



Competitiveness Of The National Economies

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Lecture № 8

Competitive Advantage in Technology-Intensive Industries through Innovations

Outline

1. Innovation and Competitiveness: the concepts and their application
2. Competitive Advantage in Technology-Intensive Industries
 - Appropriating the returns to innovation
3. Strategic Management of Technology
 - Exploiting innovation
 - Timing: to lead or to follow?
 - Industry standards
 - Managing risk
4. Strategy Implementation
 - The conditions for creativity
 - From invention to innovation

Goal of this lecture:

- Giving a clear view to the link between the innovation and the competitiveness
- Defining the ways to improve innovation and competitiveness
- Analyzing the concept of the Development of Technology
- Analyzing the innovation strategies

Innovation and Competitiveness: the concepts and their application

Innovation:

- **Innovation refers to the implementation ‘in real life’ of a novel idea or method**, whereas invention refers to the creation of the idea or method itself
- Global distinction between evolutionary or ‘incremental’ innovations, and revolutionary, or breakthrough innovations
- 4 types of innovation: product innovation, process innovation, organisational innovation, marketing innovation (OECD Oslo Manual)
- Innovation can happen and be developed in the public sector, i.e. government and administration, as well as in business
- **Innovation has to be ‘demystified’**: it does not correspond necessarily to “hightech”: creating an activity which is rather common, but does not yet exist in a country or territory is an innovation

Innovation and Competitiveness: the concepts and their application

Competitiveness:

- In the OCTs, as in the EU outermost regions, there are only few chances for many products and services to be cost competitive, because of the lack of economies of scale, distance which makes expensive both imported inputs and goods exported on foreign markets, and, in general, relatively high labour costs compared to the regional environment
- **Non-price competitiveness is based on comparative advantages**, mainly the **differentiation** of products and services, related in general to the local context and conditions, including the local innovation capacities: either concerning products and services which are specific to the region or concerning products and services that local capacities will allow for adapting to regional needs and constraints

Innovation and Competitiveness: the concepts and their application

Linkage innovation-competitiveness:

- Both concepts are strongly interrelated, in the economic theory as well as in real life: OCTs have to be competitive through differentiation (not forgetting nonetheless that price competition is still there to some extent).
- **Differentiation is based on innovation, non-technological as well as technological.**

What about a typology?

Criteria generally used refer to:

- Isolation and distance from populated and/or developed geographical areas (which constitutes a barrier to the diffusion of innovation, know-how and information in general)
- Economic specialisation
- Political and institutional status of the insular and peripheral territories
 - To be noted: as a matter of principle, no problem of trade balance, no problem of balance of payments
- Vulnerability

The most important within our perspective: economic specialisation

What about a typology?

With respect to economic specialisation:

- Highly isolated and focused on production and services to inhabitants
- Making their living mainly from sea resources or mining
- Agricultural with some specialisation allowing for export
- With a strategic geographical position, characterised by service activities, maritime transport or scientific missions
- Mainly touristic
- Commercial and/or financial platforms

This division must not of course be taken as rigid: a number of countries can be considered as belonging to more than one category

Targeting ways to improve innovation and competitiveness

Each nation has to review to what extent each of the following ways is appropriate to its needs and to what extent it can support it through strategies and policies supporting innovation and competitiveness:

Reducing the dependency of the economic fabric upon the exterior in the following sectors:

- agriculture / fishing and the agrofood industry
- energy: improvement of energy efficiency: selection of the most appropriate renewable energies and of the most appropriate energy mix; transport with the enlarged use of electric and hybrid vehicles

Exploiting natural resources while reducing/mitigating the impact on environment. Four sectors are mainly concerned: mining, agriculture and fishing, construction, tourism

Targeting ways to improve innovation and competitiveness

Developing the potential for exporting know how, engineering services and expertise. Many countries provide excellent sites for experimenting innovative solutions in specific geographical and climatic conditions, that could be transferred to other territories, a situation that gives them a comparative advantage with respect to Europe. Experimentation, while generally carried out in collaboration with large groups, allows for developing local competences (e.g.: energy sector)

Exploring and developing systematically relevant market niches: fruit and vegetables, financial services, eco-tourism

Targeting ways to improve innovation and competitiveness

Consolidating an «evident», but highly competitive and volatile, export sector : tourism and eco-tourism. Non-price competitive advantages have to be found through building on specificities and targeting niche markets

