Journal of Intellectual Property Rights
Vol 22, May 2017, pp. 121-135

Standard Essential Patents (SEP's) - Issues & Challenges in Developing Economies

Ankita Tyagi[a] and Sheetal Chopra[b†]

[a]European Business Technology Centre (EBTC), New Delhi, India
[b]Ericsson India Private Ltd., Ericsson Forum, DLF Cyberciti, Sector 25A, Gurgaon, Haryana, India

Received 22 January 2017; accepted 4 May 2017

Intellectual property rights (IPRs) in standards have proven to be an intensively debated issue nowadays. Although standards are meant to offer 'access' to technology and patents grant the possibility to 'exclude' others (exclusivity rights), both aim to promote innovation. The "return on investment" (ROI) from the patented technology selected to become part of a standard is the motor that fuels the development and implementation of standards. When aiming to solve highly complex technology problems the effort of many companies in sharing the technology resulting from large R&D investments is necessary. It is not surprising that, before sharing with others, such technical solutions are protected by patents. Thus, in the information communication technology (ICT) area the phenomenon of patents in standards is the general rule. Indeed, connecting millions of devices with each other (interoperability) and making them work properly (high performance) can only be achieved when the best technologies out of thousands of contributed technical solutions are selected. Considering some of the most celebrated Government of India's initiatives such as Internet of Things, Start Up India, Make in India, Digital India etc. calls for an effective IPR regime that incentivizes development of standardized technologies and encourages indigenous local manufacturing of innovative standardized devices. This will go a long way in reducing India's net import reliance, enhancing value addition, creating IP, generating employment, increasing domestic patent footprint, reducing cash outflow due to Bill of Materials (BOM), etc.

With this view, the present paper analyses the concept of Standard Essential Patents (SEPs) and related issues to mobile technology that are deliberated at various forums. It summarizes some important aspects that arise when dealing with SEPs. The linkage of standards and patents has also been studied. The paper examines the patent landscape and offers analysis of existing and anticipated patent holdings. It also outlines the evolution of key technologies and provides comparative analysis of key patents. The paper brings light to some notable circumstances likely to influence the mobile patent landscape for the next several years and gives some recommendations for facilitating India's growth story in creation, protection, and wider adoption of technology.

Keywords: Standard Essential Patent, IPR, mobile technology, litigations, licensing, cross licensing, FRAND, non-discriminatory, injunction

Intellectual property has been an integral part of the economic engine of the western world for many decades. Knowledge based economies of today's world have created an ecosystem which essentially must compete on creation, funding, execution, and protection of the new ideas in the form of Intellectual Property Rights (IPRs).

The value of standardization has been felt increasingly as it ensures that devices talk to each other (i.e. interoperate) while enabling that standardized products and services perform with greater efficiency. A standard is a set of technical specifications which provides a set of rules, guidelines or characteristics for a materials, products, processes and services[1] to interoperate. In simple words, if devices want to 'talk' to each other, they must speak 'the same language'; standards create that language. Interoperability is the key component which results in setting of a standard. Once interoperability is set, all future steps are focused on obtaining a better performance. This is the moment were the standard is developed. Standards are important in many areas of economic life and generally increase efficiency and reduce costs associated with the provision of a wide variety of products and services.[2] Consumer demand has grown exponentially for standardized devices. India has been a key beneficiary of standardization and formally showed its commitment to follow global standards by launching the Telecom Standards Development Institute of India (TSDSI) in 2013.

†Corresponding Author: Email: sheetal79chopra@yahoo.co.in
The views expressed in the paper are that of author's own and does not necessarily reflect views of organizations to which authors are employed by and affiliated to.

Therefore, the value of technologies that contributes in performance of standards cannot be underestimated. Various companies are intensively involved in developing standardized technologies and regularly participate in working of Standard Development Organizations (SDOs)[3] where technology is selected purely on 'technical merit' and 'Consensus'. Development of such standardized technologies is highly R&D intensive. In 3GPP, a global initiative that unites seven SDOs, 262,773 technical contributions were submitted in order to deal with the technical problems in 3G and LTE. From those only 28,460 were approved for the standard. Such tremendous effort needs to be compensated.

Patents offer an important asset for companies to ensure a return on investment (ROI), and those patents covering technologies adopted in the standard are called Standard Essential Patents which are assured on FRAND (Fair, Reasonable, and Non-discriminatory) licensing terms and conditions.

Patents, are exclusive rights granted by a sovereign state to an inventor or their assignee for a limited period existence of a patent on a technology conveys the statutory right granted by the government to the inventor and to other persons deriving their rights from the inventor for a fixed period of years, in exchange for the public disclosure of an invention, and act as incentives to innovate. Such rights exclude other persons from manufacturing, using or selling a patented product, or from utilizing a patented method or process,[4] but in no way guarantees economic power in the marketplace.[5] It is to be noted that FRAND accessible patents (also known as Standard Essential Patents) have made it possible for India to witness a tremendous growth of mobile companies of Indian origin such as Micromax, Intex, Lava, iball etc.

Mobile Technology

Mobile devices are playing the role of connecting society and are one of the important technologies in ICT domain. Mobile phones have become ubiquitous devices that have empowered the consumers and serve an important function of providing "Information" (Jankari), "communication" (Soochna) and Entertainment" (Manoranjan). Mobility Industry has shown positive impact on a consumer's behavior besides evolution of societies and cultures over time. As a result, there has been a big influx of investment and innovation over the decade.

