



# ICT Standardisation in a Digital world

THE POWER OF OPEN INNOVATION

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# EXECUTIVE SUMMARY

## 1. INTRODUCTION

The standardisation world is at a crossroads; standards are: critical for digitisation of private and public sectors alike; increasingly high on the political agendas of both the European Commission and Member States, as instruments for industrial policy and cybersecurity; and key assets of industry, for open infrastructures and technologies. Considering the increased relevance of openness, which is now established as the prime paradigm for digital transformation, can standardisation meet all these expectations? This paper will explore the challenges, and provide some input.

## 2. OPENNESS – THE BASIC PARADIGM IN THE DIGITAL WORLD

The digital world has largely been driven by openness. Collaboration, community work, open platforms, interoperability: these all rely on openness. In 2015, OpenForum Europe (OFE), working with its OpenForum Academy Fellows, developed five core “OFE Openness Principles”, which should be at the centre of any claim to ‘openness’:

1. **User Centricity** - Providing choice to consumers, including options (for example, in terms of cost or accessibility) that eliminate digital exclusion.
2. **Competition** - Providing a level playing field between producers, forcing them to compete on functionality and quality and ensuring constant innovation.
3. **Flexibility** - Enabling the construction of complex combinations of products and/or services from different providers where parts of the combinations can be upgraded or replaced when better products or services become available in the future.
4. **Sustainability** - Enabling the construction of product, services and combinations thereof that are sustainable in terms of access to information, cost and impact on the environment.
5. **Community** - in which everyone can participate, where no single entity dominates the debate, and where decisions are taken via a transparent process.

## 3. WHAT MAKES IT STANDARDISATION DIFFERENT?

In ICT, we can distinguish between horizontal and vertical standards. For instance, ICT standards for software interoperability and for portable data formats are not industry-specific: some are horizontal in nature, providing language definitions and enabling systems interconnectivity - the basic building blocks for ICT infrastructures and systems; whilst the banking

and insurance verticals, for example, have a good track record in defining IT interoperability and data standards in fora and consortia, building upon horizontal standards.

Other sectors such as construction and manufacturing increasingly require software interoperability and data format standards. Traditionally, standards for these sectors are developed in formal venues (such as within 'ESOs') focussing on functional requirements-orientated standards in the areas of health, safety, and the environment (i.e., in the regulated domain). Such standards tend to vary comparatively little over time. Yet, software and data format standards for these industry sectors will have to go beyond functional requirements and need to be very specific if interoperability is to be achieved. Therefore, the formal standards development approach in many sectors has to be complemented by the uptake of relevant interoperability and data formats developed in fora/consortia.

Unlike other sectors, the ICT market's need for standards relates almost entirely to interoperability and portability, providing a core platform for the development and integration of products and services. This open innovation model is now the prime driver for much of the ICT sector. So the question is not what is right or wrong, but how Europe's approach to standardisation not only recognises the differences, but proactively responds to the needs of new/emerging technologies and markets.

## 4. DIGITISATION – STANDARDISATION AS ENABLER AND DRIVER

ICT standards play a key role for digitisation. Interoperability and connectivity facilitated by Open Standards are key for technology integration. Given the high political relevance of digitisation for innovation and growth in Europe, standardisation is also in close focus for policy makers. These basic technology standards have meanwhile been complemented by other standardisation deliverables on a more vertical level, e.g., Reference Architectures, standards describing special semantics, process standards, use cases, as well as standards landscapings and roadmaps.

In general, not many new standardisation activities are required to support digital transformation as there are not many functional gaps. In addition, as pilots and reference projects take place, information will be gained on potential further functional gaps which will then incrementally be addressed and closed. This is where plug tests, plug fests and Open Source implementations play an important role for gaining information about the actual state of maturity of standards and about work needed for improvements. It will be critical for all stakeholders involved in standardisation and in the governance of Standards Developing Organisations (SDOs) to define mechanisms for standardisation to accompany and support evolving technologies without immediately pulling them into the usual structures and processes of standardisation. And because much of the

innovation today is driven in Open Source projects, this also will have to include collaborating with Open Source.

## 5. OPEN SOURCE – DISRUPTIVE AND COMPLEMENTARY FOR STANDARDISATION

Open source technologies are typically developed collaboratively in open communities. Open source projects provide the respective framework and rules for the integration of technologies and the approval of new code and features.

It is important here to clearly differentiate between Open Standards and Open Source. Standards are building plans, blueprints. They describe how something is built and how interoperability is achieved, e.g., by defining APIs and protocols. Open Source, on the other hand, is software code that we can read; it may implement standards, but it is not a standard. Standards are tested, and Open Source is a well-established way to promulgate relevant standards and to promote their broad market adoption.

Over recent years Open Source has begun to challenge standardisation in so far as it has become a major playing field for providing open technologies. SDOs recognise this situation – which goes hand in hand with Open Source being highly attractive for developers, often at the cost of standardisation. Many SDOs are therefore investigating options for how to make use of, or collaborate with, Open Source.

There is certainly no single approach for collaboration between standardisation and Open Source. Likewise it's clear that SDOs cannot ignore Open Source and its potential, e.g. for (reference) implementations or the promulgation of standards. Each SDO will have to evaluate its own best way on how to collaborate with or make use of Open Source. Not every SDO needs to transform and host Open Source projects itself, but collaborating with an Open Source foundation could be an option. Similarly, there are different ways to make use of Open Source so that here too SDOs may find different approaches, depending on what best suits their interests and their membership.

## 6. THE ROLE OF GOVERNMENT

As a basic principle, governments in Europe set the legal framework and provide regulatory and policy requirements, but leave it to industry and other stakeholders to develop technologies which respond to and satisfy those requirements. In regulated areas, this separation works very well. In a similar way, this model is applied in non-regulated areas in the field of ICT standardisation, where the European Commission outlines its policy objectives, proposes standardisation actions to support the implementation of the objectives, and invites industry and other stakeholders to respond

with technology development in standardisation. The important tool which is used for this is the “EU Rolling Plan on ICT Standardisation”, which the Commission develops collaboratively, with advice from the EU Multi-Stakeholder Platform on ICT Standardisation.