Supporting ICT both as a sector in itself and as a transversal instrument for enhancing innovation and competitiveness in all economic activities

Major issues to be addressed to set up territorial strategies for innovation (and competitiveness)

Assessing the competitiveness and innovation gap

- Assessing competitiveness factors: agriculture and agrofood (local and external markets), tourism, energy
- Assessing the innovation gap: analysis of supply of RTDI, and analysis of effective/potential demand (sectors)

Defining appropriate policy instruments:

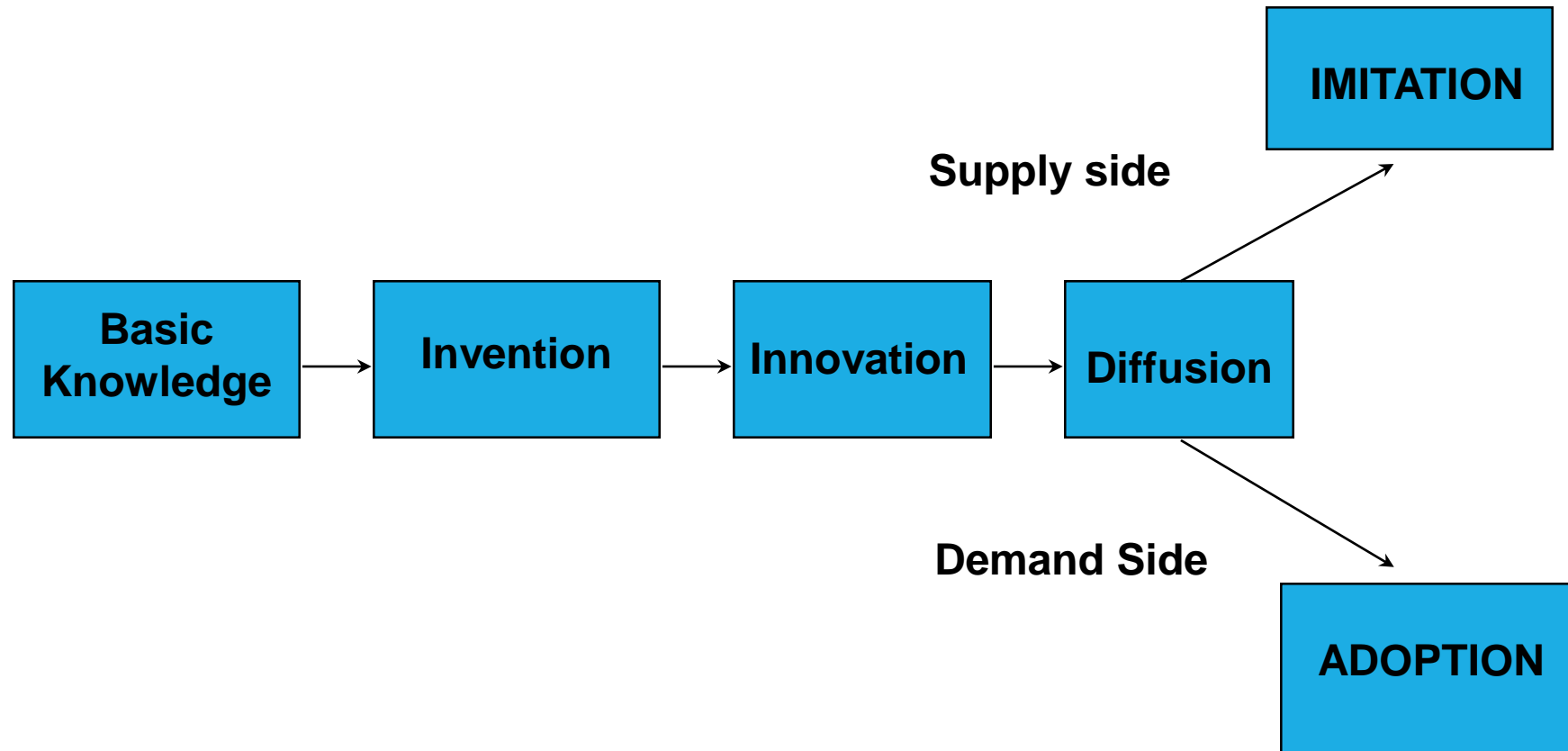
- Support to the development or strengthening of R&D & innovation capacities
- Support to entrepreneurship
- Immaterial support to innovative projects: assistance, advice, mentoring
- Finance beside 'classical' banking loans: soft loans, guarantee, seed- or venture-capital
- Facilities dedicated to host innovative projects and enterprises (incubators, technoparks ...)
- Innovation governance (including statistical tools)