Another interesting fact is that the number of patents related to mobile technology and granted byUnited States Patent and Trademark Office(USPTO) and European Patent Office (EPO) grew by 440% and 71% respectively.[6]

Despite the fact that some technologies have been kept proprietary, these figuresshowthat companies are intensively involved in R&D to develop the best of mobile related technologies enabling standardization. It has been estimated that mobile technology sector will invest close to 4 trillion USD by 2020.[7]

Standards, Standardization Efforts & The Impact of Standards on Indian Economy

What are Standards

The International Organization for Standardization (ISO)[8] defines a formal standard as "*a document,*

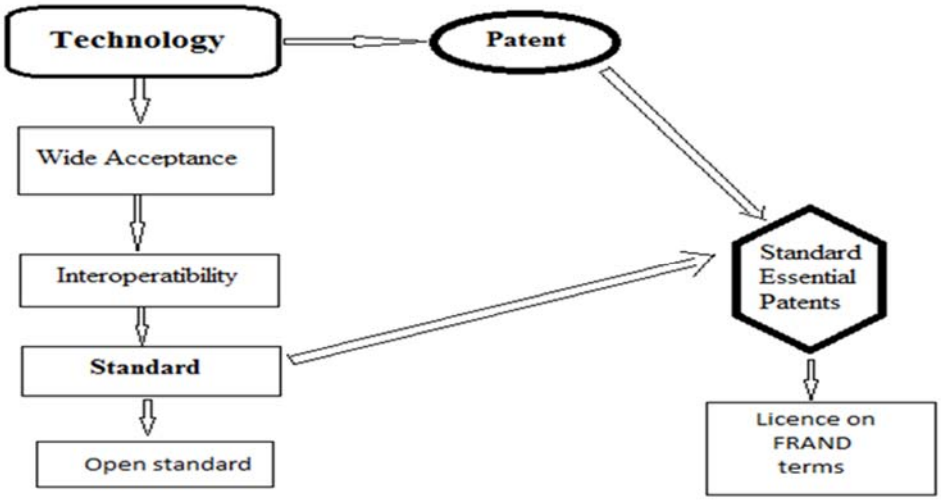

Fig. 1 — Flowchart showing the evolution of SEP

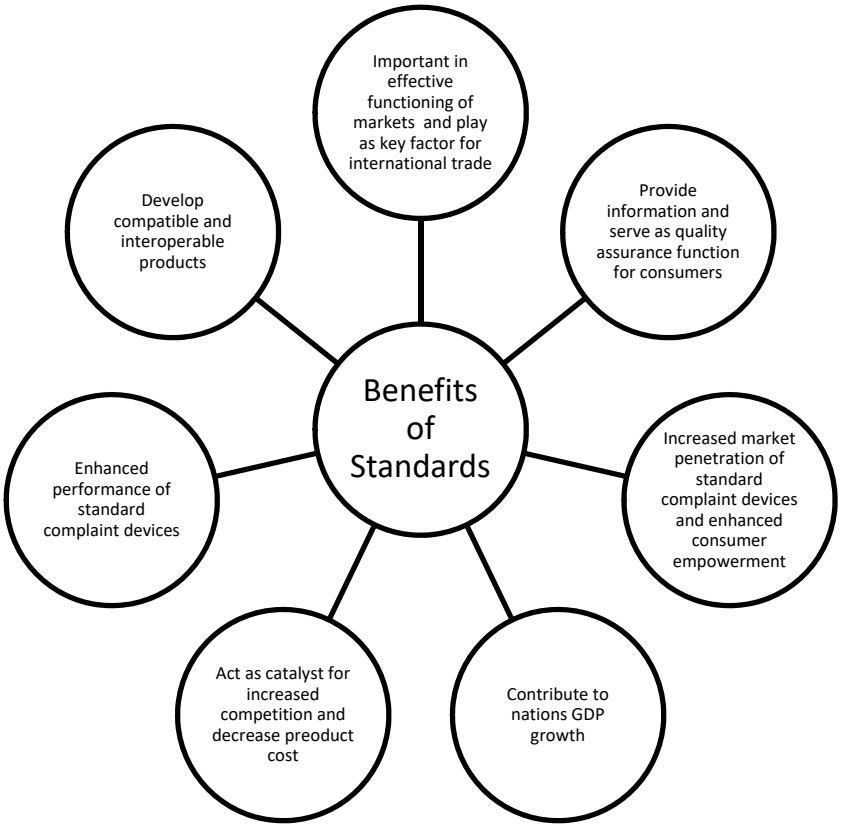

Fig. 2 — Importance of standards

established by a consensus of subject matter experts and approved by a recognized body that provides guidance on the design, use or performance of materials, products, processes, services, systems or persons". A standard, therefore, is generally a set of characteristics or qualities that describes features of a product, process, service, interface or material.

"Interoperability is the key component which results in development of the standard". A "standard" is a "set of technical specifications which either does, or is intended to, provide a common design for a product or process."