This principle of separation has proved to be very effective and efficient in encouraging innovation and actions in ESOs and SDOs, stimulating bottom-up standards development activities and resulting in high-quality standardisation deliverables based on high technology expertise contributed by industry and other stakeholders. Governments with key expertise of their own typically participate as stakeholders in standardisation work.

This provides a good balance in terms of the relation and role of government in standardisation. This should be accompanied by a regular dialogue and exchange with industry and other stakeholders – as takes place today in Europe (in the MSP, the main advisory group on ICT standardisation).

That’s why recent proposals, such as the proposed Cybersecurity Act are concerning. Indeed, the proposal sets aside the well-established practice of a clear separation of standards from conformity assessment and certification, and, by inventing a parallel system to the NLF it acts to devalue standardisation and cybersecurity standards.

## 7. THE INTERPLAY BETWEEN IPRS AND STANDARDISATION IN THE OPEN INNOVATION ECOSYSTEM

High quality standards depend on the availability of relevant innovative, state-of-the-art technologies. Often such technology elements have been patented, which has led SDOs to set up IPR policies to govern the process for declaring claims regarding so-called Standards Essential Patents (SEPs), and the rules for ensuring the availability of declared SEPs to those who implement the respective standards. Perhaps the greatest level of controversy relates to the issue of perceived incompatibility of standards which depend on one or more SEPs with Open Source based developments. On a simplified view, two approaches can be identified in relation to patent policies: FRAND and RF (whether Royalty-free or Restriction Free).

FRAND is a promise. A patent-holder contributing an SEP under FRAND terms and conditions makes the promise that licences to exploit the patent will be available to implementers of the standard under “fair, reasonable and non-discriminatory” terms. The specific terms of the licence, in particular the royalty fee aspects, are subject to bilateral negotiation with the associated need for agreement to be reached between the patent-holder and the would-be licensee. RF is a guarantee to implementers of the standard that SEPs will be available for licensing without

the imposition of royalties or restrictions on use. A significant number of global SDOs active in IT standardisation opt for an RF policy (or a more blanket non-assert policy) whereby no claims will be made and no licensing is required.

In the context of Open Source projects, SEPs are problematic in that they require that each patent-holder will need to establish private relationships with community participants, which is usually not practicable, and conflicts with community-based open innovation and collaboration approaches.

Overall, each of the two licensing approaches works well in its own market segment or technology layer, but this does not mean there are no issues. There are disputes and court cases about validity of essential claims, about what FRAND means, and about whether an offer made is really FRAND or is excessive. However, the global standardisation ecosystem has long adapted to the need for different models to support open innovation and respond to respective needs and requirements. It is well balanced, in so far as there are global SDOs (fora/consortia) whose members decided to implement IPR policies or respective options with a policy which allows implementation of their standards in Open Source. At the same time there are other areas where securing access to technology inventions is of primary importance, with the accompanying need to provide incentives for inventors to contribute their technologies to standardisation, and receive some fair compensation for their R&D efforts. Therefore:

- both FRAND and RF have their distinctive roles to play;
- any balanced approach, and further improvements in the balance of interests between patent holders and implementers require a thorough understanding of the relation between innovation and standardisation;
- in the case of standards for software interoperability the availability of RF licensing terms should be encouraged, so as to ensure the possibility of Open Source implementations to compete in the marketplace with proprietary offerings on a level playing field, and to encourage new standards to be derived from Open Source
- As SDOs adapt to changes in the marketplace, they and their members need to strive for consensus on the most appropriate patent licensing approach in order to provide high-quality standards for the overall marketplace.

## 8. WHERE ARE STANDARDS BEST DEVELOPED?

IT software standards are very different from standards typically enshrined into European Norms (ENs), which are designed to support the sale and distribution of goods within the single market, and are primarily set to establish health and

safety rules for products. From a single market perspective, it makes absolute sense (for these subjects) to have a single standard across Member States.

However, these observations are not true when it comes to ICT standards. Depending on where in the lifecycle, there may not be a single solution when work starts on the definition of a new ICT standard. If done correctly, a specification that is developed late in the cycle as a result of users (enterprises, consumers and governments) applying pressure to vendors to address a perceived lack of interoperability or portability may result in a single standard around which industry can coalesce. However, this is very rare. In addition, a substantial number of standards are written early in the innovation cycle, with various groupings attempting to write multi-vendor standards for specific problems.

ICT standards are most effective when the need for them has been identified, and they are then developed by industry players and users. Many ICT standards are a direct result of users lobbying industry for interoperable or portable solutions, or simply of industry deciding to come together to investigate standard solutions. This voluntary nature of standards initiation enables communities to gather together where and when a need is foreseen. Work on such standards will be best in an environment which allows the formation at will of communities open to all stakeholders, regardless of geographic location or organisational size. These types of standards can be developed at a formal International or European level; however, this is very uncommon as (typically) fora and consortia provide a more appropriate environment for the engagement of globally relevant stakeholders (including users) to develop specifications in a timely manner.

## 9. CONCLUDING REMARKS

The ICT standardisation ecosystem is currently in a period of flux, with the participation of an increasingly wide range of stakeholders. This is positive because experience has shown that the most successful standards are those with broad stakeholder support – especially from industry as the main contributor to standardisation regarding ever-evolving technologies and expertise. Governments can play a role in this evolving context. Governments should focus on supporting the market, providing a framework that allows stakeholders to develop the standards by improving the recognition of fora/consortia standards. Governments should also promote the use and uptake of standards and technical specifications. However, not all standards are the same, which means that in order to get the best results from standardisation activities, the governments should promote Open Standards for software interoperability. Governments can also help the standardisation activities with their expertise, contribute to requirements gathering and with their technical experts in standardisation.