Major issues to be addressed to set up territorial strategies for innovation (and competitiveness)

Identifying and understanding expecting outcomes:

- Through supporting innovation and competitiveness, the major stake for the countries is to **find opportunities for diversification and growth on their own domestic market, and on external markets** in order to trigger a **'virtuous' spiral of development**
- **Outcomes and impacts have to be referred to targets selected:**
 - Select a set of appropriate indicators
 - Have a scoreboards of achievements
 - Improve statistical data in order to build up a sort of 'observatory' of change
- Back to **governance** issues ... (towards a better governance)

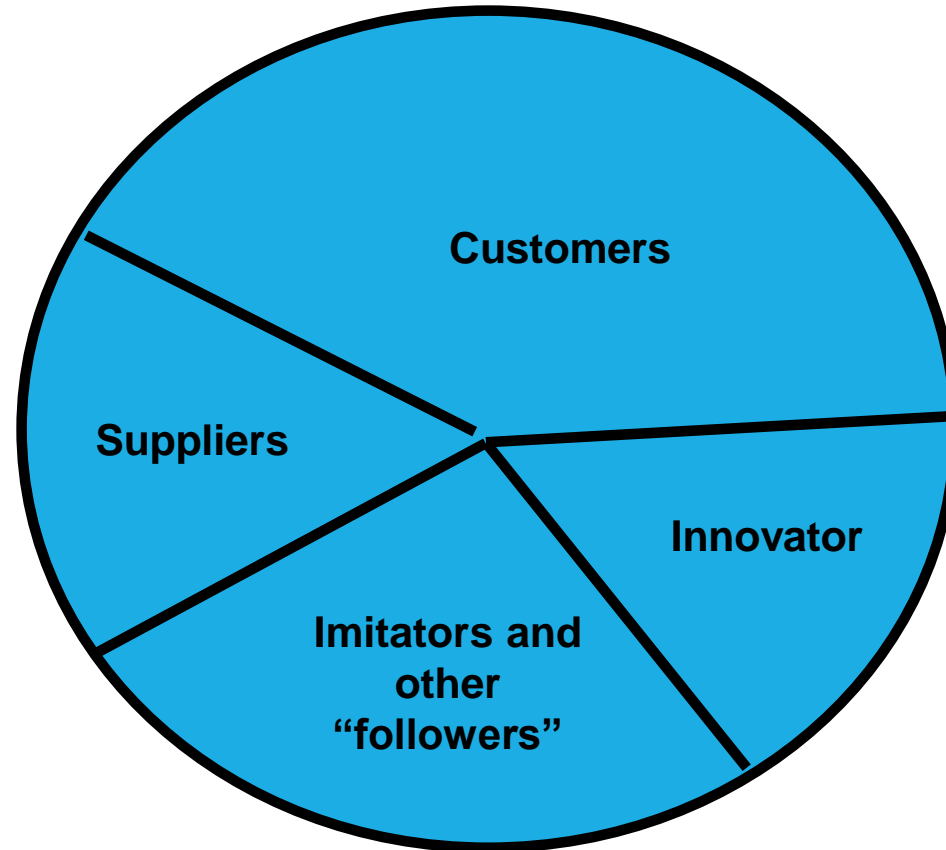
The Development of Technology: From Knowledge Generation to Diffusion