Standards benefit the market by:

- Encouraging compatibility among rival firms' products
- Promoting interoperability across competing devices
- Lowering the costs of products for consumers

Standards can be established in several ways:

i) Industry may agree upon them
ii) Government may impose them
iii) The market may determine them

The standards can be implemented in two ways:

- De-facto Standards: occur when some companies imitate the conduct of others. standards arise spontaneously by the degree of market penetration of a particular technical solution. Generally, there is no competing standard available for de facto standards. DVD fast forward button, Windows operating system, QWERTY system of letters in typewriters and other devices, Android represent some examples of de facto standards.
- Technical or de jure standards: A standards development organization (SDO) (also known as standards organization, standards body, or standards setting organization (SSO)) is an organization whose primary activities are developing, coordinating, promulgating, revising, amending, reissuing, interpreting, or otherwise producing technical standards that are

intended to address the needs of some relatively wide base of affected adopters. It is an industry group that sets a common standard for industry to ensure compatibility, interoperability and high performance of devices manufactured by different entities. Thus, for example, in India, the Bureau of Indian Standards (BIS) is the national standards body; in the USA, the American National Standards Institute (ANSI) is the official body; while in the United Kingdom, it is the British Standards Institute (BSI). To be internationally acceptable a standard has to be either set or adopted by an SDO that is recognized as an international standard-development body. Organizationsin ICT having the highest international recognition are:

a) 3GPP–3rd Generation Public Partnership Project
b) ITU–International Telecommunication Union
c) ETSI–European Telecommunications Standards Institute
d) IEC–International Electrotechnical Standards
e) IEEE–The Institute of Electricals and Electronics Engineers Standards Association
f) ISO–International Organization for Standards

3GPP is a highly recognized source for mobile and core networks standardization. ITU standardizes the basic aspects regarding Telecommunication systems. Important is the regulation on international radio spectrum frequency allocation in relation to mobile communication. IEC is applicable for the equipment manufacturers at it standardizes issues that are required for international trade of equipment. ISO is important for the Telco's as it provides recommendations (and control systems) for Quality, Security, Safety, environmental protection etc.

The relevant standard developed by a SDO gives birth to a body inclusive of essential features that must be fulfilled by any device to be in conformity with a standard. When a device is found to be in conformity with a standard it is allowed to bear a mark to indicate to the public that the product is compliant with the set standards. Therefore, to produce a standard compliant device, access to certain patents is required.

Members of an SDO are typically organizations that operate with support of the industry. SDOs usually have established procedures following the WTO criteria[9] by which they choose a technological path for a standard. SDOs ensure that the technology does not get locked up and that consumers can benefit as much as possible from standard-development activity. For that purpose, they created in their policies the FRAND commitment.

To promote application of the standard and to avoid any competition concerns, the patentee signs a voluntary declaration to make its patents essential to the standard accessible on FRAND terms and conditions.[10]

Standard Essential Patents

Standard Essential Patents are patent that claim technologies required to perform givenstandards.[11] In other words, if the standard cannot be implemented without practicing (infringing) the claims of a patent, the patent is said to be a Standard Essential Patent.

To implement an industry standard, SDO's will require committee members to disclose any known patents that relate to the work of that committee and to agree to license those essential patents they own on FRAND terms. While FRAND terms ensure that technology is not locked up and is widely available, the fact that the patented technology is open/available to all does not mean that the patent holder is obliged to license to each entity in a value chain. The usual practice is to license the end user device, since at End User Device (EUD) level the value of technology is most felt. Further, Standard Essential Patent Owners are under the contractual obligation with SDOs such as ETSI to offer licenses at Equipment level.[12]

In licensing, FRAND terms refer to the obligation that is often required by SDOs for members which participate in the standard development process. As yet, there is no court judgment that has defined the term 'FRAND" possibly because the terms & conditions are case-specific.

Standardization Lowers Barriers to Market Entry

Companies contribute to the standard specifications, and the "blessing" is the availability of detailed descriptions of high-performing technology in the specifications. This offers an excellent opportunity for implementers to set up their businesses. Information regarding various meetings, minutes, registered delegates, specifications are all widely, freely, and openly accessible.[13] This reflects the fact that Standard Developmentat 3GPPis a very transparent process which offers opportunity to various businesses who are users of technological development/enhancement. One

can witness that various specifications are extremely detailed in their nature and they run into hundreds of pages (average 500 pages long).[14]

From 3GPP standardization work alone it is evident that investment is enormous by contributing companies. Within 3GPP, there are standards developed for each generation (2G,3G, 4G etc). There are three Technical Specification Groups (TSGs)[15] where each has multiple working groups (16 WGs)[16] who develop various Technical Specifications/Technical Reports (TS/TRs) for 2G, 3G and 4G. Many of TS/TRs are relevant to handsets while other specifications and reports need to be followed by infrastructure vendors.

Together, they define a whole ecosystem that enables a telecom ecosystem to work effectively. Each such technical specification has multiple releases, each one of which is openly and widely available.[15] Until January 2017,3GPPP work has led to creation of approximately 2731 TS/TRs.

Each Technical Specification/Technical Report (TS/TR) has many releases[23] each of which runs into on an average of 500-600 pages. Thus, the specifications run into 10 of thousands of pages. There are an immense number of working hours spent in creating/writing these technical contributions. It is important to notethat the hours spent at meetings are just a minor fraction of all hourly investments in developing the solutions that are discussed and vetted at those meetings.

