ICT Standardization and Innovation

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Forming the Next Generation of ICT Standards People: A Day of Teaching Standardization

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Agenda

- Why standardization and innovation?
- Main contents of the chapter
- How to teach the contents? A proposal
- General experience from teaching standardization

Why Standardization and Innovation?

Learning objectives

- Getting insights into the interdependencies between innovation and standards/standardization.
- Understanding how standardization and innovation can benefit each other.
- Learning concrete examples how standardization and standards can boost innovation.
- Understanding the relationships between research and standardization, in particular, how standards and standardization can be leveraged during the research process.
- Learning about the ways, in which standards and standardization can support innovation, both as a process and as an output in the sense of a technology or product; so-called innovation potential in standardization.

Traditional View of Innovation and Standardization

- Standardization: Keeping things the same
- Innovation: Development of new things

"Standardization and innovation give the impression of being opposites."
Perera (2010)

Standards are "the flux between freedom and order".
David (1995)

INNOVATION

STANDARDISATION

Many Interpretations of Innovation

- Innovation is more than an invention: It includes the commercialization of the invention!
- Innovation may concern materials, processes, products/services, components, markets, and/or organizational forms
- Types of innovation (depending on novelty level):
  - New-to-the-Firm: Adoption of an existing technology that is new to the company (OECD)
  - New-to-the-Market: Known technologies that are being transferred into a new market (OECD)
  - New-to-the-World: Ground-breaking innovations (global level) (OECD)
  - Disruptive: New technology eventually displacing established competitors (Bower and Christensen 1996)
  - Incremental/radical innovation
- Even the adoption of an existing technology is understood as innovation activity. The ability of companies to accommodate existing innovation is called absorption capacity (Cohen and Levinthal 1990).

New Perspective on Standardization and Innovation

Standards as **innovation-hampering**

- Standards contain "**static**" solutions that are intended to be used repeatedly; they are static, because the solution seems to be "**frozen**" during a certain time period
- Only when there is the necessity to develop another solution, the old one makes place for the new one
- Standards induce a Lock-in effect
  - High costs of replacing the hardware
  - Switching costs incurred by users when they have to learn how to work with a new standard (education costs)
  - Penguin effect: New standard would only be attractive if others would use it

But standards can also **promote innovation:**

- Standards allow an early market uptake and support the achievement of critical mass (→ agreed upon best practice)
- Standards ensure compatibility allowing for innovation to take place based on other innovations
- Standards allow technology transfer and facilitate research
- ....

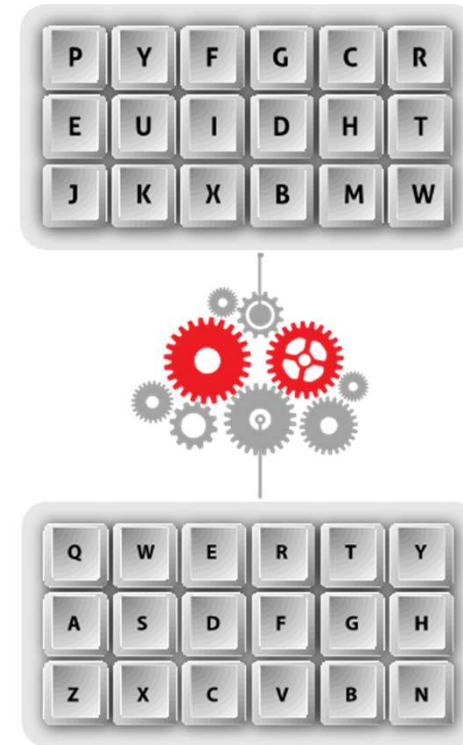Source: De Vries (2006, p. 40)
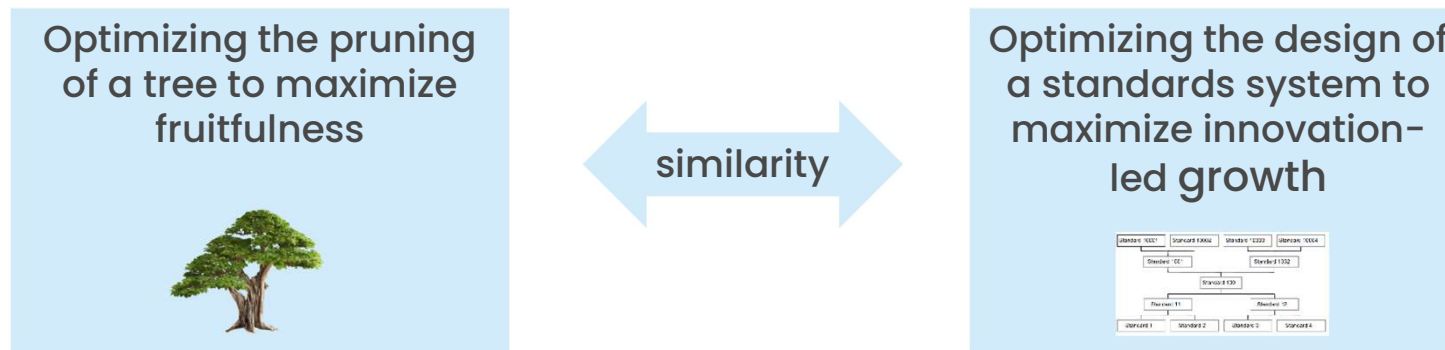
Example: The QWERTY and DVORAK Stories