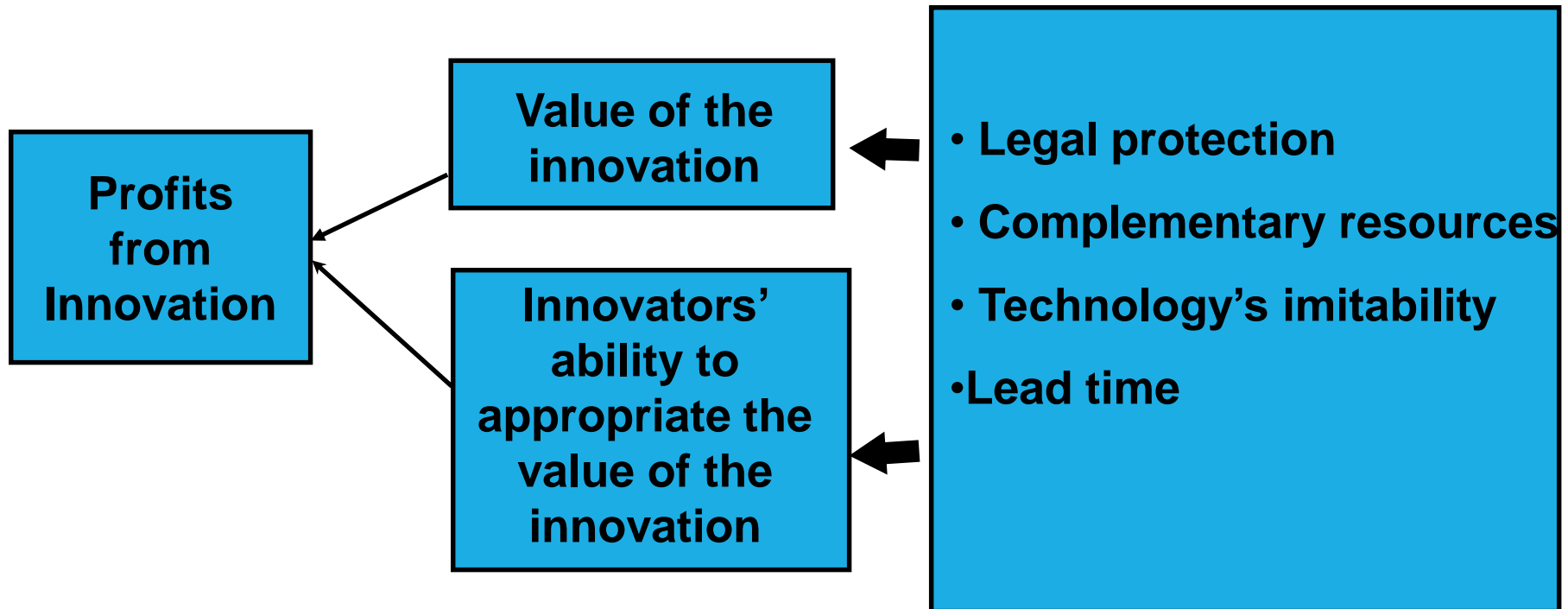
The Development of Technology: Lags Between Knowledge Generation and Commercialization

	BASIC KNOWLEDGE	FIRST PATENTS	PRODUCT LAUNCH	IMITATION
Xerography	late 19th and early 20th centuries	1940	1958	1974
Jet Engines	17th-- early 20th centuries	1930	1957	1959
Fuzzy logic controllers	1960's	1981	1987	1988

Appropriability: How are the Benefits From Innovation Distributed?