The Development of Standardized Technologies: Risky and Cost Intensive

Standardization is a complex and a multistep process that takes place at SDOs. Multiple companies and multiple countries participate to develop technologies that can solve a technical problem. The selection of technology that can form part of a standard is based on technical merit and consensus. The Table 2 shows the person working hours invested in developing standardized technologies.

As per the Table 2 above, 3 million man working hours, 462 man working hours and 38.5 man working years were spent in meetings alone in developing 2G, 3G and 4G standards let alone the immense time and effort spent in actual R&D, pre and post meeting preparations. It is estimated that approximately 1600 man years is the time spent in 3GPP.[25] There is tremendous amount of time that is spent in preparing for the meetings (around 10 days in advance preparing for meetings and 3-5 weeks post the meetings are usually spent in preparation and writing contributions etc.). In case of 4G alone more than 7000+ technological solutions were proposed but 25% of these could form part of the standard.[26] Similarly, at 3GPP for 3G and 4G more than 260,000 technical contributions were made but less than 17% were accepted.[27] This supports the fact that probability of success is too low as it is uncertain whether the

Table 1 — Creation of TS/TRs through 3GPPP

TSG RAN (Radio Access Network) Approx.		TSG SA (Systems and Networks) Approx.		TSG CT (Core Networks & Terminals Approx.	
RAN WG 1	83[20] TS/TRs	SA WG 1	210-TS/TRs	CT WG 1	185 TS/TRs
RAN WG 2	75[21] TS/TRs	SA WG 2	176-TS/TRs	CT WG 2	87 TS/TRs
RAN WG 3	117[22] TS/TRs	SA WG 3	150-TS/TRs	CT WG 3	212 TS/TRs
RAN WG 4	206 TS/TRs	SA WG 4	208- TS/TRs	CT WG 4	57 TS/TRs
RAN WG 5	50 TS/TRs	SA WG 5	379-TS/TRs		
RAN WG 6	157 TS/TRs	SA WG 6	9- TS/TRs		
Total	688 TS/TRs		1502 TS/TRs		541 TS/TRs
Total			2731 TS/TRs		

Table 2 — Person working hours invested in developing standardized technologies[24]

S No.	Technology Standard	Countries participating	Companies participating	Total Man Working Hours (MWH) invested in meetings alone	Total Man Years Invested in meetings alone
1.	2G	13	200	86600	15
2.	3G	39	300	95000	11
3.	4G	43	320	10,00,000	9
4.	4G (One Feature: Device to Device Communication Standard)	-	400+ (only 14 specifications formed part of release 11 out of out of 492 presented)	2,00,000	3.5years
Total		40+ counties participated	400+ companies	3,016,000 (3Mn MWH)	38.4 MWY 462MWM (Man working months)

Table 3—Contributions, yearly total, 2009-Q3 2015 (Sources- ABI research)

Industry Paper	2009	2010	2011	2012	2013	2014	Q3 2015	Total	Rank
Ericsson	2347	2002	1853	2563	2411	3120	2621	16917	1
Huawei	1980	2047	1938	2620	2533	2961	2626	16705	2
Qualcomm	1578	1123	938	1092	1266	1517	1190	8704	3
ALU	1102	1399	1227	1232	1233	1309	961	8463	4
Nokia Networks	1068	1155	1133	1142	959	1296	1284	8037	5
ZTE	971	1142	1196	1060	941	1015	858	7183	6
Samsung	818	1061	800	1013	966	1241	978	6877	7
LGE	614	755	604	667	730	926	881	5177	8
CATT	822	807	634	672	728	761	638	5062	9

technological contribution made will ever be able to form part of any standard.

Furthermore, the standard is continually improved as more functionality is added in several phases over time. While a given release of a standard is officially "frozen" every year, the standard is typically continually developed so that new functionality is added in each new release. For example, comparing the first release of GSM in 1990 with the first release of EDGE in 1999, it is clear that EDGE-compliant products have much greater functionality than the early GSM products. The early GSM products essentially supported only voice, particularly in terms of data transmission capabilities. Similar developments can be seen in the move from the 3G to 4G standard. Although complex, this approach has proven over the years to work well, as exemplified by the achievements of ETSI and later 3GPP. Indeed, 23 years after its first launch, GSM is still the world's most used mobile telecommunications standard.

It is important to realize that the vast majority of R&D does not result in successful technical solutions that are ultimately selected and adopted in standards. For instance, there may be five technical proposals submitted by five different innovator companies competing for selection into standards. This competitive process is very efficient in pushing innovation to its limits and in ensuring that the proposal that is technically best suited for the standard succeeds.

However, this also means that contributors to the SDOs may invest in R&D efforts that are not implemented in the standard. Therefore, participation in SDOs can be a risky endeavour as the sunk cost is not always recoverable. Additionally, incorporation of a technology into a standard does not guarantee or automatically lead to commercial success as there may be competing standards developed in parallel by different SDOs. A recent example are the two contenders for the global 4G standard. IEEE developed WiMax, while 3GPP, in parallel, developed the LTE standard. The de facto 4G standard adopted by virtually all operators globally today is 3GPP's LTE.[28]

In this dynamic environment, important ongoing R&D (i.e., and associated patenting) is carried out in parallel to the standardization process itself. Whenever a patented solution is adopted into an SSO or SDO designated standard, the patent is said to be a SEP. A SEP is thus necessarily infringed by a product that is compliant with the standard.