First version of the story:
- Innovation hampering
- Innovation fostering

Second version of the story:
- If DVORAK was really superior, users would have switched to it

Useful Analogy

Optimizing the pruning of a tree to maximize fruitfulness

similarity

Optimizing the design of a standards system to maximize innovation-led growth
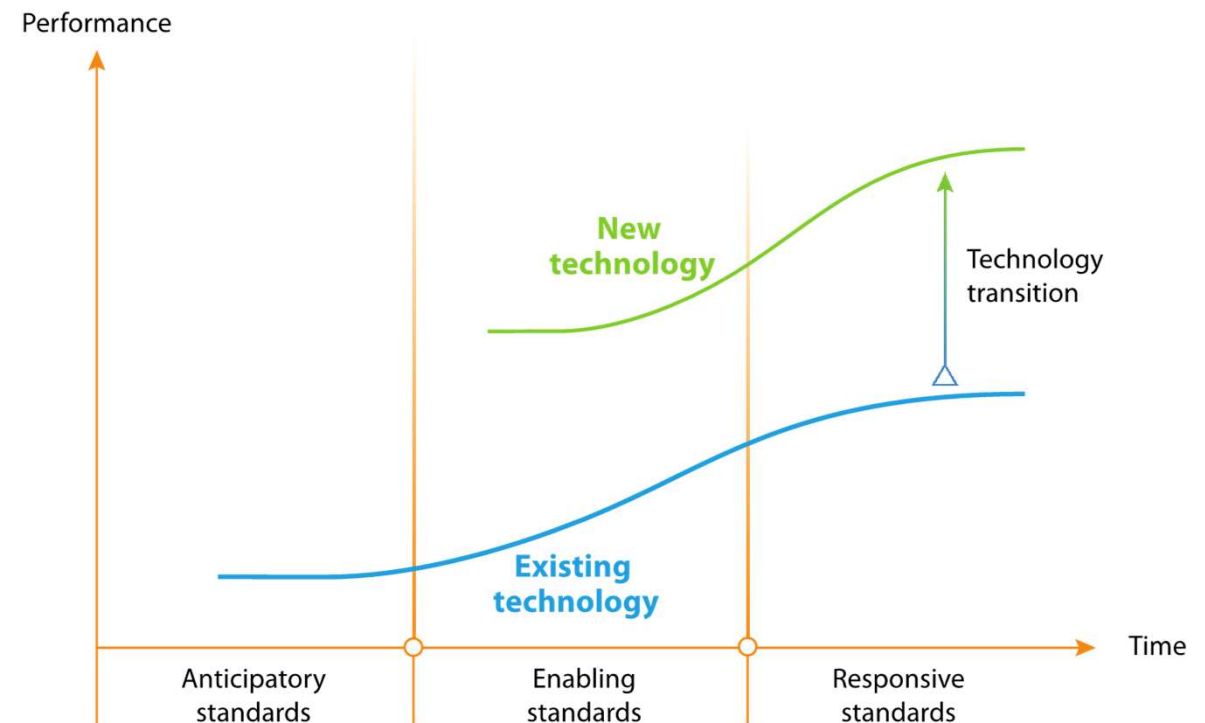
Analogies:

- Pruning eliminates dead and weak branches; standardization limits variety and helps to develop a "strong tree".
- Standardization stops messy proliferation, while enabling and shaping innovation