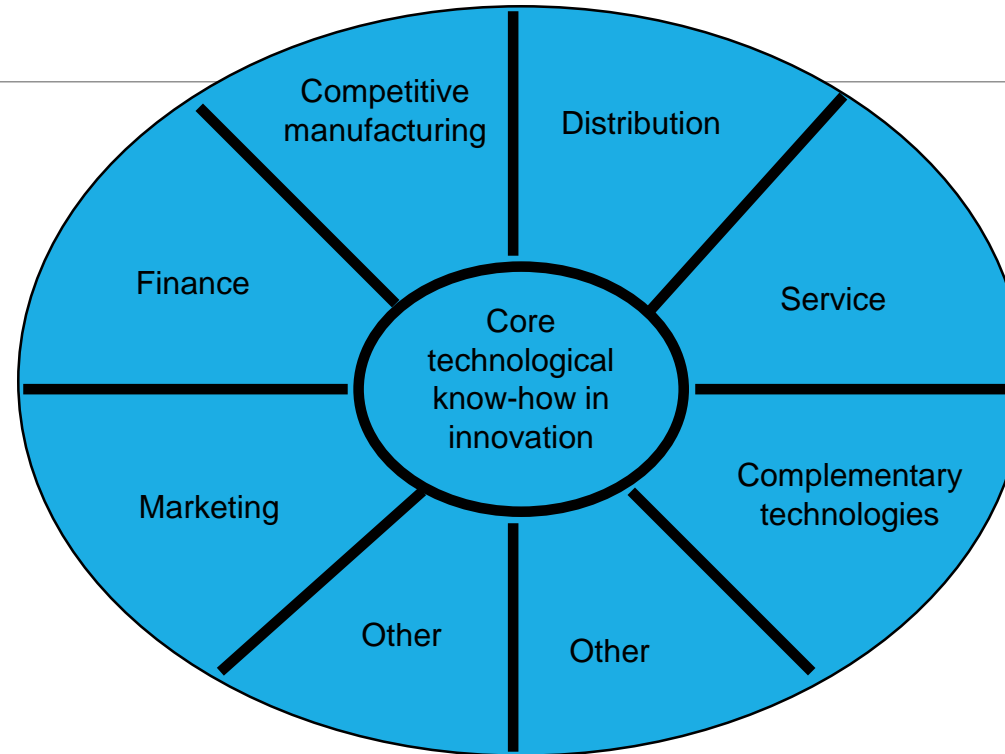
The Profitability of Innovation



Legal Protection of Innovation

Patents	-- exclusive rights to a new product, process, substance or design.
Copyright	-- exclusive rights to artistic, dramatic, and musical works.
Trademarks	-- exclusive rights to words, symbols or other marks to distinguish goods and services; registered with Patent Office.
Trade Secrets	--protection of chemical formulae, recipes, and industrial processes.
Contracts	--contracts between firms and between a firm and its employees can restrict transfer of technology and know how.

Complementary Resources



Bargaining power of owners of complementary resources depends upon whether complementary resources are *generic* or *specialized*.

Characteristics of a Technology Which Influence Imitability

Ability to imitate an innovation depends on :

How *codifiable* is the knowledge? *Explicit* knowledge is easier to understand than *tacit* knowledge.

How *complex* is the technology?

Lead Time

If rivals can imitate-- time lag (lead time) is the major advantage of the innovator.

But maintaining lead-time advantage requires continuous innovation

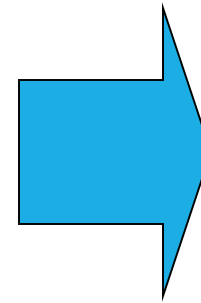
Rapid Cost Reduction During Diffusion

Lead time can be reinforced by learning effects

Learning efficiencies

Economies of scale

Process innovation



Rapid cost
reduction

e.g. Ball point pen

1945

1952

\$12.50

\$0.15

Once dominant design paradigm established, diffusion tends to be rapid

Alternative Strategies for Exploiting Innovation

	Licensing	Outsourcing certain functions	Strategic Alliance	Joint Venture	Internal Commercialization
Risk & Return	v. small investment risk, but returns also limited (unless patent position very strong) Some legal risks	Limits capital investment, but may create dependence on supplies/partners	Benefits of flexibility, risks of informal structure	Shares investment and risk. Risk of partner disagreement and culture clash	Largest investment requirement and corresponding risks. Benefits of control
Competing Resources	Few	Permits accessing of outside resources and capabilities	Permits pooling of the resources and capabilities of more than one firm		Substantial requirements in terms of finance, production capability, marketing capability, distribution, etc.
Examples	Konica licensing its digital camera to Hewlett Packard	Pixar's computer animated movies (e.g. "Toy Story") marketed and distributed by Disney Co.	Apple and Sharp build the "Newton" PDA	Microsoft and NBC formed MSNBC	TI development of its Digital Signal Processing Chips

The Comparative Success of Leaders and Followers

PRODUCT	INNOVATOR	FOLLOWER	WINNER
Jet Airlines	De Havilland (Comet)	Boeing (707)	Follower
Float glass	Pilkington	Corning	Leader
X - Ray Scanner	EMI	General Electric	Follower
Office P.C.	Xerox	IBM	Follower
VCRs	Ampex/Sony	Matsushita	Follower
Diet Cola	R.C. Cola	Coca Cola	Follower
Instant Cameras	Polaroid	Kodak	Leader
Pocket Calculator	Bowmar	Texas Instruments	Follower
Microwave Oven	Raytheon	Samsung	Follower
Plain Paper Copiers	Xerox	Canon	Not clear
Fiber Optic Cable	Corning	many companies	Leader
Video Games Players	Atari	Nintendo/Sega	Followers
Disposable Diapers	Proctor & Gamble	Kimberly-Clark	Leader
Internet Browser	Netscape	Microsoft	Not clear

Value of First- and Second-Mover Strategies

Not always desirable to be first-mover.

