



European
Open Source
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Standardisation and Open Source

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General Information

Accompanying scientific article:

- Mirko Boehm and Davis Eisape. “Standard setting organizations and open source communities: Partners or competitors?” In: *First Monday, Volume 26, Number 7 - 5 July 2021*
 - Available at: <https://firstmonday.org/ojs/index.php/fm/article/download/10806/10183>

Accompanying research report:

- Knut Blind and Mirko Boehm. “The Relationship Between Open Source Software and Standard Setting” European Commission, Joint Research Centre, 2019
 - Available at: <https://op.europa.eu/en/publication-detail/-/publication/6521f427-01df-11ea-8c1f-01aa75ed71a1/language-en>
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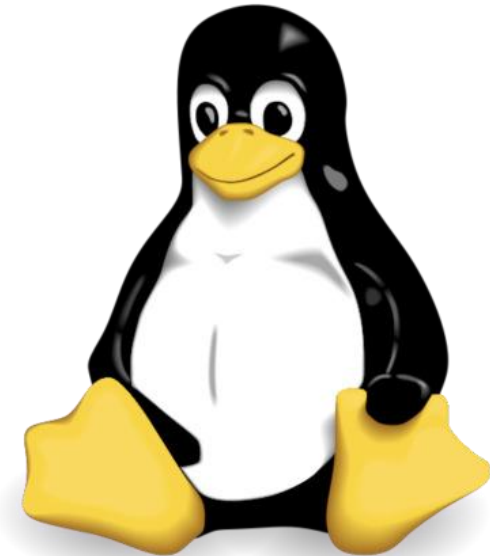


ICT Standardisation and Open Source

- The learning objectives of this webinar are:
 - To **understand** the **difference** between **standardisation** and **open source**
 - To **understand** their interactions from ideation to diffusion
 - To identify their strengths and weaknesses.
-



- What is Standardisation?
- Open Standards
- FOSS and Standards
- Practical Implications





What is Standardisation?



Standards

What is Standardisation?

- de-jure: “A technical standard is an established norm or requirement for a repeatable technical task. It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes, and practices.”
- de-facto: “In contrast, a custom, convention, company product, corporate standard, and so forth that becomes generally accepted and dominant is often called a de facto standard.”

Source: “Technical Standard”, Wikipedia



Norms (DE: “Normen”)

What is Standardisation?

- In Germany the term “norm” is used to describe a formal standard developed with broad stakeholder participation. The term “standard” is used for any specification, independent of the specification process.
 - Internationally, this distinction is not made.
 - In literature the term “norm” almost always references *social norms*.
 - We will use the term *standard* in the international connotation. We will not use the term “norm” for technical specifications.
-



Introduction

- Standards as a means to improve overall quality of life through the economies of scale, but also enabler of competition by facilitating interoperability between products of different vendors.
 - The wider open source community develops free and open source software (FOSS) that similarly benefits society as a public good.
-



Introduction

- FOSS and standards setting organisations (SSOs) are both instruments causing standardising effects.
 - A mutually beneficial collaboration between them is desirable, but their exact relationship is not fully understood, especially when and how FOSS and SSOs complement each other, or displace each other as competitors.
 - A phase model allows to compare the strengths and weaknesses of FOSS and SSOs against common opportunities and threats in the ICT sector.
-



Standard Setting Organisations (SSO)

- A SSO is an organisation whose primary activities are developing, coordinating, . . . or otherwise producing technical standards that are intended to address the needs of some relatively wide base of affected adopters.
 - Aka standards-developing organisation (SDO). No practical difference.
-



Standard Setting Organisations (SSO)

What is Standardisation?





Standard Setting Organisations (SSO)

Recognised European SDOs in the European Union

- Regulation (EU) No 1025/2012 of the European Parliament and of the Council:
 - **Designates CEN, CENELEC and ETSI as the European Standardisation Organisations (ESOs).**
 - The aims set out in the EU treaties are achieved by several types of legal act: regulations, directives, decisions and opinions.
 - Example: Directive (EU) 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies makes references to the CEN/CENELEC/ETSI standard EN 301 549.



EUROPEAN STANDARDIZATION ORGANIZATIONS



Standard Setting Organisations (SSO)

Public and private organisations

- Public organisations have been in generally created by treaties. This is the case of ITU, which is an agency of the United Nations



- Other standards organisations are private, such as ISO, IEC, ETSI or ANSI.
-



Standard Setting Organisations (SSO)

De facto standards

- Some de facto standards have significant economic and societal impacts.
 - These **ICT-related items** have in common that they have had a **huge impact**...
 - **QWERTY keyboard**: The layout for most keyboards is a de facto standard, though others exist.
 - **PDF**: a document format created by Adobe Systems, but meanwhile published as ISO standard.
 - **HTML**: a language for describing the structure of Web pages. It was originally created by Tim Berners-Lee, and it is currently published and maintained by W3C.
 - **Microsoft Windows**: an operating system that became an industry standard due to Microsoft's market power, and so did its specifications (e.g. the Microsoft Web Services Security specification, WS-Security).
 - ... They are called “**de facto standards**”. They are **common practices adopted by the market**, which are initially not the result of a standardisation process.
-