However, without standardization

- Much duplicated effort
- Low progress in the process of innovation

Source: Swann (2000)

Standardization and the Technology Lifecycle

- **Anticipatory standards:** "forward-looking" answers to expected interoperability problems; indispensable for successful network systems

- **Enabling standards:** proceed in parallel with market growth and improvement of technology and products to enhance the agreed-upon design by extending robustness and scale

- **Responsive standards:** created at the end of technology development (maturity and decline phases)

Performance

New technology

Technology transition

Existing technology

Time

Anticipatory standards

Enabling standards

Responsive standards

Source: Sherif et al. (2005)

Standardization: Bridging the Gap between Research and Practice

- Research produces knowledge that flows into standards (traditional technology transfer)
- Standards can also serve as a knowledge source for further/new R&D projects
  - Recursive knowledge flow from standardization back to research.
  - This prevents the reinvention of the wheel and stimulates ideas for new research projects

Traditional technology transfer

R&D

Standardization

Recursive technology transfer

Barriers
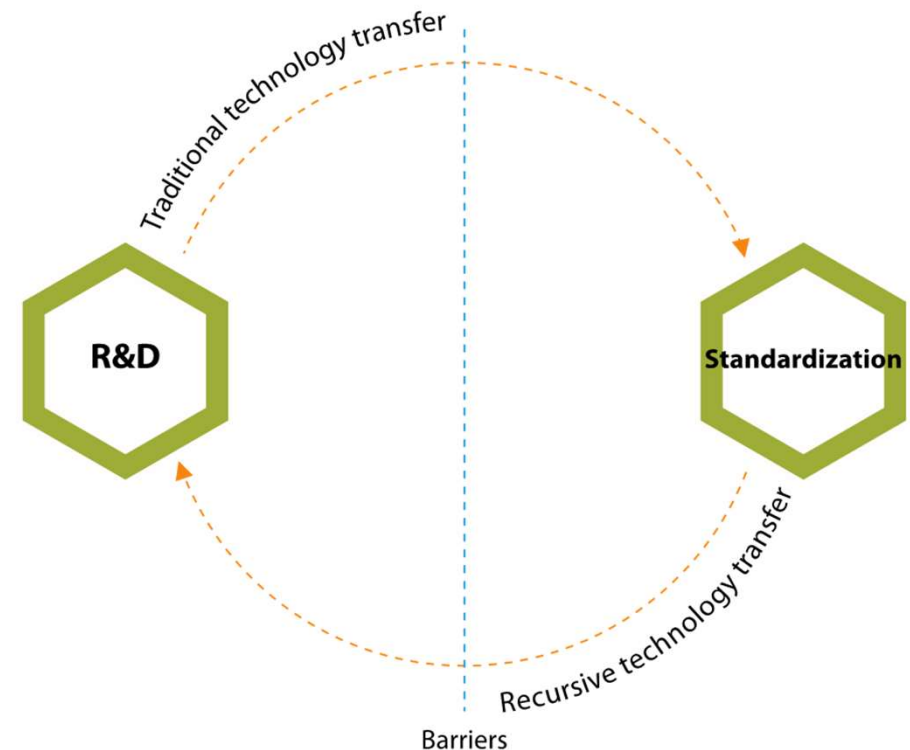
Source: Blind (2013)

