



Rigorous empirical  
research on  
intellectual property



## Proprietary vs. Open Standards

**by**

Paul Zubrinich, Kristina Medow, Anastasia Kolganova, Moritz Müller, and João Hierro  
Technical University of Berlin.

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# Proprietary vs. Open Standards

by Paul Zubrinich, Kristina Medow, Anastasia Kolganova, Moritz Müller, and João Hierro  
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## 1. Introduction

As technologies have become increasingly complex and interdependent, compatibility has become paramount. This has given rise to the growth of *open standards*, which are developed by companies aiming to establish rules and protocols by which new technologies interact.

In particular, open standards developed in the ICT (Information and Communication Technology) sector ensure interoperability, efficiency and ease of communication between electronic devices, such as smartphones, laptops, audio systems, and televisions, which conform to a certain expected performance criteria. Most of these improvements have been developed in the open standards process through large collaborations, such as the Third Generation Partnership Project (3GPP), which brings together seven telecommunications Standard Development Organisations (SDOs) with the goal of generating standards for the wireless cellular system.

The resulting *de jure* (officially endorsed) standard often incorporates patented technology, which is then made available on Fair, Reasonable and Non-Discriminatory (FRAND) terms. The FRAND commitment can comprise either royalty bearing or royalty-free terms, as well as other mutually agreed contractual conditions ([regulation \(eu\) no 1025/2012 of the european parliament and of the council](#), annex II 4.c.). Examples of SDOs developing open standards include the Telecommunications Industry Association (TIA), the European Telecommunications Standard Institute (ETSI), and the World Wide Web Consortium (W3C).

Open standards development is seen to generate high quality standards, greater interoperability, a streamlined development process, as well as opportunities for peer-reviews that are dedicated to the on-going development of the standard. By having a large range of companies participate in the process, the risk is minimised, and competition is stimulated which results in more innovative products being developed at a lower cost (See T. Frain, [Patents in Standards & Interoperability](#), WIPO and Open Stand [Open Standards vs. Proprietary: Are Open Standards Really the Wave of the Future for IoT?](#)).

On the other hand, *proprietary standards* also exist in the market. These are technologies that are developed and controlled by one company or a small group thereof where the technology has achieved critical market success to become an ‘unavoidable’ technology given the ‘winner takes all’ nature of standardisation. Examples include Video Home System (VHS), Microsoft Office (office suite), Adobe Photoshop (image editing software), and Google Search (search engine). In each of these examples, the company supporting that technology pursued a strategy based on achieving significant market share beating competing alternatives.

The present article will examine the benefits and risks attached to implementing open or proprietary standards, both from the companies' (section 2) and the consumers' perspective (section 3), before summarising the conclusions drawn (section 4).

## 2. Benefits and risks of proprietary vs. open standards for companies

### 2.1. General outline

In July 1996, Tim Berners-Lee, inventor of the world wide web, [complained](#), "Anyone who slaps a 'this page is best viewed with Browser X' label on a Web page appears to be yearning for the bad old days, before the Web, when you had very little chance of reading a document written on another computer, another word processor, or another network." He was referring to the *browser wars* between Netscape Navigator and Microsoft Internet Explorer (IE) at a time when websites would often state the best browser for viewing. At that time, Netscape still held an 85% share of the browser market. In response, Microsoft bundled IE into their Windows operating system (which held a 90% share of the desktop OS market). Consequently, Netscape Navigator fell to below a 20% share of the browser market by 2000 and 2% by 2004. Microsoft had won, and IE had become the *de facto* standard. Between 2001 and 2006, [IE's market share hovered at around 90%](#). During these years, Microsoft, however, ceased to innovate in the web browser space, only releasing one new version of IE. But elsewhere an entirely different approach was bubbling beneath the surface.

Originally titled Phoenix, the Mozilla Foundation's Firefox browser rose from the ashes of Netscape. While Microsoft was accused of intentionally flouting the web browser standard specifications developed through W3C, Firefox adhered strictly to open web standards. Along with Firefox, Apple Safari and Google Chrome emerged, both based on Apple's WebKit open standard released on a Berkeley Software Distribution (BSD) license. During this post-2006 era, often referred to as the *second browser wars*, IE's market share plummeted to 20% by 2014. Further, it was prohibited from retaliation in the 2001 decision by the U.S. Department of Justice.