Standard Setting Organisations (SSO)

De facto standards

- De facto standards may be adopted as formal standards by recognised SDOs:
 - ISO/IEC 15445:2000 Information technology -- Document description and processing languages -- HyperText Markup Language (HTML).
 - ISO 32000-1:2008 (reviewed and confirmed in 2023) Document management -- Portable document format -- Part 1: PDF.
-



Standard Setting Organisations (SSO)

De facto standards vs SDO standards (Blind 2008)

SDO STANDARD	DE FACTO STANDARD
▪ Developed in SDOs ▪ Open and consensus oriented with the option of opposition, which may sometimes lead to lengthy decision procedures ▪ Clear and transparent participation and voting rules	▪ Dominant design through a standard war or natural selection. A company achieves a dominant position by public acceptance or market forces, e.g. Windows ▪ Standardisation process with restricted access; homogeneous environment may allow fast decisions ▪ Direct participation of company alliances (e.g. consortia) and individual companies



Standard Setting Organisations (SSO)

Industrial consortia

- Some standards organisations were created as industrial consortia, e.g.:
 - AUTOSAR develops open and standardised software architecture for automotive electronic control units.
 - The Home Gateway Initiative (HGI) developed a smart home architecture that enables applications to connect with devices on any home network interface.
 - The EnOcean Alliance created a wireless standard to develop self-powered wireless monitoring and control systems for sustainable buildings as well as energy harvesting solutions.
 - In the context of rapid developments, consortia benefit from a lighter process and a lower level of consensus of document approval than SDO standards go through.
 - Documents developed by a single company (e.g. Windows as a Microsoft standard) do not fall into this category.
-



Standard Setting Organisations (SSO)

Classification of SDOs

- International SDOs

- These have members worldwide, including national or regional standard bodies, and their deliverables have worldwide coverage.



- Regional SDOs

- These have members (industries, academia and national SDOs) from well defined geographic regions that usually share, or are interested in promoting common standards.





Standard Setting Organisations (SSO)

Classification of SDOs – International SDOs (examples)

- ITU

- Since 1947 it's a specialised agency of UN, with study group members comprising state members, sector members, associates from industry, international and regional standard organisations, and academia.
- ITU sectors: ITU-T (telecommunication standardisation), ITU-R (global radio spectrum, satellite orbits), ITU-D (promotion of fair and affordable access to telecommunications)



- ISO

- Independent, international non-governmental organisation founded in 1946
- Members from more than 170 countries work in hundreds of technical committees and subcommittees
- ISO standards cover ICT, healthcare, energy and automotive, etc.