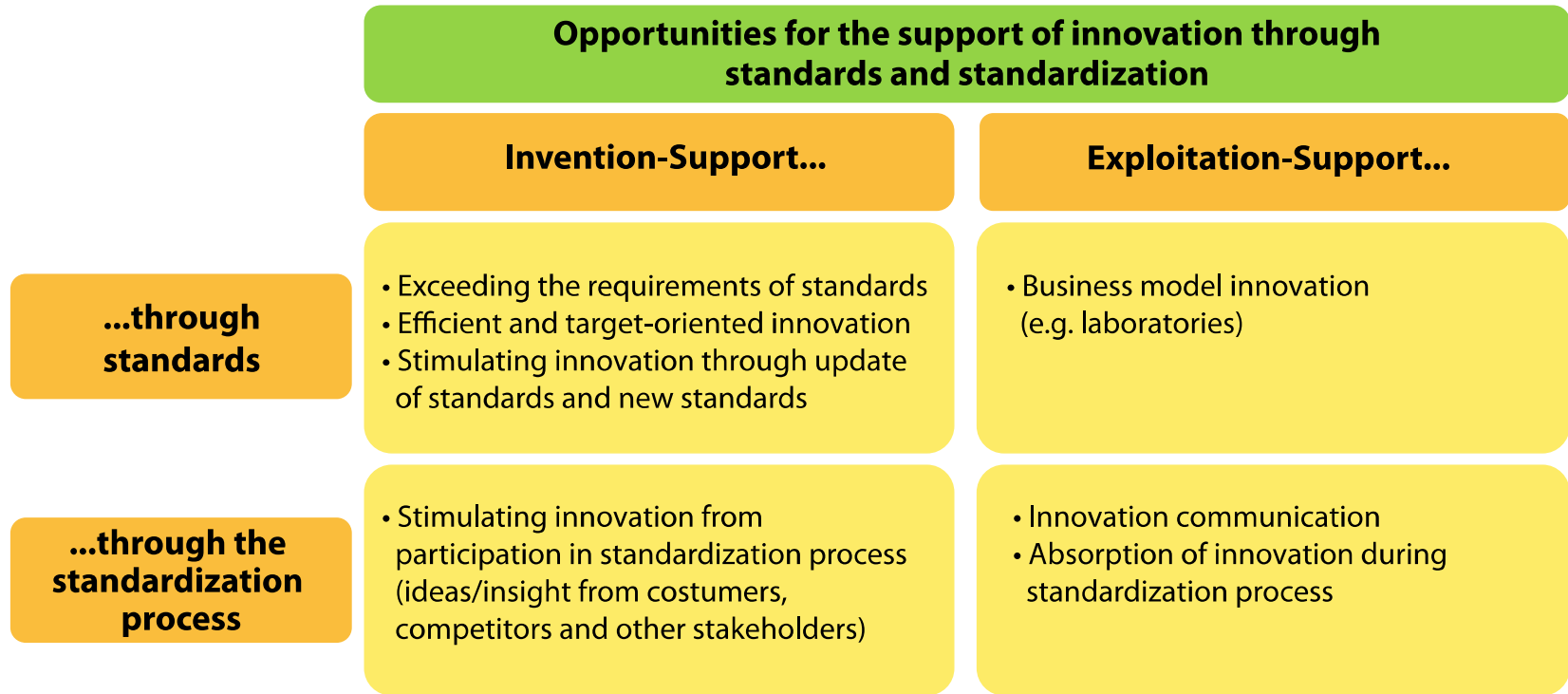# The interface between Research and Standardization
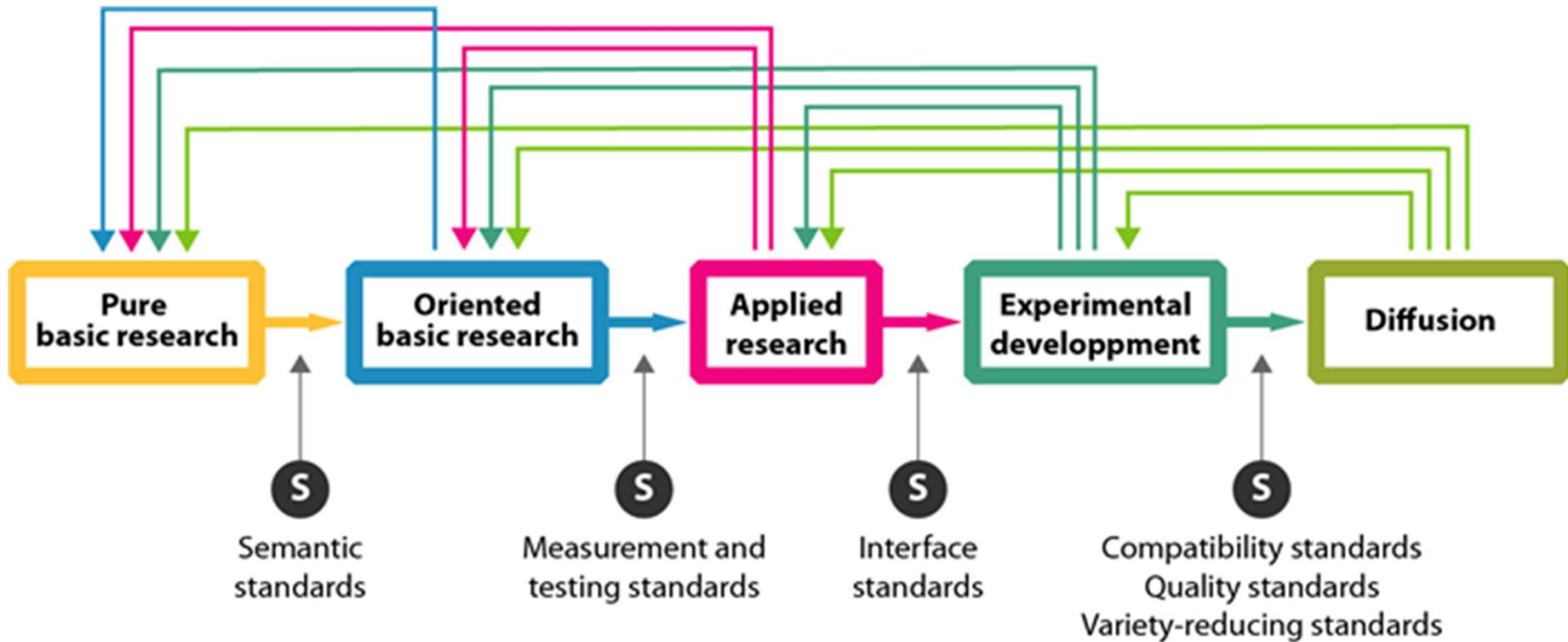
Source picture: Fraunhofer IIS