The rise and fall of IE illustrates both the benefits and risks of seeing a proprietary technology evolve into a standard. It is a high stakes 'winner takes all' approach. The rewards for de facto standards can be considerable and therefore incentivises companies to develop such technologies. However, once the technology proprietor holds its dominant position, it can control related proprietary technologies or services surrounding its *de facto* standard. In Microsoft's case, while IE was free, users of its paid and associated product, Windows, had a seamless web experience, and developers could use its FrontPage tool to generate IE compatible code.

However, Microsoft's position stimulated the market to react. W3C's open web browser standards were an industry-led approach requiring Microsoft to modify its strategy, and by 2010 Microsoft [joined the W3C](#) working group on the scalable vector graphics (SVG) standard - a key milestone in their loss of market control. There are several drawbacks of locking users in a proprietary standard. For example, the dominant company will no longer receive the sort of rapid feedback from users that occurs in competitive markets; and, competing companies can seek

alternatives, either individually or by banding together to dethrone the incumbent. And finally, there is the risk of antitrust action as Microsoft faced in 1998 from the United States.

The first point is key: If implementers or users have no ‘choice’ but to use one technical solution they are locked in (especially if switching to a competing solution is difficult) and this ‘lock in’ makes the de facto standard immune to competition and may even fall out of touch with users’ needs. This risks creating antitrust liability as occurred in this case which is a significant consideration for technology companies.

In turn, companies that are or could compete against the incumbent may become a significant threat as the W3C participants did. Equally other companies in the ecosystem can seek to squeeze out the dominant company as a new technology emerges. As mobile devices with Internet connectivity grew, Apple, Google, Nokia, and BlackBerry all adopted other lightweight browsers which helped drive Microsoft out of the market. This would indicate that standards may only have transient market power.

Similarly, in the first decade of the 21<sup>st</sup> century Adobe Flash was the *de facto* standard for video on the web and used by two dominant video-sharing platforms, YouTube and Vimeo. When Apple rejected Adobe Flash in 2010, then-CEO Steve Jobs [stated](#) that Apple’s most important reason for non-implementation of proprietary products was the loss of control of its own proprietary ‘platform’. And given that Apple had a 19.3% and growing share of the smartphone market [at the time](#), it wielded significant influence and buyer power. So, when Apple adopted the open MPEG standard H.264 for video encoding, video-sharing and news websites (including YouTube and Vimeo) rapidly ensured compatibility with H.264 and Flash became one option among many with access to Apple’s platform. This shows that when assessing de facto (and indeed open) standards, buyer-power by implementers can have a significant impact. Thus, the potentially huge benefits for the incumbent through the deployment of a proprietary standard can come with equally huge risks from competing companies and open standards that may end the incumbent’s market position. How to assess the risks involved in excessive ‘success’ and at what point a technology becomes ‘too successful’ is a problem that deserves more research.

## 2.2. Large companies’ perspective

The [European Commission defines](#) a large company as a company with more than 5,000 employees, an annual turnover greater than 1.5 billion euros and a balance sheet total of more than 2 billion euros. Thus, it is likely that large companies have more means to invest in research and development (R&D) activities such as those that are directly linked to standardisation, for example tangible and intangible resources, knowledge, absorptive capacity, economies of scale, and economies of scope (see B. Pfaff, K. David, [Society and open source](#)). Companies need to be incentivised to devote resources to technology development and standardisation.

Those technology enterprises active in the field of interoperable technologies have a business model choice: to take part in open standardisation or to develop and control proprietary technology which, if successful, becomes a widely adopted standard. Many large companies

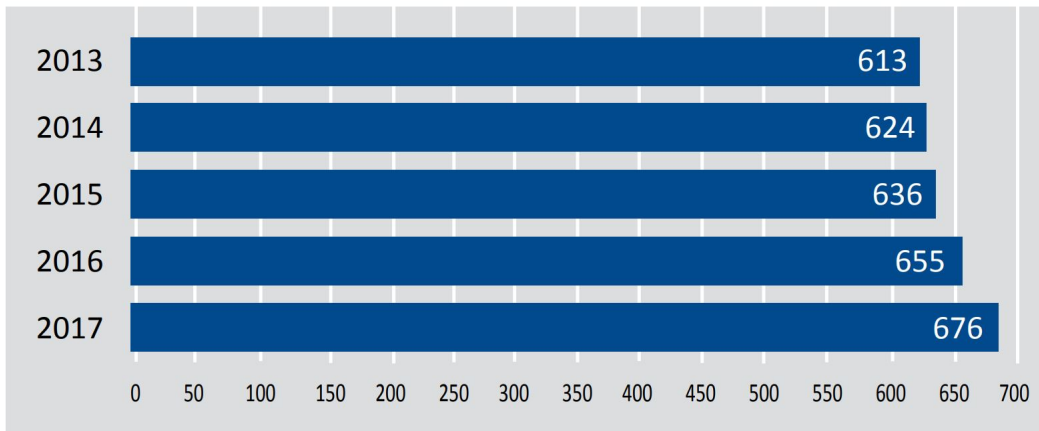
(owners of proprietary technologies) also grant licenses to competitors who, in turn, create products supporting the standardised technology. For instance, Sony licenses their proprietary CD technology to other companies that build CD players, so value from the CD ‘standard’ can also be gained by manufacturing products that implement it.