India -A Key beneficiary of Standardization

Thanks to standardization, India could accord itself as 2nd Largest in the world in terms of mobile telephony market and 4th largest across Asian market in terms of mobile infrastructure.[29] Further, India has recorded 1 billion subscriptions because of huge demand from consumers for standardized devices. Complex Standardized technologies developed after intensive R&D and tremendous human hours & labor, have spurred competition witnessing entry and growth of Indian device manufacturers. ICT Industry builds positive change in the Society; for every 1000 broadband connections, 80 jobs are created.[30] There are more than 1 billion mobile phone users in India, and it is expected that mobile subscription base will reach 2.4 billion by 2020 resulting in 100% population penetration. Telecom Regulatory Authority of India (TRAI) is envisaging close to 600 mn broadband connections by 2020 at a speed of 2MBps.[31] That will lead to generating new jobs close to 48mn[32] by 2020.

Further, another study shows that 1% increase in broadband penetration directly increases new business registration by close to 3.8%.[33] According to study by British Standards, the standards could contribute 0.3 – 0.9% to the GDP.

Standardization Efforts strengthens Competition

Several statistics are available which indicate patent portfolios of companies that are intensively

involved in standardization process. The contributors of the technologies voluntarily agree to declare their patents they believe are or may become essential to the standard and make them available on FRAND terms and conditions.[34] The mobile industry landscape report[35] has looked at over 7 million patents granted in the US and Europe. The study revealed few very interesting facts that the Multiplex Communications category saw the highest jump in patent filings in 2013 which is possibly because of most R&D activities directed towards LTE/LTE-A space. Further there is shift from devices/access to services/solutions. Table 3[36] lists companies that are major contributors in mobile communication technologies.

As one can find from above, there are handful of companies that are investing huge funds in R&D in developing standards. A standard, once developed, offers valuable opportunity to various businesses to set up manufacturing of standardized devices that invariably has larger public demand. In the late 90's 85% of the GSM market (basis for our connectivity) belonged to Ericsson, Nokia, Siemens, Motorola and Alcatel.[37] Today, globally there are more than 300 handset manufacturers[38] who are benefitting from standardized technologies enabling their businesses to make huge profits. According to Credit Suisse, handset manufacturer operating profits tripled, between 2007 and 2013, reaching U.S. $51 billion.[39]

The value of essential patents directly flows to the implementers/manufacturers as they are able to use the technologies, developed by essential patent holders, which drives the consumer demand for their devices. Improvements on existing standards are important to further the objectives of "Digital India" and "Make in India" programme enabling SME and Start Up Sector to make use of such technological revolution. For handful of technology providers to continue to make efforts in developing standardized technologies, it is important that they are reasonably remunerated during the available commercial window. India needs to address the challenge of developing a conducive IPR regime that fosters innovation, reward and recognition by making appropriate changes at policy level that convers "unwilling licensees" to "wiling licensees".

***Patent Hold Out* v *Patent Hold Up:*Reality?**

The Hold-Up Problem

As several companies, have contributed technology to create the telecom standards, there are also several holders of essential patents. A smartphone may typically cover technologies covered in close to 2,50,000 active patents[40] owned by few technology companies. Indian handset manufacturers are concerned that such a situation may lead them to pay to each such holder of essential IP (theoretical situation of a "stacking" of royalties, or Stack). [41] Indian handset manufacturing sector is primarily a net importer of the handsets whereby the value addition is less than 6% in India because handsets are only assembled here.[42] They are also strongly advocating that the royalties be paid at the component level and in the country where these are manufactured (exporting country) and not where these are sold (i.e. India). It is important to mention that patent holders considerably understand that the aggregate needs to be reasonable and their proportional share of such aggregate royalty paid when complying with their FRAND commitments. An aggregate cannot be set in advance, but market forces will drive aggregated royalties to a reasonable level. The global aggregate royalty rate for mobile handsets has been reasonable as testified by growing competition. Under FRAND, a technology provider should be paid on a reasonable basis regarding the contribution that their patented standardized technology is making to the product. Hold -up is a situation where the patent holder after adoption of the standard uses the possible high switching costs resulting from an injunctive relief if granted to extract excessive royalty fees or setting cross-license terms which the licensee would not otherwise agree to. However, there are many experts[43] who have asserted effectively that hold-up does not exist in reality.

Remedies to avoid or mitigate a potential hold -up problem provided by the SDOs include:

- Disclosure in the form of revealing all patents that are or may be essential to the standard and usually extend to patent applications.
- FRAND commitment
- No automatic injunction but no automatic rejection to injunction to ensure both parties behave in good faith

A larger question is whether hold -up really occurs in practice or is it a myth being spread by unwilling licensees. In this regard, Anne Lynne Farrarpointed out"despite 15 years proponents of the theories have had to amass evidence, the empirical studies conducted thus far have not shown that holdup or royalty stacking is a common problem in practice".[44] As the US International Trade Commission (ITC) explained "

while there may be a hypothetical risk of hold-up, we have evidence that it is not a threat in this case, or in this industry" (referring to the cellular industry).[45] The evidence shows indeed just the opposite: according to Galetovic et seq the industries have experienced more rapid price declines than any other industrybecause of standardization.[46]

Further research carried out by Boston Consulting Group shows that the average mobile subscriber cost per megabyte has come down by more than 99% and also the network infrastructure cost has come down by more than 95% from 2G to 3G and by more than 67% from 3G to 4G.[47]

The Reverse Hold-Up Problem (Hold – Out)

Any device that incorporates standardized technologies is bound to infringe on the standard essential patents. As return for making its standardized technology open to everyone the patent holder needs a Return on Investment (ROI). Conflict arises when companies infringing a standardized technology avoid engaging in good faith negotiations and successfully apply delay tactics, benefiting from weak IPR protection (i.e. no or low chances of patent holders to obtain an injunction or exclusion order against an implementer even when the latter has rejected a FRAND offer), creating a hold-out problem.