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## INTRODUCTION

The world of standardisation is at a crossroads. Standards are critical for digitisation of private and public sectors alike – for the successful adoption of new technologies in the context of Cloud, 5G, the Internet of Things, the data economy and transformative citizen-government ICT infrastructure. Standards are increasingly high on the political agenda both at European Commission and in Member States as instruments for industrial and innovation policy. Standards are also a key asset of the industry for open infrastructures and technologies. Can standardisation meet all these expectations?

Moreover, the standardisation ecosystem continues to expand beyond established Standard Developing Organisations (“SDOs”). Ever more players contribute to standardisation at different levels – industry associations get involved in use case or reference architecture work, Open Source communities provide new and agile ways for innovative technology development and deployment with fast iterations and updates, and tasks that used to be addressed in standardisation are nowadays partially or fully addressed in Open Source.

Openness has become more relevant and is now established as the prime paradigm for digital transformation. Digitisation and the move towards a data economy means crossing boundaries and collaborating beyond traditional borders, be it geographic, cultural, technical, linguistic or functional. In other words, open innovation<sup>1</sup> and collaboration are critical to productivity and competitiveness in the digital age.

SDOs feel the need to accelerate their adoption of these developments. Collaboration with Open Source, exploring Open Source development strategies, striving for new ways to modernise standardisation, working across organisational boundaries on the SDO level, as well, are just some examples of projects and initiatives undertaken by SDOs.

Standardisation is needed for digital transformation; and standardisation needs to change in order to optimise digital transformation in the next decade. This paper will explore the challenges, and provide some outlook.

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<sup>1</sup> Professor Henry Chesbrough originally coined the term ‘Open Innovation’ in his book of 2003; this term has been used to explain the different concepts of the collaborative environment thus engendered and the resulting business models. The key difference is that business value is built on top of core attributes, rather than from within those core attributes. This model is now the prime driver for much of the ICT sector. “*Open Innovation: The new imperative for creating and profiting from technology*” Boston: Harvard Business School Press; ISBN 978-1578518371



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# OPENNESS – THE BASIC PARADIGM IN THE DIGITAL WORLD

The digital world has largely been driven by openness – and there is every indication that this will continue. Collaboration, community work, open platforms, interoperability – all of this and more rely on openness in some way or another. Open innovation is at the core of this successful trend where the model is an open, transparent culture and open practices between partners.

It is of course easy to claim ‘Openness’ as an attribute, and to seek additional credibility by adding Open to a product or organisational name. *Open* is used pragmatically to describe a particular approach to an area of the market – e.g.: Open Source, Open Standards, Open Data, Open Access, & Open Science. It would be entirely incorrect to dismiss these as mere marketing. Whilst each has quite specific rules related to the use of the term, in the past there has been little or no perceived need to harmonise the use of the term.

In 2015, OpenForum Europe (OFE), working with its OpenForum Academy Fellows, developed the “OFE Openness Principles”<sup>2</sup> – five core principles that should be at the centre of any claim to being ‘open’:

- Principle 1**     **User Centricity** - Providing choice to consumers, including options (for example, in terms of cost or accessibility) that eliminate digital exclusion
- Principle 2**     **Competition** - Providing a level playing field between producers, forcing them to compete on functionality and quality and ensuring constant innovation
- Principle 3**     **Flexibility** - Enabling the construction of complex combinations of products and/or services from different providers where parts of the combinations can be upgraded or replaced when better products or services become available in the future
- Principle 4**     **Sustainability** - Enabling the construction of product, services and combinations thereof that are sustainable in terms of access to information, cost and impact on the environment
- Principle 5**     **Community** - in which everyone can participate, where no single entity dominates the debate, and where decisions are taken via a transparent process

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<sup>2</sup> See: <http://www.openforumeurope.org/our-vision/>

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## WHAT MAKES ICT STANDARDISATION DIFFERENT?

The ICT sector has established a number of different structures and processes in global standardisation thereby driving innovation with global Open Standards to best serve a global market. The growth is seen in formally recognised SDOs (e.g. ISO/IEC, or the European Standardising Organisations, ETSI, CEN/CENELEC), in consortia (e.g. OASIS, W3C, IETF) and also in open source foundations (e.g. Linux Foundation, OpenStack Foundation). The preferred method of developing ICT standards and market specifications has come out of practical necessity. For global standards, agile and Open Standards development processes and focussed expertise in areas like software interoperability and data portability are key.

Standards in IT may be differentiated by distinguishing those that are horizontal in nature and those that are vertical. For instance, standards for software interoperability, and for portable data formats are not industry-specific. Some of these ICT standards (such as TCP/IP, HTTP, HTML) are horizontal in nature, providing language definitions and enabling systems interconnectivity which can be considered basic building blocks for ICT infrastructures and systems. On a vertical level, banking and insurance, for example, have a good track record in defining ICT interoperability and data standards in fora and consortia building upon horizontal standards (SWIFT, FpML, ACCORD).

Software interoperability and data format standards are increasingly required in other industry sectors, such as construction and manufacturing. Traditionally standards for these sectors are developed in formal venues (such as within ‘ESOs’) focussing on functional requirements-orientated standards in the areas of health, safety, and the environment (i.e. in the regulated domain). Such standards tend to vary comparatively little over time. Yet, software and data format standards for these industry sectors will have to go beyond functional requirements and will have to be very specific if interoperability is to be achieved, i.e., down to “bits on the wire” specifications. Such specifications are not fixed and will likely evolve quickly as new base and horizontal technologies (such as protocols and languages) are adopted, together with new techniques and a continuing evolution of how to use software in an industry vertical. The formal standards development approach in many sectors, if not all, will therefore have to be complemented by taking up respective standards for software interoperability and data formats developed in fora/consortia.