- IETF

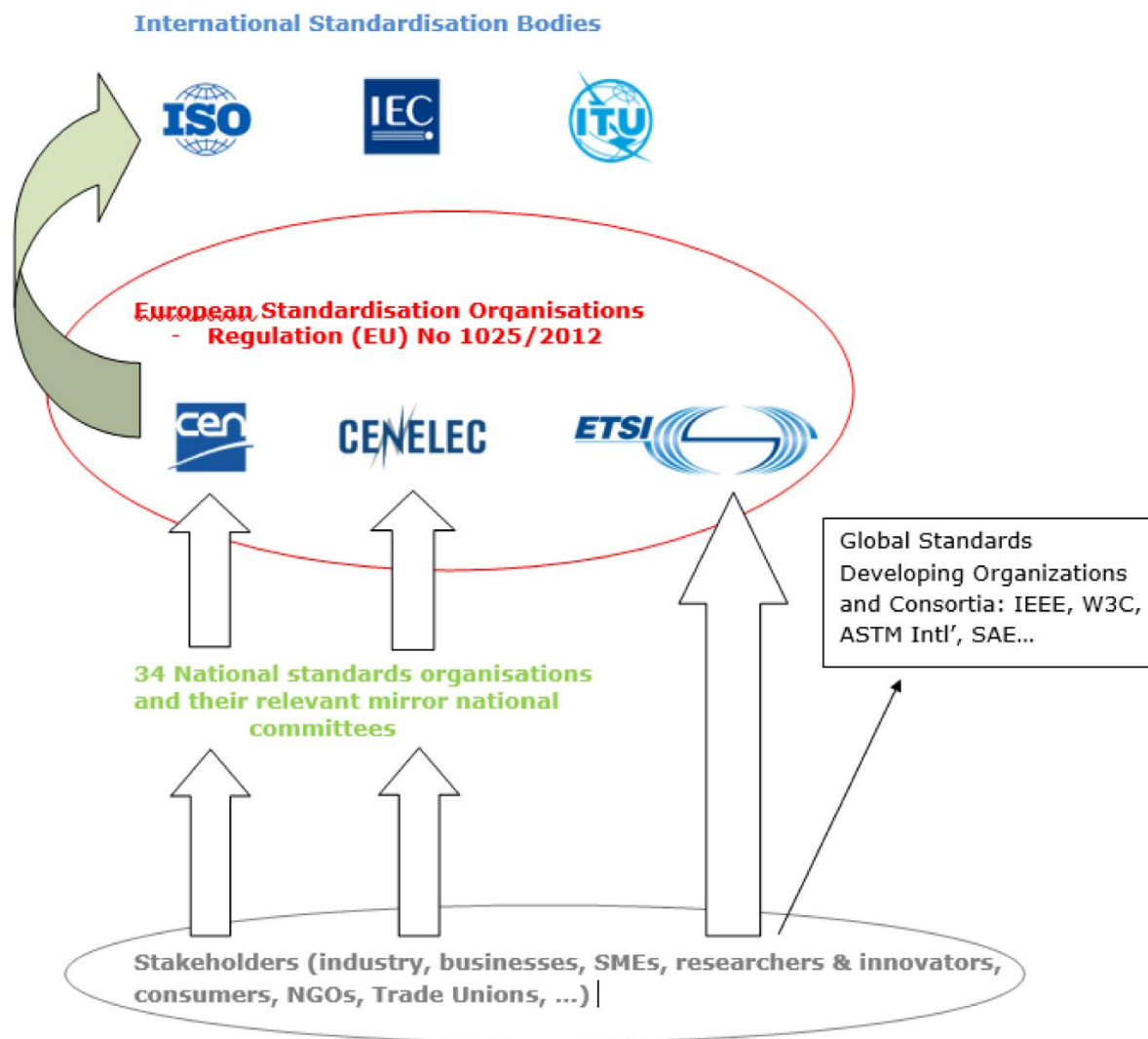
- Governing body of the Internet as part of the Internet society (ISOC)
- It is controlled by the Internet Architecture Board (IAB), which is both a committee of the IETF and an advisory body of the Internet Society





Standard Setting Organisations (SSO)

The EU Perspective





Standard Setting Organisations (SSO)

Geographical scope of organisations and standards

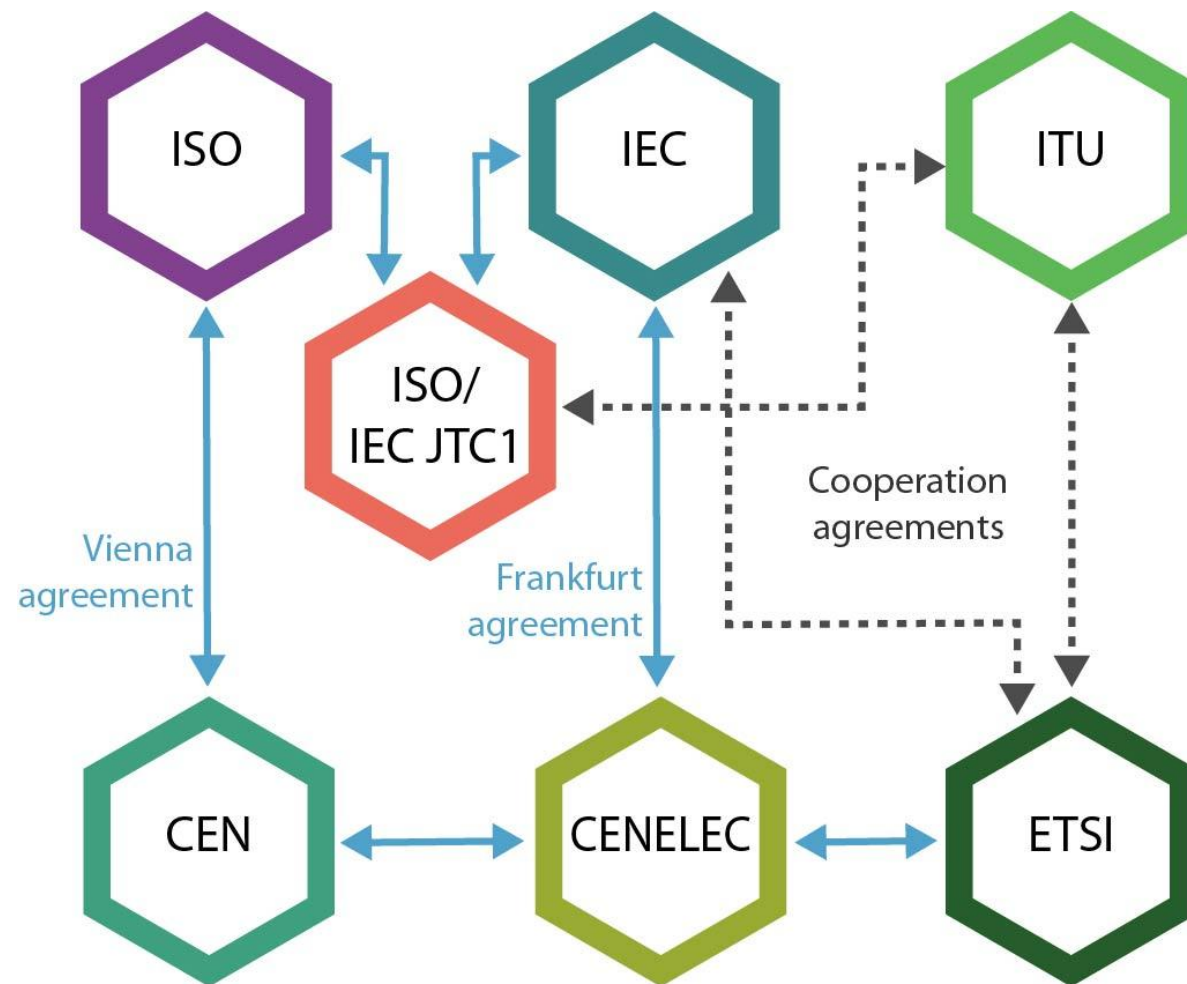
	National level e.g. Germany	Regional level e.g. Europe	International
General			
Electrotechnology			
Telecommunications			