In *Huawei* v *ZTE* [48] case the highest Court in Europe, i.e. the Court of Justice of the European Union (CJEU) has recently established certain guidelines that each party (patent holder and alleged infringer) must follow in order to show good faith, thus endorsing the view that FRAND is a two-way street":

The standard essential patent holder must:

1. Inform the alleged infringer of the infringement
2. Specify in which way the standard essential patent/s has/have been infringed
3. Present written offer for a license on FRAND terms (if alleged infringer has expressed its willingness to conclude a licensing agreement on FRAND terms specifying (a) the amount of the royalty and (b) the way in which that royalty is to be calculated

The alleged infringer to avoid injunction must:

1. Respond to patent holder offer (in good faith, without delaying tactics).
2. If disagree with the offer, submit promptly and in writing, a counter-offer that corresponds to FRAND terms
3. If counter-offer is rejected provide appropriate security (bank guarantee or deposit) for the number of the past acts of use of the standard essential patent/s
4. must be able to render an account in respect of those acts of use

In the case it is proven that the licensee is "unwilling", then the essential patent holder is entitled to seek (and obtain) injunction as a remedy.[49] After this CJEU ruling, no intervention by antitrust authorities or regulation is needed, as parties have enough guidelines to negotiate FRAND in good faith, and if disagreement occurs, courts (or if parties agree arbitration panels) are well-equipped to apply the CJEU guidelines to the specific circumstances of each particular case.

Litigation

In order to assure future access to the standard while assuring adequate compensation to those who contribute their proprietary technology into it, many SDOs request patent owners to submit a form, sometimes called a Letter of Assurance (LOA), that indicates their future intentions related to their standard essential patents. In almost all SDOs around the world, such LOAs indicate patent owners licensing intentions without delving into the commercial terms of what may be "reasonable". Instead, FRAND terms are left to the parties to negotiate so that it is flexible enough to take into consideration the specific circumstances, terms and conditions of the parties on case to case basis. There cannot be a "One Size Fit All" since licensing must take into consideration facts of each case. The only exception to this rule to date has been in the recent change of the IEEE IPR policy, a change undertaken in possible violation of the WTO due process requirements regarding openness, lack of dominance, balance, notification, considerations of views and objections, and consensus vote requirements. As a result of this drastic deviation from the FRAND regime as it is known elsewhere in the world, IEEE has experienced a delay of technical standardization work and a growing uncertainty as major contributors are no longer willing to submit letters of assurance under the new policy.[50] Thus, this approach evidently breaks down standardization. As per WIPR, ETSI Secretariat has concluded that IEEE policy is no longer compatible with its own.[51]

To justify the drastic measures incorporated in the new IEEE some interested groups often mention the hold-up theory and argue that royalty sought by the patent owner(s) is too high as a result of royalty stacking.

However, such a statement is not supported by any empirical evidence. Layne-Farrar debunks the theory of royalty stacking and proves that royalty staking does not exist.[52] Further a report by Keith Mallison,[53] clearly establishes that the "Cumulative Mobile SEP-royalty payments as no more than around 5% of mobile handset revenues". Courts also acknowledge that royalty stacking is a theoretical issue. The U.S. District Court for the Eastern District of Texas for example. stated that "the best word to describe Defendants' royalty stacking argument is theoretical. (…) given the opportunity to present evidence of an actual stack (…) Defendants came up empty". The Court continued by stating that the Defendants' expert "never identified an actual royalty stack".

Using hold-up and royalty stacking theories, some patentees are confronted with the following:

- Implementer does not negotiate in good faith
- Implementer refuses to pay or forces signing of agreement to pay below FRAND rates
- Implementer exhausts the patentee by refusing to pay until each patent in a large portfolio is challenged and proven with regard to validity, essentiality and enforcement.

The key determinants of litigation are

- Entities also go for litigation to establish a case law that can serve as a precedent and offers much needed clarity on the interpretation of particular provision of a law
- To protect the patent rights against infringement acts
- To challenge validity of patents

Royalty Calculation for Standard Essential Patents

Basing royalty at a level (downstream product) where value of technology is most felt has been the industry usual practice. One of the reasons for doing so is that the value added by the standardized technology to the final product will not be the same in each case; for instance, the same 3G, LTE or Wi-Fi standard can be used in a phone, a tablet, a smart meter, a laptop or even a "connected" car but may offer different value to the end user. For example, in a smart meter, it is only occasionally that communication technology will be used to send data to consumer. In a gap of 15 days or so, the meter has to send a message to consumer with regard to consumption etc, but such a latency cannot be absolutely afforded in case of a mobile phone where a doctor is remotely offering support to another doctor over a surgery or a connected car that needs to send signal to healthcare center to send a quick help in case of an accident. Similarly, a 3G technology in a phone can offer far more uses to consumer (such as uploading photos, browsing internet, use various applications such as instant messaging serviceand so on. However, it will offer completely different value to a farmer who has put 3G technology in a probe that is put under the earth many miles down and provides data such as soil health, humidity conditions at different intervals. Similarly, a 4G connectivity that provides higher speed and least latency allows consumers to effectively use a camera, click their selfies or take photos, upload them on instagram or share them with their friends while in case of automotive the use-cases of such a communication technology will be completely different such as remote servicing of a car, connecting to healthcare centre in case of a car breakdown and so on.