For the marketplace, this differentiation between formal standards and specifications developed in fora/consortia has rarely proved to be a practical obstacle. On the contrary, the easy availability of global Open Standards has been a driver for innovation, which has accelerated the broad adoption of ICT standards and the demand for standards-based IT solutions. For example, a substantial portion of the internet and the web

is based on consortia and fora specifications. Only where governments are bound by specific rules for the referencing of standards in their policies or public tenders (as is the case in Europe, where the Procurement Directives define a hierarchy, with a strong preference for standards from formally recognised SDOs) does the fact that the different structures in use by the ICT sector become an issue which has to be circumvented or “solved.”

Unlike other sectors, the ICT market’s need for standards is almost entirely related to interoperability and portability, providing a core platform upon which products and services can be developed, integrated or built upon. This open innovation model is now the prime driver for much of the ICT sector.

***Unlike other sectors, the IT market’s need for standards is almost entirely related to interoperability and portability, providing a core platform upon which products and services can be developed, integrated or built upon***

The question is not what is right or wrong, but how does the European approach to standardisation not only recognise the differences, but proactively respond to the needs of the new and emerging technologies and markets? The question can no longer be ignored. The lessons already visible in Cloud computing will be dwarfed by those now predicted in relation to the ‘Internet of Things’ (IoT).

As such the continuing need to be user-led and user-centric regarding the choice of market needs should be recognised as well as some fundamental questions such as:

- Does this indicate a preferred ‘top down’ approach, or a ‘bottom up’, industry-led one? Or a mixture of the two?

Which role do standardisation bodies play, when increasingly new standards seem to be emerging almost as by-products of solutions development? In ICT, the use of ‘Open Source’ components within software development has already had a fundamental impact on ICT thinking. This has impacted not only the route through which standards might be developed, but the approach to IPR selection and expectations. How can the European Standardisation System (ESS) respond to such a move, and where would it leave ESOs and fora/consortia?



- Within ICT, the acceptance of ‘openness’ is now ubiquitous - but does the definition need to be more precise? What does openness mean – in both general and specific contexts? Is there any need to tighten the definition of a truly ‘Open Standard’, or would doing so only lead to yet another battle over definitions, rather than getting requirements right in specific contexts?

*The European approach to standardisation must not only recognise the differences, but proactively respond to the needs of the new and emerging technologies and markets.*

## 4

### DIGITISATION – STANDARDISATION AS ENABLER AND DRIVER

ICT standards play a key role for digitisation. Interoperability and connectivity facilitated by Open Standards are key for technology integration. Given the high political relevance of digitisation for innovation and growth in Europe standardisation is also in close focus of policy makers.

To a large extent ICT standards have provided the basis for any kind of digital transformation. Without the respective ICT standards being available already today the ability of integrating technologies and thus of digitisation would not be given. These are basic, horizontal ICT technology standards that form basic building blocks for all kind of systems integration.

These basic technology standards have meanwhile been complemented by other standardisation deliverables on a more vertical level, like Reference Architectures, standards describing special semantics, process standards, use cases and, finally, also standards landscapings and roadmaps.

In general, there are not many new standardisation activities required to support the digital transformation as there are not many functional gaps. Some of them – most notably in the area of semantics – have been identified already and work has started on closing these gaps. In addition, as pilot projects and reference projects will take place, information will be gained on potential further functional gaps which will then incrementally be addressed and closed. This is where also plug tests, plug fests and Open Source implementations play an important role for gaining information about the actual state of maturity of the standards and about work that is needed for improvements.

***‘Horizontal ICT technology standards form basic building blocks for all kind of systems integration’***

The digital transformation will most likely be the leading paradigm for change on all levels in the coming years and it must be expected that it will progress rapidly and trigger further innovation. As new technologies evolve SDOs will be tempted to be fast in addressing these new areas, as well, and offer standardisation activities to proceed fast. While being fast is important a proper balance is critical for allowing evolving technologies to establish on the market and mature before their principles get carved in stone via standardisation.

It will be critical for all stakeholders involved in standardisation and in the governance of SDOs to define mechanism for standardisation to

accompany and support evolving technologies without pulling them into the usual structures and processes of standardisation right away. And as a lot of innovation is today driven in Open Source projects this will have to include the aspect of collaboration with Open Source, as well. One may expect that this overall standardisation ecosystem will have to evolve into something like a dynamic network of tools and processes for bringing new technologies to the market, allowing them to mature, providing, in a timely manner, those standardisation deliverables the market requires at a specific point in the innovation value chain.

*It will be critical to define mechanism for standardisation to accompany and support evolving technologies*



## 5

### OPEN SOURCE – DISRUPTIVE AND COMPLEMENTARY FOR STANDARDI- SATION

Open source has become a major driver in open innovation. Emerging technologies are brought to the market fast and effectively via Open Source projects and technology development is done collaboratively with frequent release cycles and fast iterations of technology improvements.

Open source technologies are typically developed in open communities in a collaborative fashion. Open source projects provide the respective framework and rules for the integration of technologies and for the approval of new code and new features. Governance is of key importance for assessing Open Source foundations: who takes decisions? Is the project built on democratic principles and is decision making based on consensus? Or is the Open Source work in the end controlled by a single entity or a closed group.

The relationship between Open Source to standardisation cover many aspects. First of all, it is, however, important to clearly differentiate between Open Standards and Open Source. Standards are building plans, blue prints. They describe how something is built and how interoperability is achieved, e.g. by defining APIs and protocols. Open Source, on the other hand, is code. Open Source is software. Open Source may implement standards, but it is not a standard.

For standardisation, Open Source provides a way for developing reference implementations. Standards are tested and Open Source is a well-established way for the promulgation of the respective standards and for promoting their broad market adoption.

Open source is also used for the development of technologies in the context of standardisation like tools or test suits. Collaborative methods and open innovation make such developments faster and more efficient – high quality delivered in a timely manner.