One result of developing a successful proprietary solution is that competitors will have the incentive of challenging the market by creating rival solutions. Market entry and product competition are highly desirable but may become problematic where these solutions need to interoperate (See Charles M. Koziarok. [Proprietary, Open and De Facto Standards](#)).

Other times, large companies also often see large revenue streams from licensing out technologies that they have developed. For instance, Microsoft has been charging Android smartphone-based manufacturers an estimated [USD 2 billion per year](#) for [only 310 patents](#) (that Android may infringe). Apple’s royalty receipts from Samsung also exemplify such a strategy, as it charges Samsung for pinch-to-zoom (\$3.10), bounce-back (\$2.02), and tap-to-zoom (\$2.02) for a total royalty burden of \$7.14, which comprises 17-25% of Samsung’s material cost. At the same time, some large companies face situations where their customers prefer open rather than proprietary technologies.

In general, open standards are becoming more valuable to large companies given their accessibility and the potential for growth in the market in which they are active in. This increase in market size can contribute to the company’s popularity and uptake leading to network effects. Open standards are often supported by those who believe in collaborative work, by companies that specialise in specific areas in their industry, and by companies without the sufficient resources to build high-quality technology solutions by themselves ([especially as communications standards are so highly complex it is unlikely that any one company could develop them](#)). Companies and research institutes are therefore interested in being involved in creating an open standard that would be widely adopted and give every company involved a chance to generate revenue. To guarantee this scenario, members of SDOs have rules that guarantee accessibility and openness to the standardisation process and resulting standard. In that context, those that contribute essential technologies usually agree to make their patents available on Fair, Reasonable and Non-Discriminatory (FRAND) terms and conditions. It has been observed that an increasing number of large companies are embracing the value of open standards. For instance, the membership of [ETSI](#) has [increased](#) from around 600 members in 2000 to currently over 800 members (including more than 33% of SMEs and micro-enterprises) although those companies that contribute core technologies remain small (in the region of 10%).

### Evolution of ETSI Full Membership



source ETSI annual report 2018

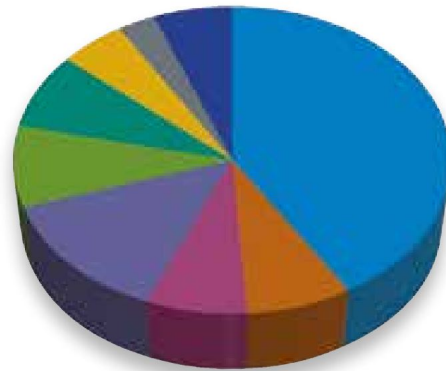
### Membership by type

	1-1-2017	31-12-2017
Full Members	655	676
Associate Members	131	140
Observers	18	14
<b>Total</b>	<b>804</b>	<b>830</b>

source ETSI annual report 2018

### Full and Associate Membership by category

Manufacturers	336 (41%)
Network operators	65 (8%)
Administrations	60 (7%)
Research bodies/ universities	111 (13%)
Service providers	71 (9%)
Consultancies	63 (8%)
Users	41 (5%)
Other Government bodies	23 (3%)
Others	46 (6%)



source ETSI annual report 2018

Ultimately one cannot argue that ecosystems in general benefit from open standards more than from proprietary standards although both strategies have their advantages and disadvantages, and both can be beneficial in different market and industry conditions. Currently, large companies continue to experiment with both strategies. For example, IBM supports, sponsors, and develops the well-known Linux Standard Base (LSB) open standard, while it has a more protective approach with its hardware.

### 2.3. SMEs' perspective

In recent years SMEs are increasingly supportive of and interested in participating in the standards development process (open standards creation) through SDOs. Being a part of an SDO provides several advantages for SMEs, as contributors and as implementers.

