



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

Economic Value of Standards

Presented by
the International Electrotechnical Commission



Aim

- This presentation was developed by the International Electrotechnical Commission (IEC) to create a better awareness and understanding of the importance of standards for students of business schools and management of technology, and technology policy faculties of technical universities.

- It consists of three lectures:
 - An introduction to standards and their importance
 - A discussion of the life cycle of standards, their development, use and maintenance
 - A discussion of the economic value of standards (i.e. their relevance for business, innovation and international trade).

Contents

- ▶ Economic Benefits of Standards
- ▶ Basic Concepts in Economics of Standardization
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Introduction

- We live in a world profoundly reliant on product standards. They affect our lives in ways we sometimes do not even notice, but they have far-reaching implications for economic activity (WTO, 2005)
- Standards have a positive impact on the economy, e.g. ...

Economic Benefits of Standardization

- Standards account for 13% of the growth in labour productivity in the UK 1948-2002 (Blind, 2004)
- Standards have a positive effect on exports (DIN, 2000)
- Standardization accounts for about 1% of the European GNP* (Blind, 2004)
- International standards lead to international competitiveness (DIN, 2000)
- Macroeconomic benefits of standardization are greater than individual industry advantage (DIN, 2000)

Economic Costs of Standardization

- ▶ Who finances standardization?
 - ▶ Participants usually have to finance themselves
 - ▶ Short-term costs versus long-term pay-off

- ▶ Standards can become Trade Barriers (more later on)

Basic Concepts in the Economics of Standardization

- ▶ Economies of scale
- ▶ Free rider problem
- ▶ Information asymmetry
- ▶ Transaction costs
- ▶ Network externalities
- ▶ Switching costs
- ▶ Excess inertia and lock-in
- ▶ Bandwagon effect

Economies of scale

- Standards reduce variety, thereby lowering the cost associated with the production of one unit and creating *economies of scale*.
- Economies of scale are often taken into consideration when choosing which standard to support and adopt (e.g. the GSM standard).

Free rider problem

- Companies who are unwilling to participate in and contribute to the standards process usually nevertheless have access to the standard (because most committee standards are available on the web for free or at low cost). This phenomenon is called the *free rider* problem.*

Information asymmetry

- *Information asymmetry*: information about e.g. a product is available to one party (the producer) but not to the other (the consumer). The information provided by standards reduces the problem of information asymmetry (Leland, 1979)*
- In the presence of information asymmetry, if buyers cannot differentiate between high and low quality goods, lower quality products can eventually drive out higher quality products. This is called *adverse selection* (Akerlof, 1970)
- The information provided by standards reduces the chance that imperfect information creates market failure (DTI, 2005)

Transaction costs

- *Transaction costs* are costs not directly related to an economic exchange (e.g. the time and resources required to establish a common understanding). Standards reduce transaction costs of negotiation because “both parties to a deal mutually recognize what is being dealt in...” (Kindleberger, 1983, p.395).

Between producers and customers:

- Standards reduce transaction costs by improving recognition of technical characteristics and avoidance of buyer dissatisfaction (Reddy, 1990). They reduce e.g. *search costs* since there is less need for customers to spend time and money evaluating products (Jones & Hudson 1996).

Between producers:

- It is through sharing a common standard that anonymous partners in a market can communicate, can have common expectations on the performance of each other's product, and can trust the compatibility of their joint production (WTO, 2005).

By reducing transaction costs, standards make markets more efficient

Network externalities

- Standards, particularly in the communication field, have *network externalities*: i.e. every new user in the network increases the value of being connected to the network (Farrell and Saloner 1985; Katz and Shapiro 1985)
 - *direct* network externalities: e.g. every new fax machine increases the reach of the network
 - *indirect* network externalities: e.g. if everyone buys the same car brand, the number of dealers and the availability of spare parts will be higher
- Network externalities require compatibility. Competing networks that are incompatible reduce the externalities of the networks involved.

Switching costs

- ▶ Refers to the costs associated with switching from one standard to another
- ▶ It involves a standard-specific investment that makes organizations hesitant to change standards (von Weizsaecker, 1982; Farrell and Shapiro, 1988)
- ▶ Estimated switching costs play a decisive role in the market strategy of network industries in particular (Shy, 2001)

Excess inertia and lock-in

- *Excess inertia* occurs when users are reluctant to switch to another standard (Farrell and Saloner, 1986).
- *Lock-in* occurs when switching has become too difficult (Farrell, 1990).
- E.g. QWERTY keyboard layout (David 1985).

Bandwagon effect

- *Bandwagon effect* occurs when an important agent makes a unilateral public commitment to one standard; if others follow the lead they will be compatible at least with the first mover, and potentially with the followers (Farrell and Saloner, 1988)
- The *first adopters* of a standard take the highest risk, but they also have the benefit of developing competence early
- If the old technology does not retain its critical mass, those left behind are referred to as *angry orphans* (David, 1987)

Standards and Innovation

- Standards form an essential part of the institutional infrastructure crucial for the development of innovation (Swann, 2000)
- Strong correlation between the number of standards and indicators of innovation (R&D level and patent count) (Blind, 2004)
- Standards generally support incremental innovation (Temple, 2004)

Influence of Standards on Innovation

- Researchers, developers and engineers use standards to obtain information about state-of-the-art technology (Bauer, 1980). In this manner standards can focus innovation.
- Both standards and innovation strongly impact the growth of the economy. Sometimes it is difficult to distinguish both impacts (DTI, 2005).