In *Lucent* v *Gateway*, the U.S. Court of Appeals for the Federal Circuit (Federal Circuit), the U.S. Court with nationwide exclusive jurisdiction over patent appeals, clarified that, "*the base used in a running royalty calculation can always be the value of the entire commercial embodiment, as long as the magnitude of the rate is within an acceptable range (as determined by the evidence). Thus, even when the patented invention is a small component of a much larger commercial product, awarding a reasonable royalty based on either sale price or number of units sold can be economically justified*".[54] Further, one can easily witness by reviewing various specifications that it defines the UE (User Equipment) behavior. i.e. the standard describes how the handset (UE) should work[55] and not how some chip should be operated or designed. It is important to note that ETSI IPR Policy[56] also guides licensing at "Equipment level", whereby a standard Essential patent owner is contractually bound by ETSI rules/policy. Any deviation from "Equipment" as a royalty base would amount to contractual violation. India's standards body, Telecom Standards Development Institute of India (TSDSI) is also a member of ETSI.[57]

However, in a bid to obviate or substantially lower down royalty payments implementers have been advocating for using as basis for determininh FRAND the Smallest Salable Patent-Practicing Unit (SSPPU), which, for example, in a smartphone could be a chip set cost which would certainly not reflect the contribution made by patented technology. It is unfair

for licensees who charge consumers based on the value that technology brings to them to thenonly be willing to accept a royalty amount based on the cost of a chip. From various licensing agreements, while deciding on the net pay royalty pay out, various costs such as transportation, taxes, accessories, diamond etc. are deducted. The component costs merely reflect the cost of making a piece of hardware; not the value of the patented technology to its user, i.e., its utility to the person using the technology. Thus, in *Commonwealth Scientific and Industrial Research Organisation*v *Cisco,* the Federal Circuit held that *"[a] rule . . . requir[ing] all damages models to begin with the smallest salable patent-practicing unit—is untenable*."[58] This is because, while the invention in a multicomponent device is carried out, for example, at the wireless chip level, "*[the SEP holder] did not invent a wireless chip*."[59] Rather, the Court explained*"[t]he benefit of the patent lies in the idea, not in the small amount of silicon that happens to be where that idea is physically implemented."*

Economic value of IP is best felt at the consumer level, i.e. the amount that a consumer is willing to pay for the product consisting of IP goods. The value of the standardized technology is not reflected by the value of a component used to make a standardized UE. The component costs only reflect the cost of making a piece of hardware (with R&D cost only for the manufacture and creation of the component). There are parallel examples that can help to make this point further. The value of a painting is not judged on the basis of the costs of the paint and brush but on the basis what a painter chooses to do with that paint and brush. The tube of paint has a market value that is different than the value that the artist can create with the paint, which can vary from artist to artist; differently-skilled artists can create differently-valued paintings from fungible tubes of paint. Likewise, the price of a film is not set by reference to the price of the DVD on which the images are stored. Indeed, the manufacturing cost of a DVD has no relation to the cost of making the film, which includes production, direction, screenplay, music, acting etc. It is the value of the IP to the end product that is important. The value to the end user is not limited to the DVD but rather is essentially driven by the content that is contained by it. The price of a book is not set by pure reference to the price of the paper and ink that was used to make it but rather to the intellectual work that was required to create the story. End users do generally not buy the book for its paper and ink but rather because of the intellectual creation that is contained in it, i.e. the story. The story gives value to the paper and ink. Finally, the price of a medicine is not set by mere reference to the production cost of the pill but rather to the intellectual property that was created via R&D investments. End users would not buy the pill for the pure ingredients; these ingredients need to have a health effect that has been proven and sufficiently tested.

The statutory rule, which must ultimately guide courts in determining patent infringement damages, is set forth in 35 U.S.C. § 284: "*the Court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer." As that rule has been interpreted by the Federal Circuit (relying on the Supreme Court's guidance in Garretson* v *Clark) "the ultimate combination of royalty base and royalty rate must reflect the value attributable to the infringing features of the product, and no more*."

Economically, *the value that the invention adds to the product is related to the value of the end-product including the technology in question minus the value the end product would have if it did not include the technology.*[60] The standard essential patents are licensed in a portfolio that offers "Freedom to Operate" and lowers transaction costs for parties in negotiation. Such a portfolio includes multiple components of a smartphone that are essential for effective functioning of a phone. From a very technical perspective, a handset should include a lot of solutions such as, but not limited to, connection setup; mobility; paging; data transmission; voice coding. One will not have a modern and fully functional handset if the handset does not have all of these features. Maybe it is more like removing the wheels, brakes or the engine from a car. Portfolio licensing ensures that a license is offered for all such features. Indeed, *some patents cover complete handsets or entire communication systems (including both handsets and network infrastructure equipment).*[61] Thus, substantial portfolio covering Standard Essential Patents, in the cellular industry could, in fact, be the entire smartphone, or even the entire cellular communications system.[62]

Commercial practice shows that standard essential patent holders choose to license at End User level. This practice, as explained above, also ensures that there is no case of double dipping (i.e. seeking royalty multiple times for same patents in a value chain) because of

exhaustion of patent rights. End User level licensing ensures that the IP holder receives reasonable remuneration that is commensurate with the value that standardized technology brings to the consumer.