- Does not guarantee competitive advantage.

Advantages of first-movers

- Most important: positive reputational effect with customers.
- Can be recognized as particularly innovative firms which can positively influence customers' perceptions of products/services.
- Have first opportunity to move along learning curve.

Value of First- and Second-Mover Strategies (cont.)

Disadvantages of first-movers

- Will sometimes offer products/services that are poorly designed or defective.
- Might also launch new products with inadequate marketing or promotional efforts.
- Sometimes customer demand is so strong that first-movers are unprepared to handle it.

Value of First- and Second-Mover Strategies (cont.)

Second-movers have opportunities due to mistakes of first-movers.

- They can “piggyback” on the efforts of first-movers, while avoiding much of the initial costs/
- R&D, marketing and advertising, and costs associated with opening distribution channels.

Value of First- and Second-Mover Strategies (cont.)

Factors which characterize the dynamic industry contexts in which these decisions must be made:

- Ambiguity of emerging markets
 - Uncertainty of customer demand
 - Lack of industry infrastructure typical of established industries.
 - Lack of industry standards.
- Product life cycles can be very short
 - PCs: 4-6 months
 - CT scanners: less than 2 years

Value of First- and Second-Mover Strategies (cont.)

Importance of three factors for successful first- and second-movers:

- Dominant design
 - Much of firm's success depends of this.
 - Chrysler and their minivan in 1982.
- Imitability
 - The more difficult to imitate, the better.
- Interconnectedness of product requirements and company resources.

The Strategic Management of Technology: To Lead or to Follow

Key considerations:

Is innovation appropriable and protectable against imitation?



If so, advantages in leadership.

The role of complementary resources



Followers may be able to avoid investing in complementary resources due to better-established industry infrastructure



Firms possessing complementary resources have the luxury of waiting

Is owning/controlling industry standard critical to competitive advantage?



If so, advantage in being a leader.