As a contributor, an SME can enjoy a process which is open, transparent, impartial, and in which the best contributions are chosen based purely on their technical merits. Thus, it is not surprising that in practice SMEs succeed as much as large companies in getting their technologies adopted into the standard (in [The Role of SMEs and Startups in the Standards Development Process](#) K. Gupta shows that SMEs/startups contributions had a probability of approval of 34.42% versus a 28.91% probability if the submission is made by non-SMEs/non-startups during the period 2005-2014).



### Likelihood of acceptance for SMEs and startups vs other contributors to standards

Firm Type	Contributions	Acceptances	Likelihood of Acceptance
SMEs and startups	5,377	1,851	34.42%
Other contributors	390,651	112,925	28.91%

Source: K. Gupta, The Role of SMEs and Startups in the Standards Development Process 2010-2014

### Likelihood of acceptance for SMEs and startups vs. top other contributors

Firm Type	Contributions	Acceptances	Likelihood of Acceptance
SMEs and startups	5,377	1,851	34.42%
Top 10 other contributors	244,865	72,977	29.80%
Top 20 other contributors	310,266	91,055	29.35%

Source: K. Gupta, The Role of SMEs and Startups in the Standards Development Process 2010-2014

Notwithstanding the above, participation in the standards' setting and developing process may also involve considerable risks for SMEs that can in fact affect the ability of SMEs to enter a market. For instance, the costs associated with allocating precious resources to the development of the standard – including membership fees, travel expenses, participation fees, and the costs incurred for being physically present at meetings – can be considerable (See Le Gall F Prager M. [Participation of SMEs in Standardization](#), ETSI). Therefore, innovative SMEs usually seek investors to support the financial burden required to be involved in standardisation. An SME may also opt to be represented in the standardisation process by Small Business Standards (SBS), a European non-profit association established with the support of the European Commission. Moreover, SMEs that are interested in better understanding the benefits of European Standards and the business tools required to access the European Standardisation System are encouraged to contact the [European IPR Helpdesk](#) or the Chair or Technical Officer of a specific committee in ETSI.

As an implementer, an SME may adopt procedural and technical standards to increase efficiency internally, as well as to ensure the quality of their products and/or services by adhering to standards created. By doing so, SMEs may need to also bear costs for using patented technology incorporated in the standard, i.e. standard-essential patents (SEPs). It has been argued that even if royalties set by each SEP holder were reasonable, the cumulative royalty rate (total fees for all SEPs) would be unaffordable (so called “royalty stacking”) (see M. A. Lemley and C. Shapiro, [Patent Holdup and Royalty Stacking](#)). This would lead to companies being forced to charge higher prices to end-consumers and be faced with costly manufacturing expenses, as well as lower chance of market entry and falling innovation and functionality.

The perception of royalty stacking in this industry is greatly exaggerated, unfortunately (see G. Sidak, [Holdup, Royalty Stacking, and the Presumption of Injunctive Relief for Patent](#)

[Infringement: A Reply to Lemley and Shapiro](#)). Indeed, evidence shows that costs in the mobile wireless industry are reasonable and affordable (See K. Mallinson, [Cumulative mobile-SEP royalty payments no more than around 5% of mobile handset revenues](#), [A New Dataset on Mobile Phone Patent License Royalties](#) by A. Galetovic, S. Haber, and L. Zaretski, [What Aggregate Royalty Do Manufacturers of Mobile Phones Pay to License Standard-Essential Patents?](#) by G. Sidak). This is also reflected in the increase of performance combined with the decrease of prices in the market. Prices for mobile devices have fallen over time, with greater quantities circulating in the market and with more companies participating in the industry making it less concentrated, which implies that any company looking to manufacture devices complying with the standards does not have to face unfair fees from SEP holders (See A. Galetovic and K. Gupta, [Royalty Stacking and Standard Essential Patents: Theory and Evidence from the World Mobile Wireless Industry](#)).

Finally, any SME, whether contributor or implementer, can gain a competitive advantage through being part of a network of companies, increasing the potential to form partnerships and take advantage of “knowledge spillovers” (i.e. exchange of ideas among individuals) that could occur. Accordingly, a study conducted by ETSI in 2011, in which SMEs were surveyed and interviewed, reported that the main benefits of participation in open standards were related to increasing the company’s reputation and visibility in their respective industries, creating greater networking opportunities with both large and small companies that participated, and increasing contact with potential customers. Further, a key motivation for SMEs to participate in standardisation is understanding the overall competitive landscape and recognising emerging technology trends in their industries, rather than the potential revenue benefits of licensing and patent protection.