***Standards are tested and Open Source is a well-established way for the promulgation of the respective standards and for promoting their broad market adoption***

Most importantly, Open Source is developing certain technologies like APIs that are also subject of standardisation work. This creates some overlap between standardisation and Open Source. And because Open Source provides open technologies in a way that the source code is openly available for everyone, there is little to no stimulus for Open Source communities to submit outcome of their work like APIs to standardisation.

Over the last years Open Source evolved into challenging standardisation in so far that it has become a major playing field for providing open technologies. SDOs recognise this situation – which, moreover, goes hand in hand with Open Source being highly attractive for developers, often at the cost of standardisation.

Many SDOs are, therefore, investigating options on how to make use of Open Source or collaborate with Open Source. The challenges which SDOs face in this respect are manifold.

Fundamentally, SDOs have the choice whether to host Open Source projects themselves or to collaborate with Open Source foundations. The major difference of developing Open Source from developing standards is that Open Source means developing code. Typically, this code is put on the market under a certain Open Source license. The most common licenses are those approved by the Open Source Initiative (OSI)<sup>3</sup>. Bringing code to the market is different from making standards available in so far that distributing code and software entails different liability rules. If the code or the software is faulty or buggy and creates damage the respective distributor can be made liable. This is different from standardisation.

Distributing code and software may also require other rules for copyright than what SDOs have in place for standardisation. Indeed, Open Source implementations and/or reference implementations must also be neutral. Therefore, if SDOs decide to host Open Source projects or to actively promote Open Source implementations of their standards it must be clear that these are just “one possible” implementation – not superior, nor inferior to possible others on the market.

***There is certainly no single approach for the collaboration between standardisation and Open Source***

A major challenge may occur regarding the interaction of patents and standards and Open Source. In its vast majority, Open Source development and distribution terms are largely incompatible with the principle of licensing patents that are essential for implementing a standard on Fair, Reasonable and Non-Discriminatory Terms (FRAND). Typically, the requirement to obtain an individual patent licence or the royalty payment obligation is incompatible with Open Source since this is conflicting with the practice of community work, free and open availability and the right for everyone to use, improve and expand the code.

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<sup>3</sup><https://opensource.org/licenses>

There is certainly no single approach for the collaboration between standardisation and Open Source. It is likewise clear that SDOs cannot ignore Open Source and its potential, e.g. for reference implementations or the promulgation of standards. Each SDO will have to evaluate its own best way on how to collaborate with or make use of Open Source. Not every SDO needs to transform and host Open Source projects themselves, but collaboration with an Open Source foundation may be an option, as well. Similarly, there are different ways of making use of Open Source so that also in this respect SDOs may find different approaches depending on what suits their interests and their membership best.



## THE ROLE OF GOVERNMENT

In Europe, standardisation has always played an important role for market access. For the regulated technology areas under the New Legislative Framework / New Approach, regulatory requirements can be met by means of standards that are developed voluntarily and listed in the Official Journal of the EU (OJEU). If the respective standards are implemented, vendors can issue a Supplier's Declaration of Conformity and operate under the Presumption of Conformity. Usually the Commission issues a Standardisation Request ('Mandate') for the development of the respective harmonised standard(s), and ideally International Standards form the basis for the respective European Standards which are then listed.

More recently, standardisation in non-regulated areas has gained high attention from governments both in Europe as well as globally. Standards are seen as critical drivers for innovation in the context of the "digital transformation". Therefore, standardisation has become an aspect that is considered in industrial policy, with the objective of promoting the uptake of new technologies on the basis of trusted standards. The respective policy initiatives in Europe are manifold – on both EU and national levels. Standardisation plays a key role in the EU's Single Market Strategy and in the Digital Single Market (DSM). A number of specific regulatory actions and Communications have come out of these strategies, e.g. the Joint Initiative on Standardisation<sup>4</sup>, the Communication on EU ICT standardisation priorities<sup>5</sup>, and further specific policy initiatives such as the ones on Digitising European Industry<sup>6</sup> and on European Cloud Initiative<sup>7</sup>. In addition to promoting the uptake of new technologies, these initiatives follow the goal "to ensure that the EU becomes a leader in the global digital economy"<sup>8</sup>.

Similarly, on a national level, several governments are now focussing on standardisation. A prime example is in Germany, where the Federal Government's Ministry for Economic Affairs and Energy is leading the 'Plattform Industrie 4.0' initiative – a Public Private Partnership ('PPPs') which includes specific working groups working on standardisation, architectures, etc. This initiative operates in parallel to the SDOs which are also active in this area. Individual governments are developing national and regional competences in a various verticals. It would, however, be hugely counterproductive for PPPs to replicate well established ICT standardisation or specification setting SDOs/consortia/foundations.

<sup>4</sup> See: [http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item\\_id=8852](http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8852)

<sup>5</sup> See: <https://ec.europa.eu/digital-single-market/en/news/communication-ict-standardisation-priorities-digital-single-market>

<sup>6</sup> See: <https://ec.europa.eu/digital-single-market/en/digitising-european-industry>

<sup>7</sup> See: <https://ec.europa.eu/digital-single-market/en/%20european-cloud-initiative>

<sup>8</sup> COM(2016) 176, at p. 4

Prevalent in these initiatives one finds the notion that governments need to involve themselves in standardisation to ensure that standards get developed faster, the right priorities are set, standardisation needs are identified, etc.; in other words, some involvement from governments to initiate work top-down, rather than relying on the well-established bottom-up process.

Moreover, an increasing trend is for governments to involve themselves in defining standards lists and recommendations, or in reference implementations for particular technology areas (such as Cloud, Smart Grid, etc.). While such lists promote interoperability and provide guidance to public procurement agencies and the market in general, they may have the unintended effect of conferring normative status and introducing de facto regulation in non-regulated areas, so that governments end up selecting “winners” in terms of specific technology recommendations. Taking this one step further, such lists of recommended standards may lead to increased manifestation of certain technologies whilst reducing or even excluding different approaches, thus creating barriers for new innovations to be adopted fast and in agile ways – which even risks dis-incentivising innovation.