Standard Setting Organisations (SSO)

Cooperation and coordination

- There are **cooperation and coordination** agreements between **European** and international SDOs
(modified from Jakobs, 2008)



Regulation (EU) No 1025/2012



Standard Setting Organisations (SSO)

Summary

- Difference between standards and regulation
 - Different types standardisation bodies from formal over consortia to de facto standards
 - Various linkages between the different levels of formal SDOs
 - Liaisons between formal SDOs and consortia
 - Dynamic landscape (with the exception of the SDOs) and relations
-



Open Standards



Possible Definitions

Open Standards

- “An **open standard** is a standard that is openly accessible and usable by anyone. It is also a common prerequisite that open standards use an open license that provides for extensibility. Typically, anybody can participate in their development due to their inherently open nature. There is no single definition, and interpretations vary with usage.”

Source: “Open standard”, Wikipedia

- “‘Open Standards’ are standards made available to the general public and are developed (or approved) and maintained via a collaborative and consensus driven process. ‘Open Standards’ facilitate interoperability and data exchange among different products or services and are intended for widespread adoption.”

Source: “Definition of ‘Open Standards’”, ITU



FOSS and Open Standards

Open Standards

- Open Standards need to allow implementations to guarantee the “Four Freedoms” (<https://www.gnu.org/philosophy/free-sw.en.html>):
 - The freedom to run the program as you wish, for any purpose (freedom 0).
 - The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
 - The freedom to redistribute copies so you can help others (freedom 2).
 - The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.
 - Implies royalty free, no negotiations, no restrictions on redistribution.
 - Openness applies to the standard and the process (again).
-



Standards and standards-essential patents (SEP)

Open Standards

- Implementations of standards may require patent licenses, (e.g. Blind et al. 2022) common options:
 - Royalty free
 - RAND: “Reasonable and non-discriminatory terms”
 - FRAND: “Fair, reasonable, and non-discriminatory terms”
 - RAND/FRAND not well defined, may or may not guarantee “Four Freedoms”.
-



FOSS and Standards



Standard Setting Organisations and Open Source Communities - Partners or Competitors?

- Integration between open source projects and standards development processes is a win-win situation: on one side the alignment of open source and standardisation can speed-up the standards development process and the take-up of ICT standards (especially for SMEs) and on the other side standards can provide for interoperability of open source software implementations.

Source: “European Commission. Communication from the Commission to the European Parliament, the Council and the European Economic and Social Committee: Setting out the EU approach to Standard Essential Patents. Publications Office of the European Union, Nov. 2017.



An antiquated view of “standard”

FOSS and Standards

- A standard is “a document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.” - ISO/IEC Guide 2:2004
 - aka: A standard is what SSOs produce
 - Does not explain how FOSS communities achieve standardisation
-