### **3. Benefits and risks of proprietary versus open standards for consumers**

In general, open standards ensure interoperability of systems and devices, and are beneficial for consumers by helping to ensure factors like quality, reliability, and consistency in products and services across the board (see [Standards matter to consumers How standards benefit us all, every day](#), London: BSI Group; 2017).

Proprietary standards, on the other hand, have proved market success and therefore a level of quality. While proprietary standards can provide the consumer with a certain guarantee of support and a more tailored solution, they are, however, unlikely to be transferable into other fields of application and, if left unchallenged, can bring a certain “lock-in” effect. The process of trying to transfer parts or data out of a proprietary system to make them work elsewhere can be problematic and complicated with only having the possibility of manually exporting data (e.g. transferring music/video out of an Apple system).

#### **3.1. Standards and the Internet of Things**

In the field of the Internet of Things (IoT), billions of devices from different sectors will be connected. In such an environment, open standardisation can be a great enabler and

substantially improve user experience across devices and platforms, whereas a proprietary standard will largely lead to the very opposite.

While proprietary standards do have their place, they may become increasingly obsolete and complicated to maintain in the age of the digital transformation, which is generally driven by open standards. For instance, more than 50% of all Internet users store at least part of their data in the cloud (See [Cisco. Cisco Global Cloud Index: Forecast and Methodology, 2015–2020](#)) and enable their digital services to harness that data, expecting a seamless cross-platform experience. A [study](#) conducted by Cisco forecasts that 92% of data will move into the cloud. This trend suggests that open standards are the key to making IoT work since machine to machine communication is essential for this.

In fact, open standards appear to be the key path forward for IoT as a network of interconnected devices around the world (see S. Chester and D. Liang, [An open Internet of Things for the benefit of all](#), Directions Magazine. 2016). [Evidence](#) suggests that the more devices benefit from this system, the more open standards will become essential for anyone dealing with data transfer of any kind. Consumers will reap the benefits of decreasing prices due to reduced development cost, no more required custom solutions, and a reliable support network that guarantees seamless interconnectivity across a myriad of supported devices.

In a society with such a heterogeneous array of technology, it is essential for manufacturers to develop standards together to craft the best possible experience for the consumer. The [Heterogeneous System Architecture Foundation](#) suggests that the digital device industry has already understood this shift and feels the demand of their customers for seamless interconnectivity between devices and platforms. This non-profit foundation is made up of more than 50 of the most important device and software developers in the world (Samsung, Qualcomm, AMD, Sony, and Huawei among others) and has set itself the goal of building a heterogeneous computer software system that only runs on standard programming languages to improve interconnectivity of all devices that run their software.

By pooling its resources, the industry is about to achieve a beneficial result for both the consumer and business sides by basing IoT technology on open standards and removing obsolete bricks of technology from the network, aiming to craft a more efficient solution overall, that will benefit the consumer even further in terms of speed and usability.

### 3.2. Standardisation effects on innovation

Innovation is what drives technology, which is ultimately the best tool to raise the standard of living of a population, when access to it is facilitated. Accordingly, the consumer benefits the most, when innovation is stimulated, and its results are applied to the markets sooner and more economically.

Despite complaints that open standards are slow and that SEPs can be (mis)used to hold-up implementers, thus harming innovation, the opposite effects have been observed in multiple

industries. Standards in the ICT industry have connected more than 5 billion unique subscribers (see [GSMA Intelligence](#)) at decreasing prices. The average mobile subscriber cost per megabyte also decreased by 99 per cent between 2005 and 2013, while data-transmission speeds increased by a factor of 12,000 when comparing 2G and 4G technology (see The Boston Consulting Group, [“The Mobile Revolution”](#), January 2015).

Further, one should not overlook the fact that some technological platforms, like LTE would have been impossible to develop without the open contributions from different researchers to the standard, as they are simply too complex (see M. K. Ohlhausen [former FTC Acting Chair], [Patent Rights in a Climate of IPRs skepticism](#), Harvard Journal of Law & Technology Volume 30, Number 1 Fall 2016). For example, to develop the 3G and 4G/LTE standards companies submitted 262,773 technical contributions, out of which less than 17% were selected to be part of the standards (see Signals Research Group, [The Essential of IP, from 3G through LTE Release 12](#), and C. Tapia, [Securing a competitive future in Europe](#), The Patent Lawyer).