Digitisation also challenges the role and level of involvement of governments in standardisation. As digitisation is considered highly relevant for growth and jobs and for the future of national and European economies, it is, for sure, important for governments to consider it in terms of both industrial and innovation policy. This evokes the question on the ideal balance for the involvement of governments in standardisation, while relying on market forces to drive innovation and growth.

As a basic principle, governments in Europe set the legal framework and provide regulatory and policy requirements, but leave it to industry and other stakeholders to develop technologies which respond to and satisfy those requirements. In the regulated area, this separation works very well. In a similar way, this model is applied in the non-regulated areas in the field of ICT standardisation, where the European Commission outlines its policy objectives, proposes actions standardisation actions to support the implementation of the objectives, and invites industry and other stakeholders to respond to the proposed actions with technology development in standardisation. The important tool which is used for this is the “EU Rolling Plan on ICT Standardisation”<sup>9</sup>, which is collaboratively developed by the Commission with advice from the EU Multi-Stakeholder Platform on ICT Standardisation.

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<sup>9</sup> See: <https://ec.europa.eu/digital-single-market/en/rolling-plan-ict-standardisation>

This principle of separation has proved to be very effective and efficient in encouraging innovation and actions in the ESOs and in SDOs, stimulating bottom-up standards development activities and resulting in high-quality standardisation deliverables which are based on high technology expertise contributed by industry and other stakeholders. Where governments have key expertise of their own typically participate in the standardisation work as a stakeholders.

Where the European Commission wishes to request a new standard for use in regulation, it should issue a standardisation request (formerly called Mandate). Regulation should continue to be limited mainly to the areas of health, safety and the environment.

***Governments in Europe set the legal framework and provide regulatory and policy requirements, but leave it to industry and other stakeholders to develop technologies which respond to and satisfy those requirements***

Where standards are seen as an important element of industrial policy, the market need should be evaluated, e.g. by consultation with the Multi-stakeholder Platform (MSP)<sup>10</sup>, and duplication of effort should be avoided if work is already available or ongoing on a global level. In general, governments should be cautious before requesting any standardisation development activity in the context of industrial policy, while continuing to focus on promoting the use and update of standards and open technologies in the context of the adoption of new and emerging technologies.

Regarding the development of technical standards, governments should – where appropriate - engage with technical experts by becoming members of relevant technical committees in standards bodies.

Such a basis provides a good balance in terms of the relation and role of government in standardisation. This should be accompanied by a regular dialogue and exchange with industry and other stakeholders – as already takes place today in Europe (in the MSP, as the main advisory group on ICT standardisation).

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<sup>10</sup> See: <https://ec.europa.eu/digital-single-market/en/european-multi-stakeholder-platform-ict-standardisation>



# 7

## THE INTERPLAY BETWEEN IPRS AND STANDARD- ISATION IN THE OPEN INNOVA- TION ECOSYSTEM

High quality standards depend on the availability of relevant innovative, state-of-the-art technologies. Often such technology elements have been patented, which has led to SDOs setting up IPR policies to govern the process for the declaration of claims regarding so-called Standards Essential Patents (SEPs), and the rules for ensuring the availability of declared SEPs to those who implement the respective standards.

Perhaps the greatest level of controversy relates to the issue of perceived incompatibility of standards which depend on one or more SEPs with Open Source based developments. Indeed, this is an issue which requires adequate resolution so as to further enable the full potential of European innovators in the context of the digital transformation - thereby contributing to economic growth, jobs and global competitiveness.

On a simplified view, two approaches in relation to patent policies can be identified: FRAND and RF (whether Royalty-free or Restriction Free).

FRAND is a promise. A patent-holder which contributes an SEP to a standard under FRAND terms and conditions makes the promise that the licences to exploit the patent will be available to implementers of the standard under, as the acronym puts it, fair, reasonable and non-discriminatory terms and conditions. The specific terms and conditions of the licence, in particular the royalty fee aspects, are subject to bi-lateral negotiation with the associated need for agreement to be reached between the patent-holder and the would-be licensee.

RF is a guarantee to implementers of the standard that SEPs will be available for licensing without royalties or restrictions on use being imposed. A significant number of global SDOs active in IT standardisation opt for an RF policy (or a more blanket non-assert policy) whereby no claims will be made and no licensing is required.

For Open Source projects, unless the licensing agreement includes, for instance, a non-assert clause or similar provisions, SEPs are a problem in that they create an implied threat, resulting in the risk that every Open Source based project participant will fear the future actions of the current and potential future owners of the relevant patents, in particular that those owners could be in a position of power without contributing to the project. In the context of Open Source projects SEPs are problematic also in that they require that each patent holder will need to establish private relationships with community participants, which is simply not practicable and conflicts with community based open innovation and collaboration approaches.

With some degree of simplification, it could be claimed that the more standardisation involves research-intensive and base technology, such as hardware or radio transmission, the more likely, and important, it is that a FRAND policy will have been selected to govern availability of SEPs. On the other hand, the more standardisation is located higher up in the technology stack and the more standards are focussing on interoperability and APIs, for example, the more likely, and important, it is to find an RF policy. To some extent, this relates to innovation: where the innovation is in the base technology that is included in a standard, the innovator wishes to obtain some reward for all its R&D efforts, and so it is important to enable (or allow) an incentive for innovators to contribute SEPs to standardisation. Therefore, in such cases FRAND is the dominant licensing model.