Source: Blind and Gauch (2009)

How can Formal standardization support Innovation?

Innovation potential in standardization

Opportunities for the support of innovation through standards and standardization	
Invention-Support...	**Exploitation-Support...**
...through standards	• Exceeding the requirements of standards • Efficient and target-oriented innovation • Stimulating innovation through update of standards and new standards	• Business model innovation (e.g. laboratories)
...through the standardization process	• Stimulating innovation from participation in standardization process (ideas/insight from costumers, competitors and other stakeholders)	• Innovation communication • Absorption of innovation during standardization process

Source: Abdelkafi and Makhotin (2014)

Exceeding the requirements of standards

- Knowing the basic requirements, which are captured by standards, companies can develop "out-of-the box" solutions

- Possible reasons for companies to go beyond the requirements defined by the standards are: special-purpose customer requests, marketing reasons, previous experience or hedging against uncertainties

Source: Abdelkafi and Makhotin (2014)

Efficient and target-oriented innovation

- SDO Standards provide a useful framework for the development of new products
- Standardization increases the effectiveness of R&D activities and enables the transfer of innovations from one sector to another

"The set of standards in our enterprise is the basic prerequisite for us in order not to develop products for the trash can." (a security company)

Source: Abdelkafi and Makhotin (2014)

Stimulating innovation through updated and new standards

Innovation impulses through new and updated standards

- Innovation impulses result from the update of an existing standard or after introducing a new one.
- When standards are changed over time, companies are obliged to comply, leading to incremental innovations
- The updates of standards can be perceived as a burden for the company because of additional development efforts
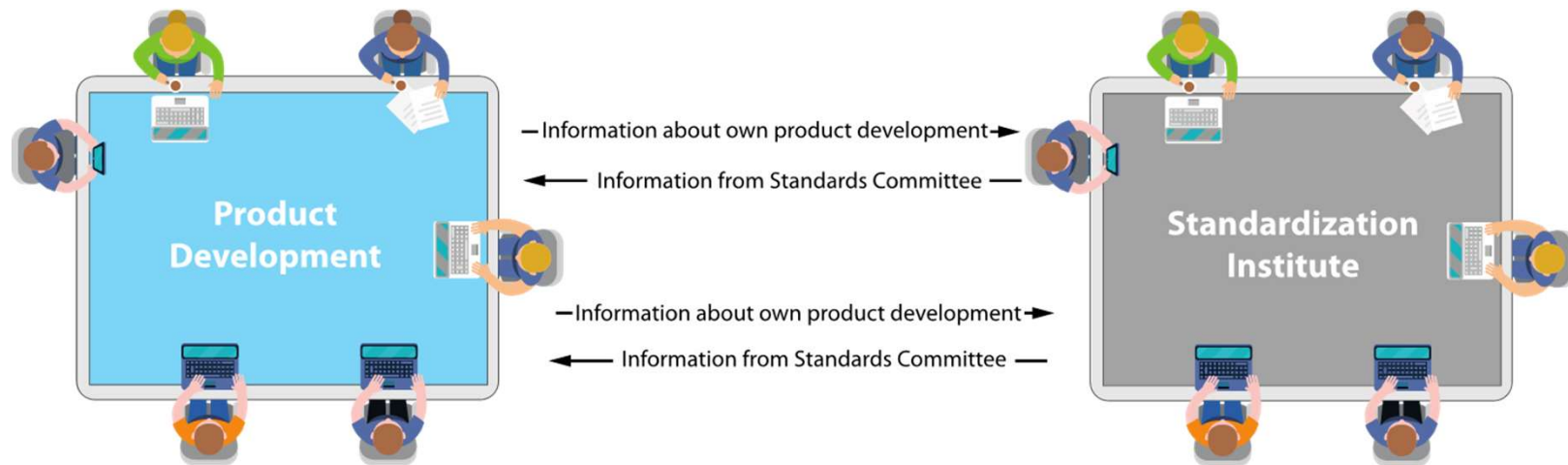