Therefore, it seems reasonable to say that open standards can be especially useful when tackling large, complex problems. Moreover, pro-competitive effects generally overcome negative effects. As [the European Commission recognises](#), standards bring:

"[1] improved market access as a result of increased competitiveness and efficiency, reduced trading costs, simplified contractual agreements, and increased quality;

[2] better relations with suppliers and clients derived from the improved safety of consumers;

[3] an immense value for the competitiveness of enterprises working in transport, machinery, electro-technical products, or telecommunications;

[4] easier introduction of innovative products provided by interoperability between new and existing products, services, and processes – for example in the field of eco-design, smart grids, energy efficiency of buildings, nanotechnologies, security, and eMobility; and,

[5] in general help to bridge the gap between research and marketable products or services".

#### **4. Conclusion**

A strong trend towards open standards across many technologies can be observed. Certainly, open standards appear to be the more beneficial approach in the long run. While large companies can still derive benefits from proprietary approaches due to their market success and the control they can exercise through a closed system, embracing open standards ties in directly with embracing open innovation and utilising global knowledge, which is of ever-increasing importance. The effect of open standards on companies' R&D budgeting is also not to be underestimated, since the move towards an open standards society effectively exercises economies of scale on R&D by spreading the cost across multiple companies. For SMEs, the increase in the application of open standard approaches comes mostly as a blessing, letting them

participate in large knowledge pools, and benefit from the resources of other players. Thanks to the FRAND assurance, SMEs get access in exchange for reasonable terms and conditions, while having equal chance to compete as innovators with large companies; who are entitled to be reasonably compensated for the patented technology they are contributing to the standard. The fair return on investment fosters in turn further R&D investment in the next generation of the standard.

Further, interoperability is improved by open standards, benefiting the consumer market, which only profits from standardised networks within an industry, especially in ICT. The more players collaborate on an open standard basis, the less compatibility issues will arise between different devices and networks, making an unhindered flow of data between platforms a reality. This is also essential for the successful implementation of IoT across the industry as well as the consumer market. Standardised and open developing approaches will make it much easier to make the large network of heterogeneous devices that exist now function as one, leading industry and consumers to a shared win-win situation. The consumers will enjoy the increased efficiency and speed that standardised and compatible networks offer, while the industry will use these networks for an improved production process, more efficient knowledge pooling, and an accelerated time to market, due to faster and more accessible data.

Open Standards	Proprietary Standards
Open and transparent collaboration amongst 100s/1000s of companies/individuals.	Developed and controlled by one company or more rarely a small group.
Contribution driven, consensus based. Only the best technical solution is chosen – generally leveraging 100s of competing technical contributions. May take years to be finalised and in consumers’ hands.	Under the control of one company that may quickly define, test and commercialise the solution.
Companies deploying open standards-based products generally have a long-term strategy.	Good to educate the market and test use cases with users in the short term.
Ensure interoperability, efficiency and ease of communication between electronic devices from a broad diversity of manufacturers.	Closed systems. Lock-in effect. No obligation to interoperate with other solutions.
Enable an increase of performance combined with the decrease of prices in the market. Create a very competitive environment.	‘Winner takes all’ when the technology has achieved critical market success to become an ‘unavoidable’ technology. The controlling company decides everything.
Inclusive system allowing anyone to: <ul style="list-style-type: none"> <li>- Contribute to the development of the standards</li> <li>- Access the standards</li> <li>- Get access to the standards in exchange for reasonable terms and conditions – even if they have not contributed to its development</li> </ul>	Exclusive use of the developed technology.

## **Action Plan**

- Through open standards an SME and/or a large company can enjoy a process which is open, transparent, impartial, and in which the best contributions are chosen based purely on their technical merits.
- As an implementer, an SME may adopt procedural and technical standards to increase efficiency internally, as well as to ensure the quality of their products and/or services by adhering to the standards created.
- An SME may benefit from help and incentives from European Commission's funded organizations to participate to open standards.
- Depending on the required timing, an SME and/or a large company may decide to develop quickly their own proprietary standards and in parallel to participate to open standards with a more long-term strategy.
- An SME and/or a large company contributing to open standards should be able to get a fair return on its R&D investment through the Fair, Reasonable and Non-Discriminatory commitment.
- Thanks to the FRAND commitment, SMEs get access to technologies in exchange for reasonable terms and conditions, while having equal chance to compete as innovators with large companies.