Over all, each of the two licensing approaches work well in their own market segment – or technology layer - but this does not mean that there are no issues. There are disputes and court cases about validity of essential claims, about what FRAND is, and about whether an offer made is really FRAND or is excessive. In fact, the evolution of new market players in the telecommunications sector, the move towards 5G and, more generally, digitisation have led to disruptions in the market and have triggered discussions around the interplay between IPR and standardisation. There have been debates as to whether there should be precise definitions of what FRAND means, and whether for a patent holder to seek (and to enforce) an injunction against an unwilling licensee is a valid instrument in the case of SEPs. The problem with defining ‘FRAND’ is that conceptually it is not consistent with a strict or narrow definition; it is a promise, which enables technical work to progress and separates the business aspects from that technology development, assuming willingness and fair-play between the patent holder and the implementer of the standard. Further, any resulting disputes tend usually to get resolved in court or, if mutually agreed, by some other form of adjudication. On the other hand, trying to define FRAND more closely will tend to result in a situation where the different parties each try to embed their favourite formula(e) for calculating royalty rates as part of the definition. No universal definition of FRAND will probably ever exist, and trying to define the term in any formulaic manner seems likely to prove as futile as trying to square the circle.

***Most commonly used Open Source licenses are largely incompatible with the principle of licensing patents that are essential for implementing a standard on Fair, Reasonable and Non-Discriminatory Terms (‘FRAND’)***

A further issue that has hit standardisation recently concerns claims from third parties which are not members of the respective SDOs, and therefore not subject to the associated IPR rules. There have been instances where SEPs were acquired by businesses which are not in the respective business at all but still seek to impose significant royalties. Such businesses are sometimes referred to as “non-producing entities” (NPEs) or (less

The global standardisation ecosystem has long adapted to the need for different models to support open innovation and respond to respective needs and requirements. It is well balanced, in so far as there are global SDOs (aka fora/consortia) where the members distinctively decided to implement IPR policies or respective options with a policy for allowing implementation of their standards in Open Source. At the same time there are other areas where what is of prime importance is to have access to technology inventions, and therefore the need to provide incentives for inventors to contribute their technologies to standardisation and get some fair compensation for their R&D efforts in return.

***As a general rule, the more standardisation is located higher up in the technology stack and the more standards are focussing on interoperability and APIs, the more likely it is to be based on a RF policy***

The European Commission is also looking at the interplay of standardisation and IPRs. For instance, this topic is addressed in the Commission Communication on “ICT Standardisation Priorities for the Digital Single Market”<sup>11</sup> where the Commission heavily focusses on FRAND despite there being other options (p. 13): “ICT standardisation requires a balanced IPR policy, based on FRAND licensing terms. [...] A balanced policy should take into account a variety of needs: fair return on investment to incentivise R&D and innovation, a sustainable standardisation process, wide availability of technologies in an open and competitive market, and the difficulty for SMEs to participate”.

The interplay between standardisation and IPRs will continue to be critical, given the challenges of technology convergence, innovation and digitisation. The following considerations are of the utmost importance, for maintaining and improving such balance:

1. Both FRAND and Royalty-Free have their distinctive roles to play. The question in the marketplace is not a binary one (either/or), the reality is that both are of relevance and both support models of innovation. At a policy level, it is important that the significance of Royalty-Free is well recognised for the implementation of Open Standards in Open Source, and to recognise that FRAND is basically incompatible with true Open Source.

2. A thorough understanding of the relation between innovation and standardisation will be essential for a balanced approach and for further improving the balance of interests between patent holders and implementers. Any such balanced approach needs to recognise the need for support of standardisation to be attractive in the case of innovative, state-of-the-art technology players, as well as for standards to be available and widely adopted in the marketplace where innovation takes place at the level of the implementation of the standard(s).

3. Based on such a thorough understanding, in the case of standards for software interoperability, the availability of Royalty-Free licensing terms should be encouraged, so as to ensure the possibility of Open Source implementations which can more fairly compete with proprietary offerings in the marketplace on a level playing field, and to encourage new standards to be derived from Open source

4. As SDOs adapt to changes in the marketplace, it is important that whilst they operate within their respective legal framework, at the same time they and their members should strive for consensus on what patent licensing approach is most appropriate.



## 8

### WHERE ARE STANDARDS BEST DEVELOPED?

Software interoperability, data and document format standards aim to define specifications that are independent of any implementation, enabling multi-vendor choice and offering the prospect of reduced vendor lock-in. The emphasis of these types of standards is on which technical rules must be followed when two software components interoperate using the standard, and how independent software systems interpret and use data in a standardised format. This “external” view of how software behaves, regardless of how it is implemented, is a cornerstone in enabling choice between multiple vendors and products. Although two solutions can, and will most probably, implement a standard in different ways, by complying with the external rules they can appear functionally identical and so can (in theory) replace one another. Products implementing such standards, whether proprietary or Open Source, can exist on a level playing field where they compete on the basis of considerations such as (but not limited to): total cost of ownership, security, performance, reliability, and product support.

ICT software standards are very different from the standards typically enshrined into European Norms (ENs). ENs are designed to support the sale and distribution of goods within the single market, and are primarily set to establish health and safety rules for products. Some examples of ENs include: gradings of structural timber, size designation of clothing, reflectivity of hi-visibility clothing, and Audio Visual equipment safety requirements. ENs are standards that do not change very often and are strongly rooted in the laws of physics, chemistry, and biology (e.g., for food safety). From a single market perspective, it makes absolute sense (for these subjects) to have a single standard across Member States.

***IT software standards are very different from the standards typically enshrined into European Norms (Ens)***

However, these observations are not true when it comes to ICT standards. When one embarks on an ICT standard – depending on where in the lifecycle – there may not be a single solution. If done correctly, a specification that is developed late in the cycle as a result of users (enterprises, consumers and governments) applying pressure to vendors to address a perceived lack of interoperability or portability may result in a single standard around which industry can coalesce. However, this is very rare. In addition, a substantial number of standards are written early in the innovation cycle, whereby various groupings attempt to write multi-vendor standards for specific problems. Such standards may or may not

survive, and even if they do, they might not exist in isolation. Therefore the concept of a single standard which can be used across Member States and which results in the withdrawal of equivalent national standards is just the wrong way of thinking, and should only be used in special circumstances where deemed critical to the proper functioning of the single market. Adoption of a European standard as an EN is a significant undertaking, and should not be taken unless the outcome is viewed highly beneficial to the market. Unfortunately adopting standards too early in the innovation cycle, at a time when technology still continues to progress at a rapid pace, will inevitably result in software standards which are out of date before they are published, with the industry moving on to the next solution, or even taking a different direction.