Source: Abdelkafi and Makhotin (2014)

Business Model Innovation
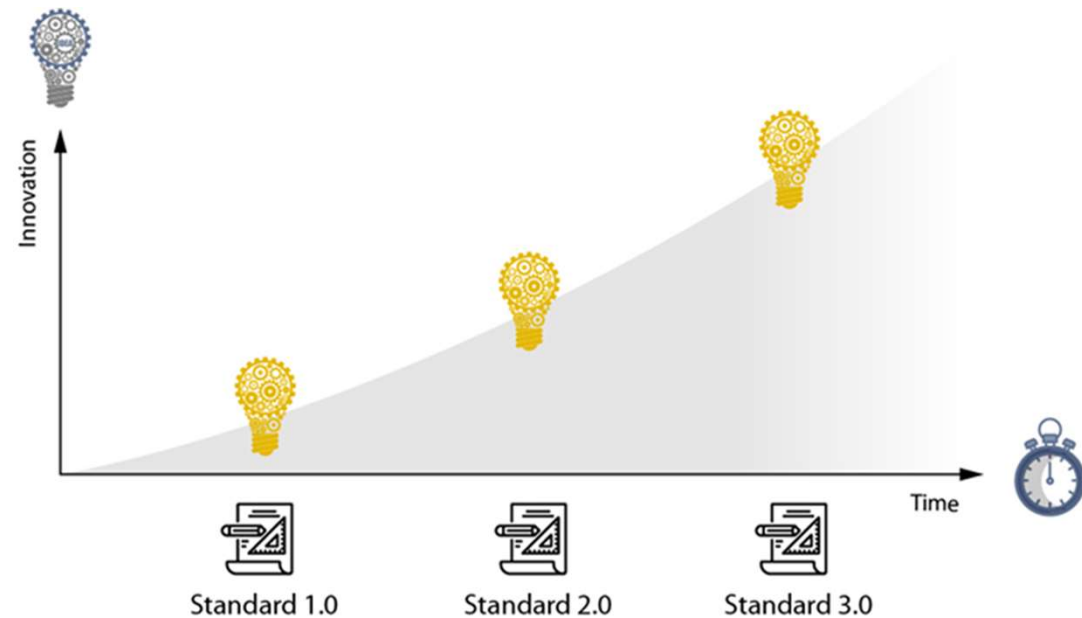
- Standards can lead to new business models, such as test labs, consulting firms, and certification organization