Society

Need

Instrument

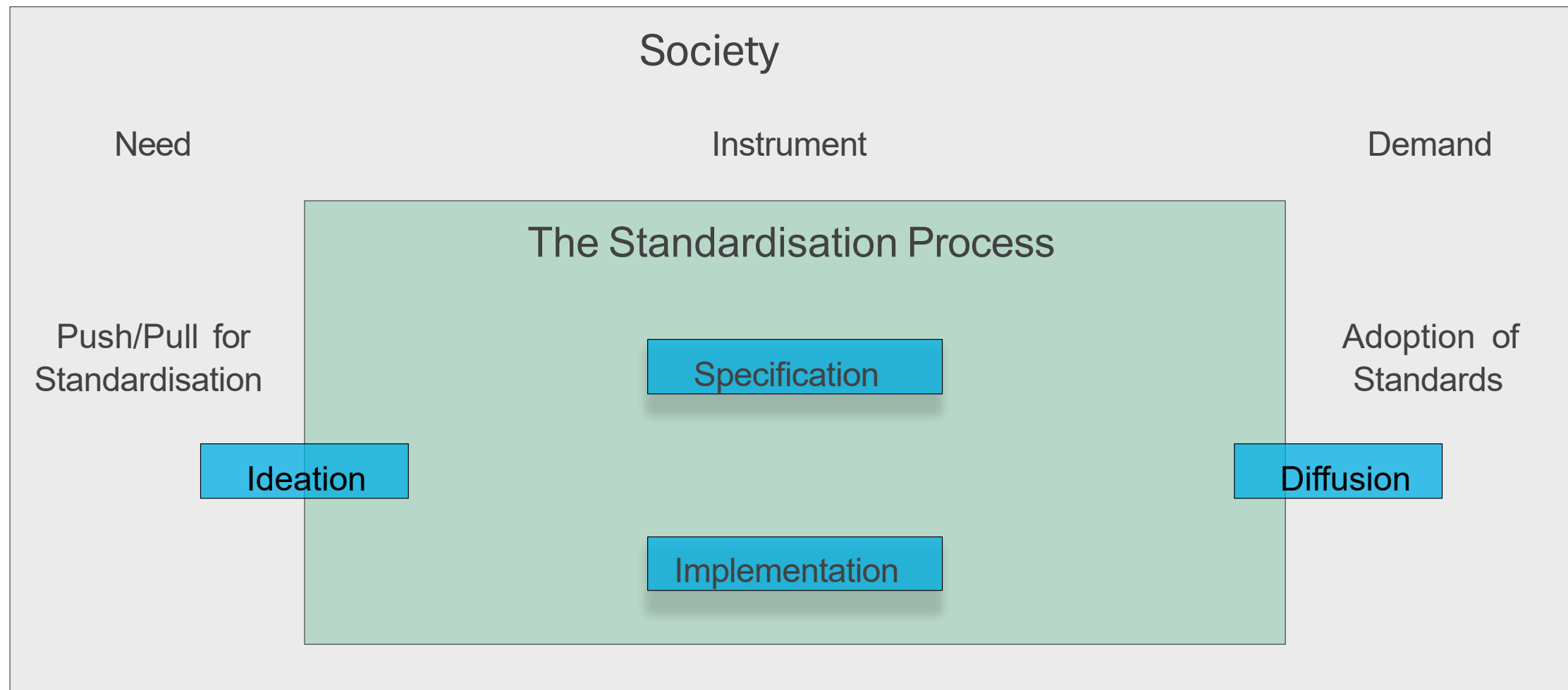
Demand

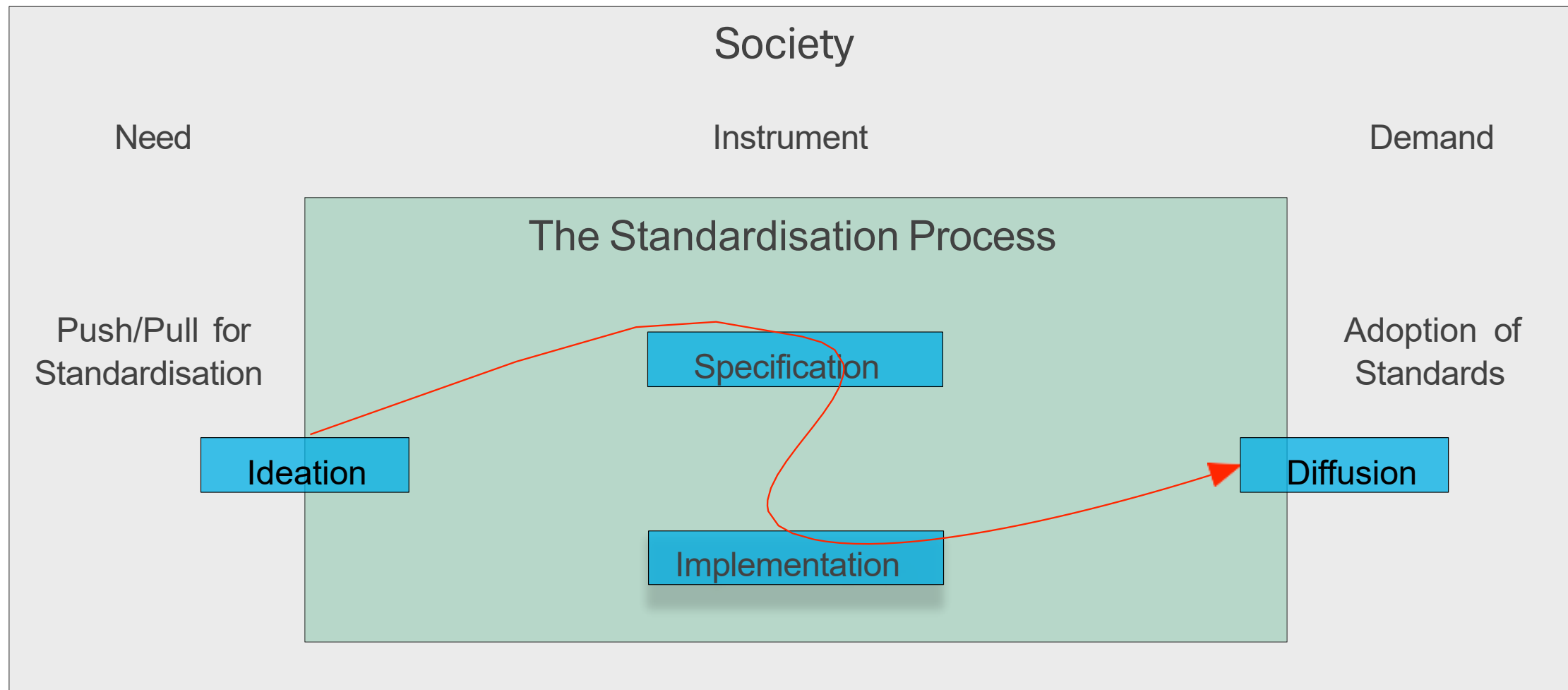
The Standardisation Process

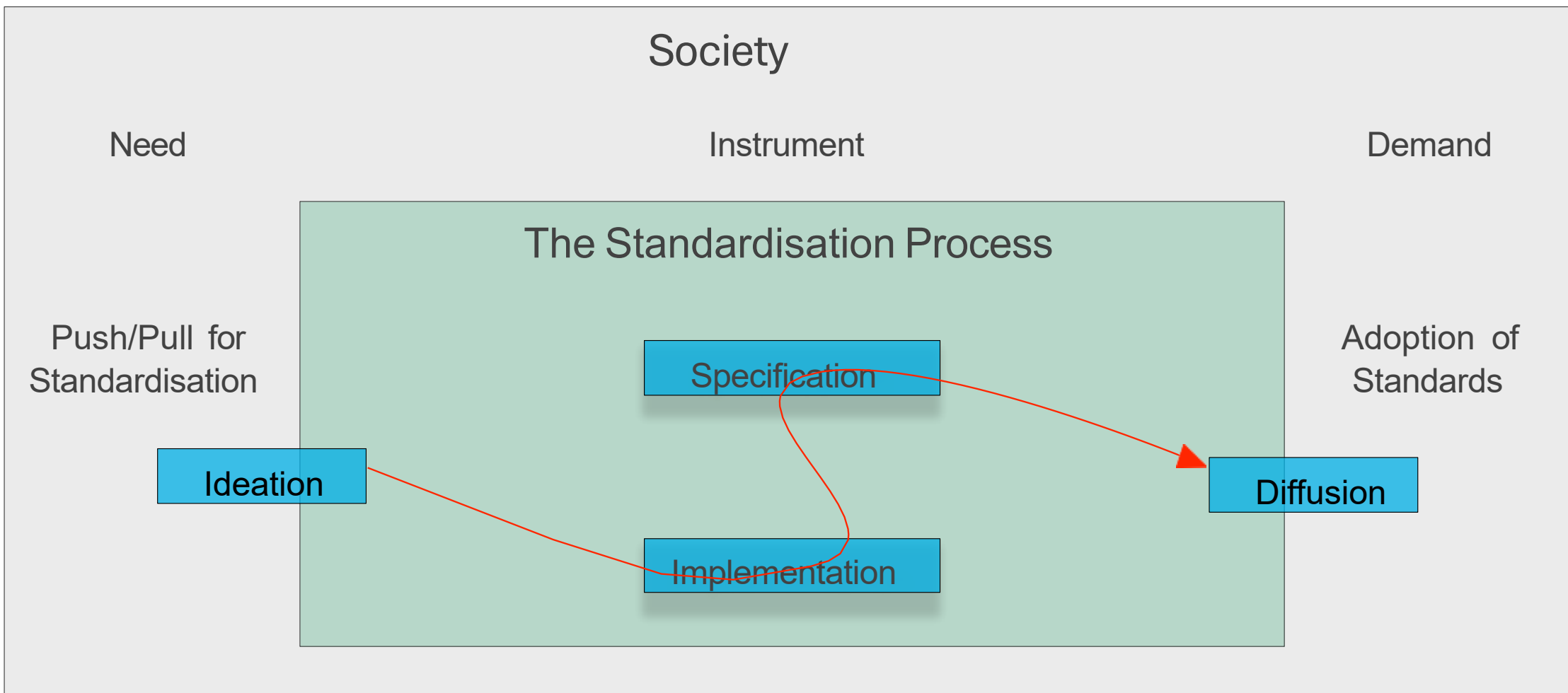
Push/Pull for
Standardisation

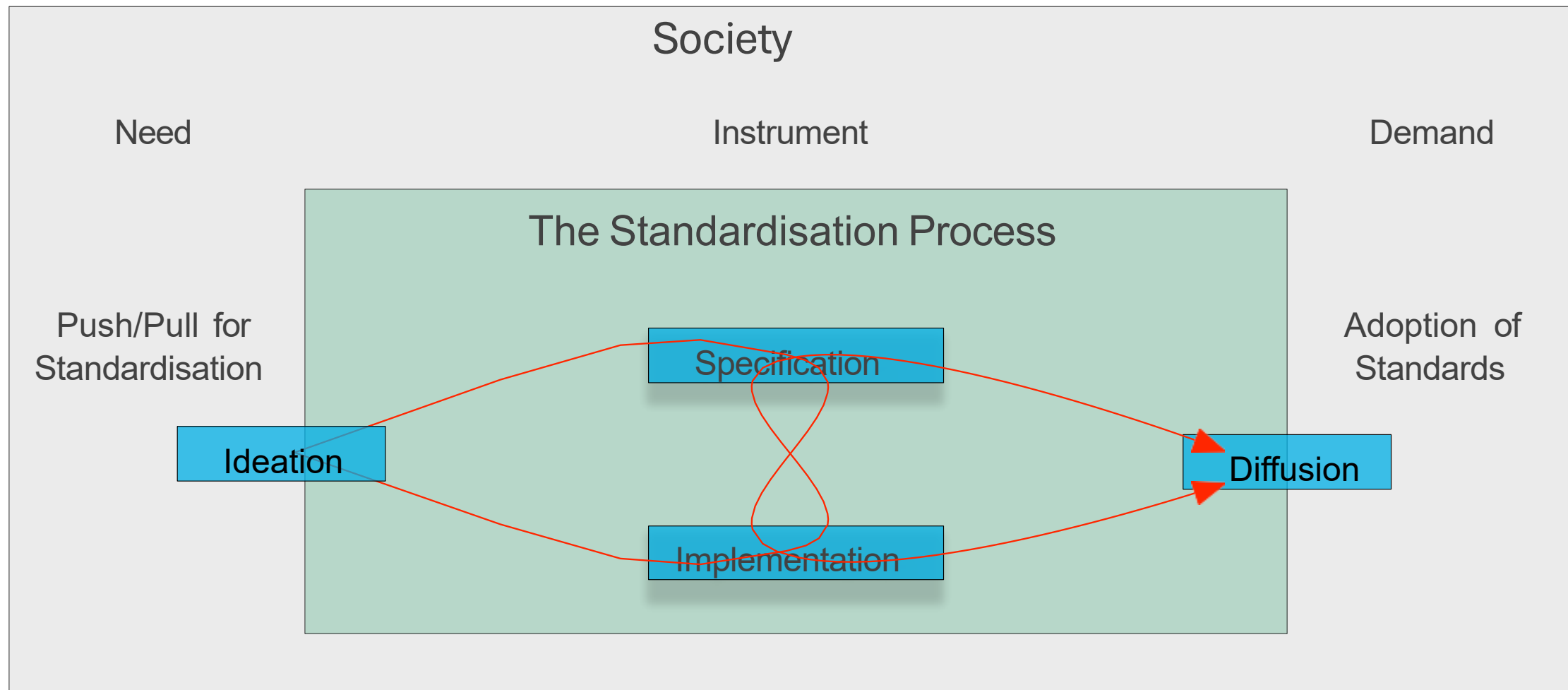
?

Adoption of
Standards











A Standardisation Phase Model

FOSS and Standards

- The phase model is able to describe a variety of early, late or parallel real-life standardisation processes.
 - Ideation
 - Specification
 - Implementation
 - Diffusion and adoption
 - Key to the phase model are the concepts of *standardisation instruments* that cause *standardising effects*.
-



Common Opportunities and Threats in the ICT Sector

FOSS and Standards

- Digitalisation and globalisation are highly impactful *sea changes*:
 - Development of improved methods of collaboration.
 - Trend towards openness and transparency.
 - Shift of relevance from national to supra- and international collaboration and regulation.
 - Shift of the role of the modern state from an employer and producer to a regulator. (Tirole, 2017)
-