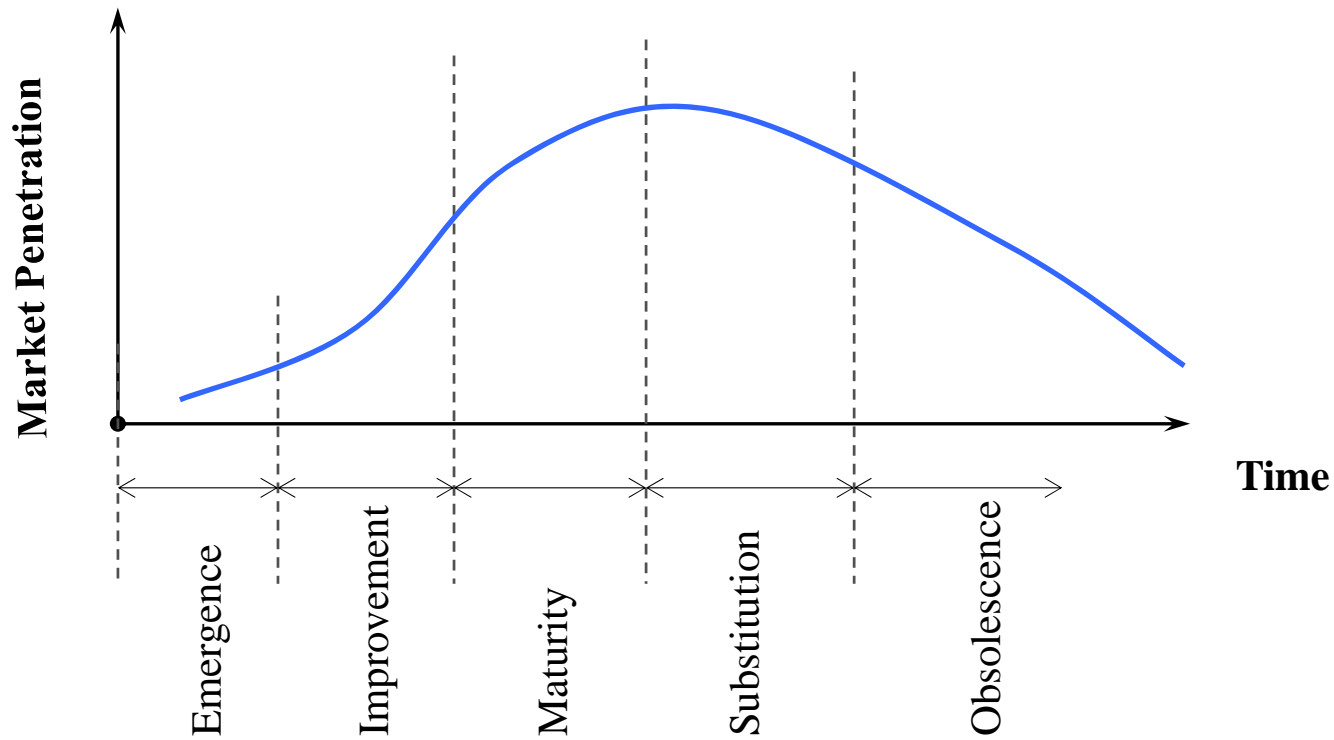
Timing of standardization

- Standardization at an inappropriate time can lead to economic inefficiency.
- Too early standardization may prematurely lock an industry into a technology, precluding experience with the diversity.
- Standardization occurs too late if technological options have already become entrenched. Companies with installed bases will then ignore the standards (Tanenbaum, 1989).

Technology Life Cycle

- The timing of standards is important in respect to the stage of technology maturity
- Technology life-cycle stages (Betz, 1993):
 - ▶ Emergence
 - ▶ Improvement
 - ▶ Maturity
 - ▶ Substitution
 - ▶ Obsolescence