Source: Abdelkafi and Makhotin (2014)
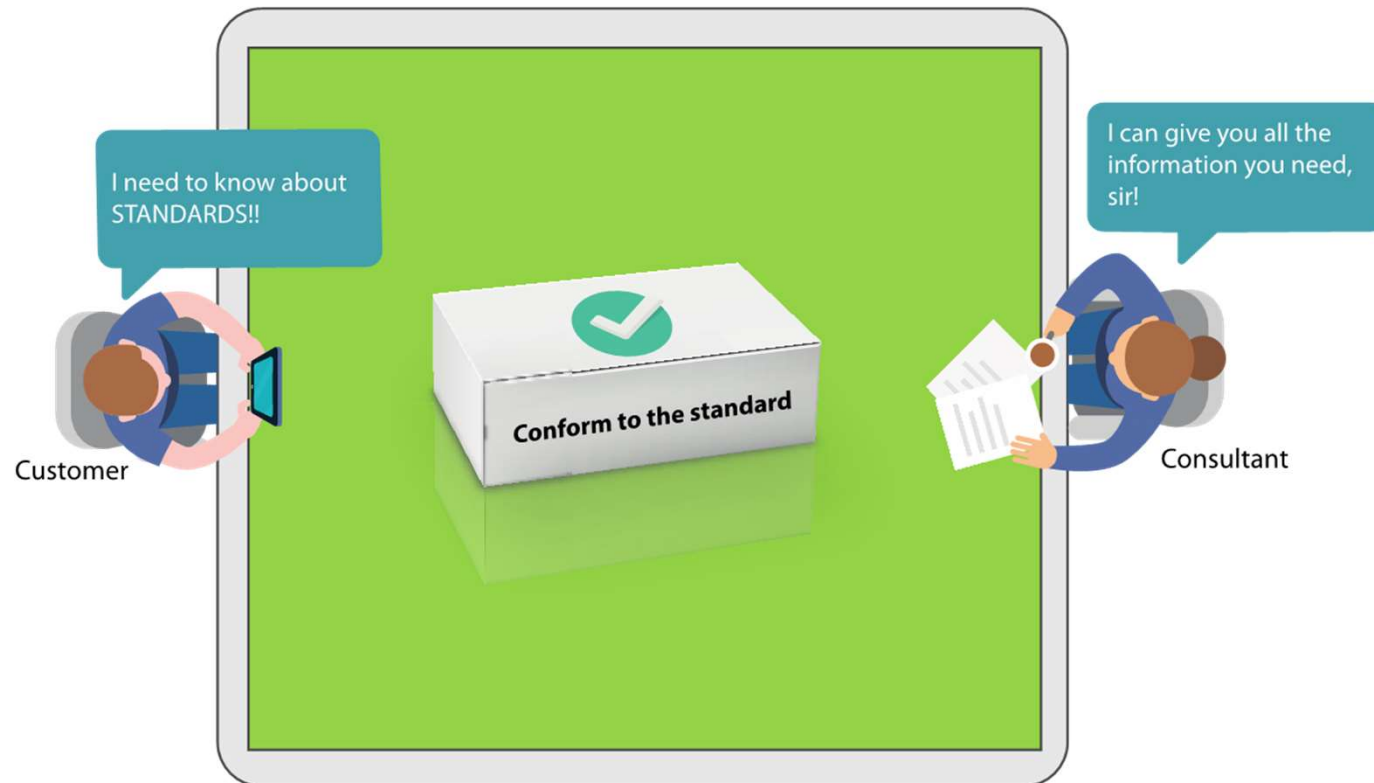
Stimulating Innovation through Participation in Standardization

- Companies can achieve a competitive advantage (differentiation), depending on how well and how quickly they can fulfil the requirements of a new standard
- Standardization creates opportunities for the development of differentiated products:
  - Synchronizing the company's R&D process with the standard development process
  - Differentiation through the development of customer-tailored standards portfolios

Product Development

— Information about own product development →

← Information from Standards Committee —

Standardization Institute

— Information about own product development →

← Information from Standards Committee —

Source: Abdelkafi and Makhotin (2014)
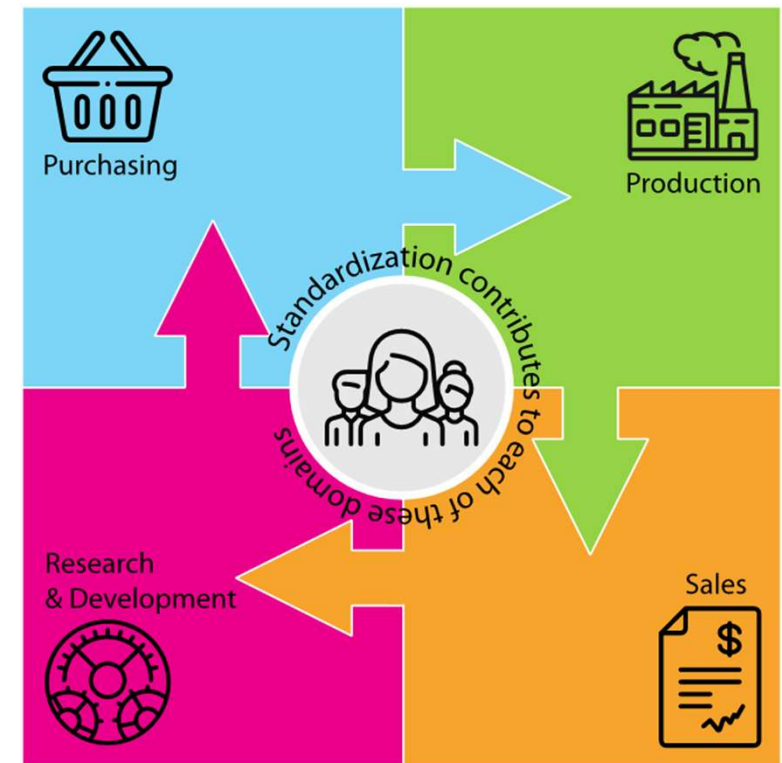
Innovation communication