The Emergence of Standards

Emergence of a dominant design paradigm

- Model T in autos
- IBM 360 in mainframes
- Douglas DC3 in passenger aircraft

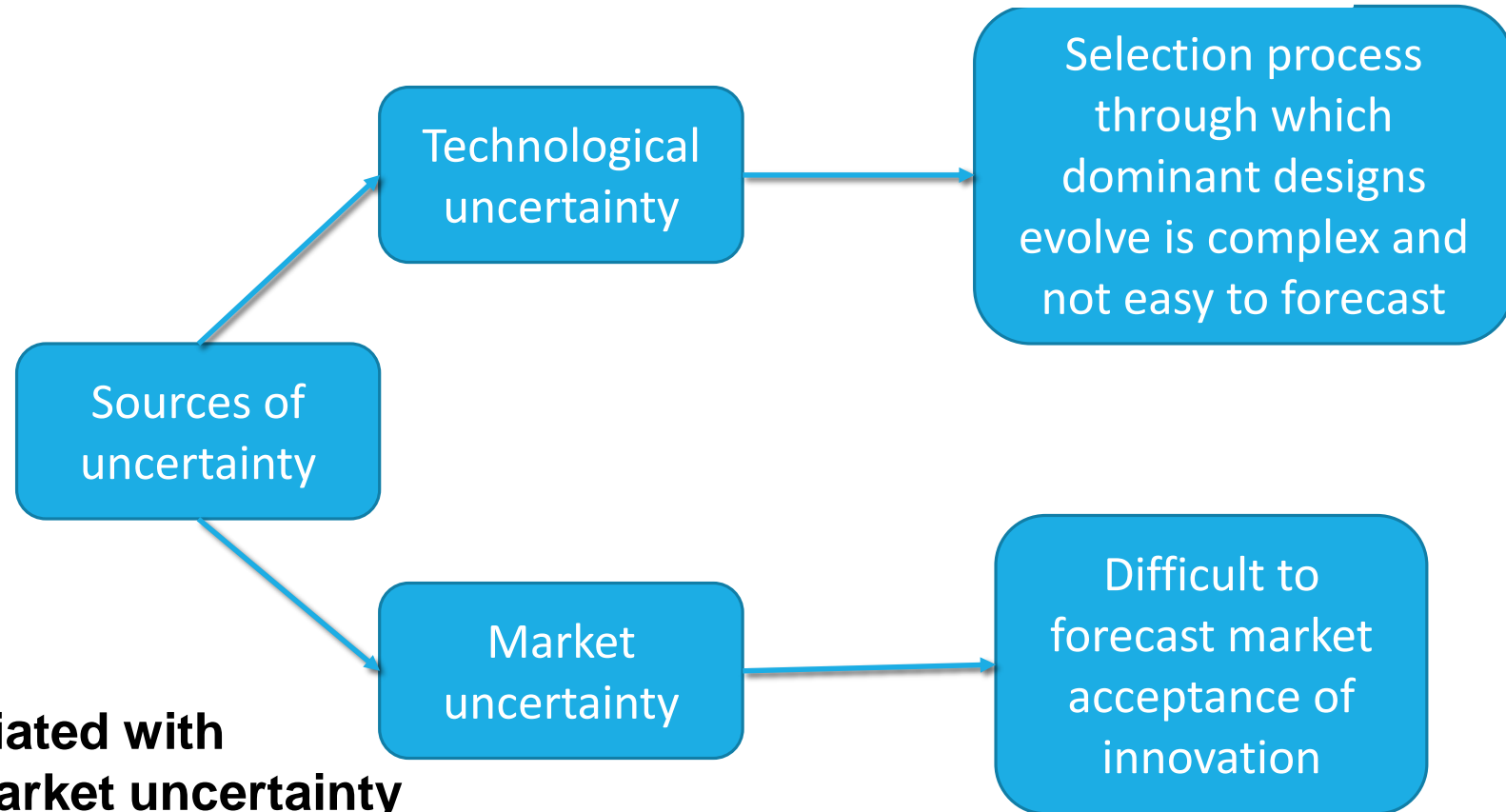
Emergence of technical standards

- Emerge in industries where there are network extremities

Entrenchment of the dominant designs and technical standards

- Learning effects: incremental improvement of the dominant design
- Switching costs
- Need for coordinated action by multiple players

Uncertainty in Technology-Intensive Industries



Business risk associated with technological and market uncertainty is compounded by high capital requirements of investment in new technology and long gestation periods of investments.

Strategic Management of Technology: Managing Risks

Cooperate with lead users

- **early identification of customer requirements**
- **assistance in new product development and refinement**
- **source of early cash flow**

Limit exposure

- **keep fixed costs low**
- **lease don't buy**
- **outsource/ collaborate where possible**
- **keep financial leverage low**

Flexibility

- **Respond quickly to new information from the market**
- **Learn from failure**
- **View investments in technology as options.**

Strategy Implementation: The Conditions for Creativity

- | | |
|---------------------|--|
| The people | -- curious, imaginative, adventurous,
assertive, playful, self-confident,
reflective, uninhibited |
| The content | -- the role of interaction

-- the role of play |
| The stimulus | -- the desire to solve problems/
respond to need |

Strategy Implementation: Invention to Innovation

While invention depends upon creativity, successful innovation requires integrating new knowledge with multiple business functions.

Need to link R&D departments with other functions (the problem of Xerox's PARC)

The role of cross-functional new product development teams as vehicles for integration

The role of product champions--in achieving integration and counteracting organizational inertia.

Questions open to discussion

Objectives ? Diversification ? Improve competitiveness of existing sectors ?

Which targets select taking into account the characteristics of a country, and the sectors considered as strategic for the future (*filières d'avenir*) ? Which ones ? All ?

- Reducing dependence ?
- Exploiting natural resources while reducing the environmental impact ?
- Exporting know how ?
- Market niches ?
- Tourism ?
- ICT ?
- Other suggestions ?

Questions open to discussion

Which policy instruments consider ?

- Building facilities ?
- Financial engineering (vs subsidies) ?
- Immaterial support
- Etc.

Time span ? 5-10 years ? Longer ?

Have you already started to build an innovation and competitiveness strategy ?

- If yes, how do you assess your experience ?
- Do you consider it is transferable ?

More generally, what could be the role of exchange of experience ? Among countries ? Between countries and Outermost Regions ? With SIDS (Small Island Developing States) ?

Thank
you