Strengths and Weaknesses of the wider Open Source Community

FOSS and Standards

- Strengths:
 - rapid prototyping,
 - release early/release often,
 - voluntary participation,
 - the upstream/downstream model
 - Weaknesses:
 - supply chain management,
 - license compliance,
 - limited understanding of meritocracy
-



Strengths and Weaknesses of the wider Standard Setting Organisations

FOSS and Standards

- Strengths:
 - proven processes,
 - defined IPR policies,
 - reach,
 - impact
 - Weaknesses:
 - the “standards development habitus”,
 - ambiguous IPR policies,
 - cumbersome processes,
 - outdated business models
-



Disadvantages (weaknesses matched with weaknesses)

FOSS and Standards

- Difficulty dealing with early investment-heavy R&D: SEP/FRAND debate
 - Globalisation vs vested interests (regional relevance and recognition of SSO) vs lack of influence (OSS)
 - “Old-fashioned” (SSO) vs not fully established (OSS) IPR policies: unclear responsibility for defining new norms (definition of open standards, FRAND, . . .)
-



- Standard-Setting Organisations and Open Source Communities
 - create complementary products
 - by applying competing processes.
-



Cost of Change and Pace of Innovation

FOSS and Standards

↓ — Pace of Innovation — ↑

Hardware - Interfaces - Software

↑ — Cost of Change — ↓



Specification versus Implementation

FOSS and Standards

- *Complements* from the product perspective:
 - EPO point of view: “Specification is everything”
 - SSO point of view: “Implementation follows specification”
 - FOSS point of view: “Implementation is everything”
 - FOSS products complement standards and are often the default implementation.
-



De-centralised versus centralised development

FOSS and Standards

- *Replacements* from the process perspective:
 - SSO: Membership often expensive, by nomination, regional, not very open.
 - FOSS: Voluntary contributions welcome, meritocracy.
 - Openly governed FOSS communities can be a replacement for SSO processes.
-



Can SSOs and FLOSS cooperate?

FOSS and Standards

- The main issue is the process incompatibility.
 - Other issues: *Replacements* from the process perspective:
 - breaking up exclusive clubs,
 - expectation of meritocracy and transparency,
 - pace of innovation
 - see “Requests For Comments (RFCs)”: informal standards that define how the internet works
-



Examples: FOSS Foundations as SSO

FOSS and Standards

The ... OCI ... is a lightweight, open governance structure (project), ..., for the express purpose of creating open industry standards around container formats and runtime.

- Open Container Initiative



Examples: FOSS Foundations as SSO

FOSS and Standards

- Charter of the Cloud Native Computing Foundation:
 - “Role of the CNCF: . . . foster common technical standards . . .”



Examples: FOSS Foundations as SSO

FOSS and Standards

- “The Joint Development Foundation is a nonprofit that provides a “standards organisation in a box” to enable groups to quickly establish projects.”
 - Projects: GraphQL, Trust-over-IP, UltraEthernet, ...
-



Examples: FOSS Foundations as SSO

FOSS and Standards

“The Linux Foundation . . . is a trade association . . . It is not a charity, or a public service organisation. It is an association of businesses. . . .”

– Software Freedom Law Center



Practical Implications



Development phases in practice

Practical Implications

- specification-first:
(early) ECMAScript, (early) C++,
WhiteRabbit, GENIVI
- implementation-first:
Cloud Foundry, OpenStack,
Kubernetes, Automotive Grade Linux
- parallel:
(late) ECMAScript, (late) C++



Nick Bramhall, "Reflected Industry"  8



Paradigm Shifts: The Role of Standards

Practical Implications

- Standards enable competition (for implementation market share)
- Standards enable interoperability (between conforming products)
- Standards mitigate cost of change
- Joint implementations are the standard
- Specification leads to fragmentation



Lulu Hoeller, "Keep Calm and Walk the Dog"  ⁹



State of the Art . . . Commodity?

Practical Implications

- The (A?) business model of Open Source is to realise cost savings through pooled R&D investments into non-differentiating technology.
- It is still early-investment-heavy R&D.
- So it is state of the art.
- And innovative.
- But still non-differentiating.
- And a commodity.
- And a public good.



jackellum2, "Commodity Centre, Braxted - Oct'15
- 5300 SOP" (public domain) ¹⁰



Negotiating over a Penny

Practical Implications

- FOSS: Zero negotiation
 - SDO-RF: Zero negotiation
 - SDO-FRAND: undefined
-
- Not a FOSS related argument per se!



Joybot, "Legal stamp – Conveyance (1964)"  ¹¹



Innovation Metrics

Practical Implications

- In most circles, innovativeness to day is still measured by the number of patents and patent applications. In particular, proxy metrics of innovativeness are:
 - Annual R&D budget
 - Number of patents filed
 - R&D headcount or budget
 - Number of active R&D or standards development projects
 - Number of patentable ideas identified
- Challenge to find appropriate indicators for contributions to FOSS...



Barta IV, "1800s Library"  12



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