- Companies that participate in standard setting processes signal know-how and high competence to the outside, which is especially important in B2B field
- Innovation communication with standards helps companies to build trust with their clients especially in areas with rapid technology development

"We inform our customers about our activities in the standard setting process. So they know what we are doing. They are quite happy to receive this up-to-date information." (Nanotechnology company)

Source: Abdelkafi and Makhotin (2014)

Absorption of Innovation
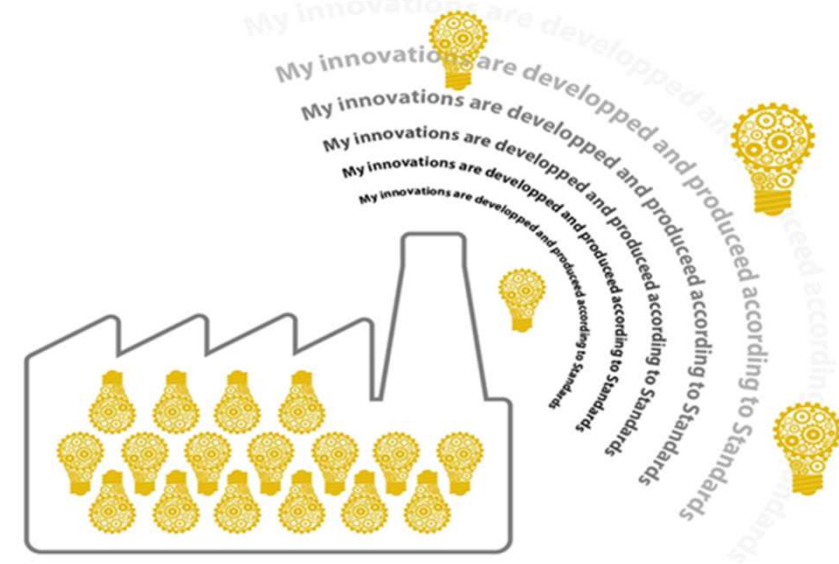
- Standardization supports the ability of companies to transfer and apply novel and useful external knowledge. The participation in standards setting process is crucial for the achievement of this innovation potential

"Not only the development of standards was important, but also we were able to identify new application areas for our products. That's what was interesting in those discussions." (Security)

Purchasing

Production

Standardization contributes to each of these domains

Research & Development

Sales

Source: Abdelkafi and Makhotin (2014)

Proposal for Teaching Standardization and Innovation

- Starting the lecture with a kind of a workshop (60-90 minutes, depending on the number of students in class)

- The workshop consists in dividing students in two group categories: In the first category, groups should elaborate reasons why standardization can support innovation, and in the second, students should elaborate the reasons why standardization can inhibit innovation.

- If students do not know much about innovation (management), this is not a problem, as innovation can be simply defined as "something new".

- Based on this, a class discussion can be initiated, and the instructor can write on the board the suggestions by the groups.

- After the workshop, the instructor can start with the contents of this chapter. All in all, a 3 hour-session is required to cover the material.

- To cover the material, two different ways can be suggested:
  - **Traditional teaching**: The instructor conveys the knowledge, while involving students actively in the lecture (to be combined with the workshop)
  - **Flipped classroom**: Students read the chapter before coming to class, and instructor asks questions, moderates, and recapitulates by using the blackboard (difficult to combine with the starting workshop)

General Experience with Teaching Standardization

- Students do not know what formal standardization is.

- There is no module on standardization. Therefore, the topic is integrated in the contents of other courses.

- At the start, I always ask students how they think of the standardization topic (interesting/boring).

- I try to relate standardization to daily life. Then, it starts making sense.

- Engineers and management students exhibit a high level of interest, once they know more about the topic.

- I use the IEEE standardization game, which turns to be very appealing to students. This is the only way to show them how standardization work happens in a practical context.

ETSI

Any further questions?

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