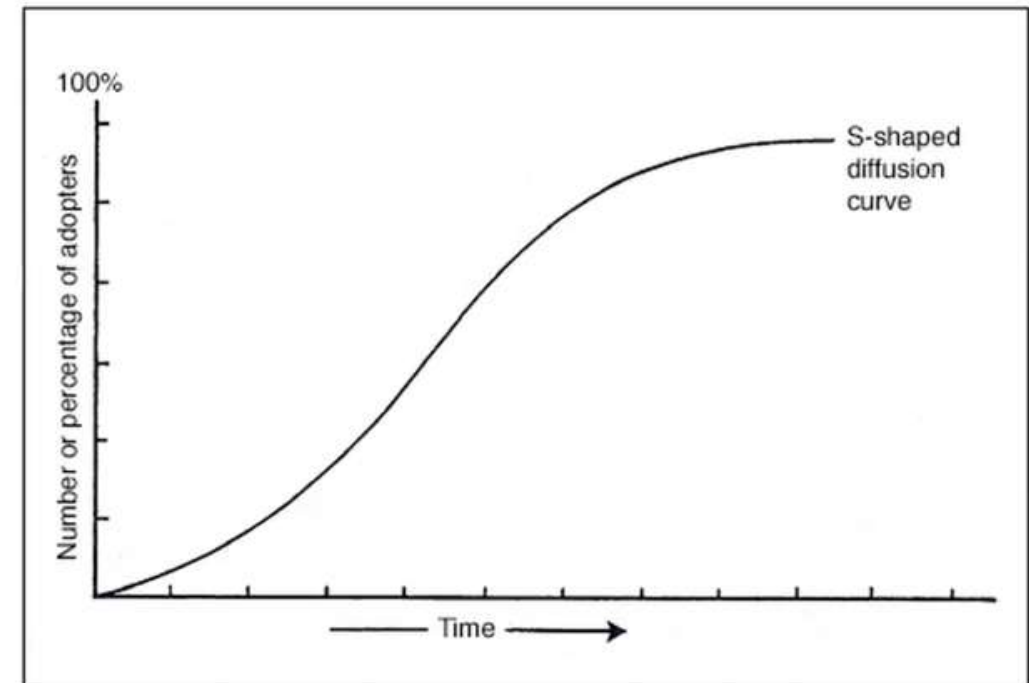
Adoption is initially slow because the technology is unfamiliar.

It accelerates as technology becomes better understood.

Eventually market is saturated and rate of new adoptions declines.

Technology diffusion tends to take far longer than information diffusion.

- Technology may require acquiring complex knowledge or experience.
- Technology may require complementary resources to make it valuable (for example, cameras not valuable without film).



The technology adoption life cycle