ICT standards are most effective when the need for them has been identified, and they are then developed, by industry players and users. Many ICT standards are a direct result of users lobbying industry for interoperable or portable solutions, or simply from industry deciding to come together to investigate standard solutions. This voluntary nature of standards initiation enables communities to gather together where and when a need is foreseen, and work on such standards will be best in an environment which allows communities open to all stakeholders, regardless of geographic location or organisational size, to form at will. It is possible for these types of standards to be developed at a formal International or European level, however this is very uncommon as (typically) fora and consortia provide a more appropriate environment for the engagement of globally relevant stakeholders (i.e., users, software practitioners, testers, etc.) to develop specifications in a timely manner. Note that very few software interoperability or data format standards have solely been developed at the International and European SDO level, and that most International standards relating to software interoperability and data formats have resulted from the adoption of submissions from fora and consortia.

***IT standards are most effective when the need for them has been identified, and they are then developed, by industry players and users***

Open Standards consortia and fora are places where leading developers come together to innovate. Such consortia and SDOs have over the past two decades learned to trust each other, and they also recognise the benefits of royalty-free development; open collaborative innovation has moved significantly into Open Source, and there is an emerging view that whilst existing Open Standards continue to provide the bedrock for software development projects, many new standards will emerge from within the

software development itself, in the form of APIs, almost as a by-product of the code. So where standards still play an essential role, the same enterprises are increasingly deciding to develop the Open Source software first and the related standards later, rather than following the more traditional practice of doing it the other way around. The reasons are many and obvious: time to market is faster, interoperability is often more easily obtainable, economies in development costs can be dramatic, and the number of standards ultimately needed is far less. Interestingly, when standards have been needed to support new platforms also being enabled by Open Source software, such as the Cloud, Internet of Things, networking and virtualisation, ICT companies have almost always opted to develop them in pre-existing consortia and traditional standards development bodies, rather than by launching new consortia for that purpose.

*Typically, fora and consortia provide the most appropriate environment for the engagement of globally relevant stakeholders in the development of IT standards*

This raises the question of the ongoing inter-relationship between Open Source based development projects with the SDOs such as which is the focus of ongoing European Commission analysis driven through a stakeholder community (C-SIG<sup>12</sup>). Already, initial outcomes increasingly recognise the critical role of bottom-up consortia developing timely solutions.

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<sup>12</sup> <https://ec.europa.eu/digital-single-market/en/cloud-computing-strategy-working-groups>

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## CONCLUDING REMARKS

This paper has looked the current state, and the challenges that will shape the global ICT standardisation ecosystem. This ecosystem is currently in a period of flux, with an increasing wider range of stakeholders getting involved in the standardisation ecosystem. This is positive because experience has shown that the most successful standards are the ones that have broad stakeholder support – especially from industry as the main contributor to standardisation regarding ever evolving technologies and expertise. This is one element, combined with the openness principles, that could encourage the development of standards should build on the same principles of openness, transparency and consensus. This will have a positive outcome for the DSM, as it would lay the grounds for innovation and growth, for flexibility and choice, global market success and fair competition. In other words, an open ecosystem will be the one where society, government and industry align and where everyone is sure to benefit. Fundamental to keep this ever evolving ecosystem open will be the role of the Open Source communities. SDOs and Open Source communities are similar because both contribute to open innovation and both provide open technologies for an open competitive market and on the basis of openness principles. At the same time, both complement each other – Open Source implements Open Standards. However, standardisation and Open Source are different undertakings and must not be confused. Open source challenges standardisation in so far that some technologies result from Open Source developments that used to be done solely in standardisation before, such as APIs.

Having these precisions in mind, the paper supports the idea that partnerships between SDOs and Open Source may help to gain consistency and prevent fragmentation and duplication of efforts. Therefore, collaboration between standardisation and Open Source is likely to increase. This collaboration will take several different forms, because there is no single silver bullet. For example, SDOs may provide ways for taking up those technology parts from Open Source which make sense to standardise. Some SDOs may have to review their processes for becoming more flexible and thus attractive for collaboration with Open Source.

However, SDOs should be cautious in extending their scope into hosting Open Source projects because SDOs should stay neutral – thus providing the implementation of a standard may not be an optimal way but may lead to closing markets and limiting choice rather than enabling them. SDOs should be cautious because SDOs should not compete with Open Source projects but rather support them by providing Open Standards (downstream) and providing a flexible platform for standardisation technologies resulting from Open Source (upstream). Therefore, although standardisation and Open Source play an important role together in driving innovation for successful and sustainable digital transformation, they should not be confused because, as shown above, they are not the same.



Governments can play in this evolving context. Governments should focus on supporting the market, providing a framework that allows stakeholders to develop the standards by improving the recognition of fora/consortia standards. Governments should also promote the use and uptake of standards and technical specifications. However, not all standards are the same, which means that in order to get the best results from standardisation activities, the governments should promote Open Standards for software interoperability. Governments can also help the standardisation activities with their expertise, contribute to requirements gathering and with their technical experts in standardisation.

The open innovation environment is in an ever evolving age. It is necessary to make sure that a healthy global ICT standardisation ecosystem is maintained and that there are multiple ways to respond to the challenges. Therefore, there should be a commitment by all stakeholders to recognise, support and strengthen this global ecosystem.

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A low-angle, upward-looking photograph of four modern skyscrapers with glass and steel facades. The buildings are arranged in a square pattern, creating a central void. The sky is a pale, overcast blue. The perspective creates a sense of height and architectural scale.

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