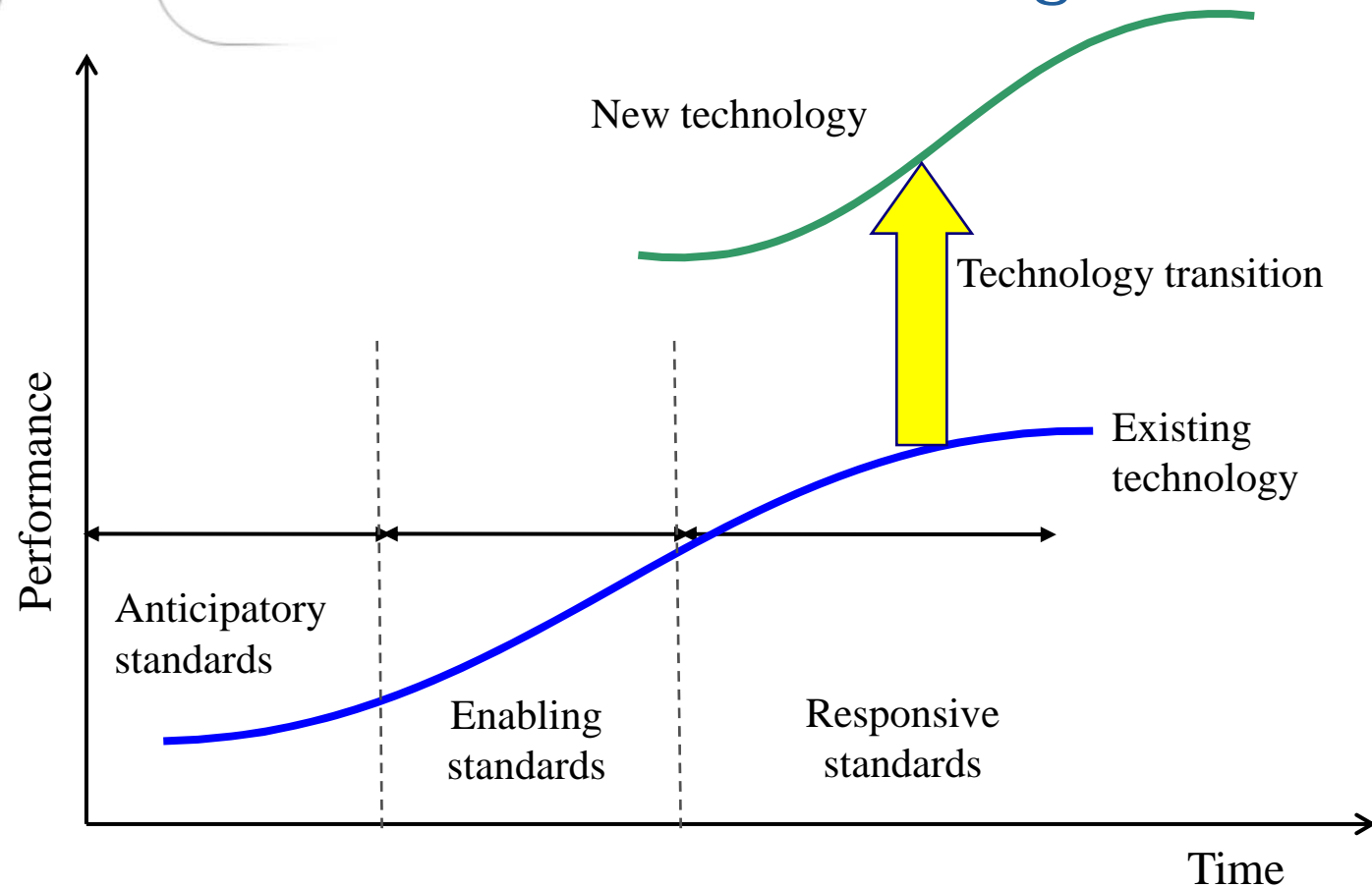
Technology Life Cycle (graph)



Technology maturity and standardization timing

- ▶ Different types of standards are needed at each stage of technology maturity (Sherif, 2006a)
 - ▶ *Anticipatory standards* specify the production system of the new technology.
 - ▶ *Enabling standards* refine the system.
 - ▶ *Responsive standards* codify knowledge already established in practice through precursor products or services.

Technology maturity and standardization timing



Standards and Trade (e.g. Swann *et al.*, 1996)

- “The very existence of standards is positive for trade” (DIN, 2000)
- Standards facilitate trade by increasing the compatibility of products.
- Standards make the characteristics of domestic markets more transparent, in particular for foreign producers and consumers, and improve investment decisions (DIN, 2000).



Trade example: electrical white goods

- ▶ 20 years ago trade was dominated by national (sometimes regional) manufacturers
- ▶ Significant world trade today
- ▶ Standards have contributed to acceptance of goods worldwide, notably
 - ▶ electrical safety standards, and today
 - ▶ energy efficiency standards and
 - ▶ performance standards
- ▶ Cultural differences still exist (e.g. North American consumers are used to much larger appliances than European/Asian consumers)

Trade barriers

- Standards can also be used to protect domestic markets.
- Complicated procedures to determine product conformity with technical requirements increase transaction costs and hinder trade (WTO, 2005).
- If producers have to certify their products in each country, they will face substantial costs (WTO, 2005). Mutual recognition of certification bodies resolves this problem.

Summarizing the benefits

Function of standards	Effect on the market
Compatibility	<ul style="list-style-type: none">▶ Creates network externalities▶ Avoids lock-ins
Information	<ul style="list-style-type: none">▶ Corrects for adverse selection▶ Facilitates trade▶ Reduces transaction costs
Variety reduction	<ul style="list-style-type: none">▶ Allows economies of scale▶ Builds critical mass

(Source: Blind, 2004, adapted)

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NB: References to all lectures are included in the accompanying document



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