The European Commission itself has explicitly acknowledged that "*[i]n cases where the licensed technology relates to an input which is incorporated into a final product it is as a rule not restrictive of competition that royalties are calculated based on the price of the final product, provided it incorporates the licensed technology*." (Technology Transfer Guidelines, paragraph 184). The Court of Justice of the EU has clearly articulated that assessment of whether fees charged for access to IP are unfair or unreasonable should be based on whether the fees bear a reasonable relationship to the economic value of the IP.

In the recent decision by Chinese agency NDRC (National Development and Reform Council), it was found that the practice of Qualcomm to base their royalties on the User Equipment is not in breach with competition law.[63]

In *Ericsson* v *D-Link* (Fed. Cir. 2014), the US Court of Appeals for the Federal Circuit, found basing patent damages/royalties on the end device to be legitimate.

In *CSIRO* v *CISCO* decision (Fed Ci 2015), the Court flatly rejected the suggestion that all Standard Essential Patent damages models begin with the smallest salable patent-practicing unit (SSPPU). In the Intex[64] as well as Micromax matter also, the interim order rendered by Hon'ble High Court, royalty amounts were was based on the handset.

Standards are integral to the functioning of most the technical products. Weak enforcement of concerned IPRs appears to contribute in what economists call 'hold -out' problem that may threaten innovation incentives and midterm can harm consumers by not allowing them to access interoperable high performance products and services at a reasonable price. Some have argued that certain groups of technology-users who do not contribute to standardization and wish to free-ride while freeing themselves from any obligation of reasonably remunerating the SEP holders, could have indulged in buyer's cartel or group boycott[65] in order to absolve themselves from paying FRAND royalties and facilitate collusionarypractices. If true, this would be highly prejudicial to consumer's interest in being able to receive technology upgrades timely as it has impact on chilling the innovation cycle.

As per recent decision by German court in *Sisvel* v *Haier*[66]case, it has been made amply clear that owning Essential Patents does not necessarily mean holding a dominant position. The Competition Act, 2002 inter alia stipulates that the company's dominance in the market does not attract anti-trust provisions under the Act unless the dominant position is abused.[67] History reveals that FRAND accessible patents have promoted a healthy competition in the market as new Indian business has entered and their profits increased.

Further, the goal of IPR policies—to ensure that the patented technologies incorporated into a standard are available for licensing on fair, reasonable and non-discriminatory terms—is fully realized by the current Telecom Standards Development Institute of India (TSDSI) IPR Policy, as is the goal of the Make in India program to "create a globally competitive electronics design and manufacturing industry".[68] Mandating a different licensing schema in India (i.e. licensing at component level) than in the rest of the world (i.e. at the end user device level) could only serve to discourage technology firms from contributing to standards, negatively impacting huge R&D investments made by them, India's economy, innovation cycle, Indian manufacturing business and consumers.

Leading India towards the Path of Innovation

While the media & entertainment sector, software industry, publishing, fashion and sports industry are all facing the issues of weak enforcement in the form of piracy and counterfeiting, the telecom industry involved in development of telecom standards is also facing the same brunt.

For the progression in technological growth and to ensure effective commercialization of Intellectual Property, it is important that the IP is timely granted without undue delay. Considering the fact that the technological growth in telecom sector leap frogs very quickly, any undue delay in the granting of IP can be a deterrent. It is important to note that for a robust ecosystem to work, besides timely grant of patents, good quality of patents must also be ensured.[69] The current efforts of Government of India in increasing the man power at IP office by hiring large pool of examiners are commendable and we are highly hopeful that the challenges faced at Intellectual Property Office, India would soon iron out.

It is equally important that the patent office examiners are continuously put through intensive training towards technological development so that they are aligned to industry needs and the consumer demand for better and improved innovations.

Continued technical training of examiners is thus desirable.

There are approximately, 250 million phones[70] being sold in India in 2016, of which many are unlicensed. Thus, enforcement of standard essential patents is a big issue. In many cases, the manufacturing of cell phone is being done without proactively securing a license from the holder of essential patents, although the standard specifications are all publicly available and downloadable from the 3GPP website. This puts the standard essential patent holder at a disadvantaged position, which has already given an irrevocable undertaking to make its patents available under FRAND terms. It is only after the cell phone is launched, the negotiations start to take place. As a result, there is no guarantee for timely return on investment for the innovator of the standard that has already incurred huge fundsR&D.[71]As a result, it negatively impacts the innovation cycle delaying technological development thus hindering India's path towards innovation.

Adequate protection of IP rights in India thus will play a significant role in attracting more Foreign Direct Investment (FDI) especially considering that the neighboring country would sound to be more attractive otherwise to foreign investors, given ease of doing business.

Developing the IP culture which reflects respect for innovation and the rights thus accrued post its registration, requires a complete fabric change right from youth ("capturing the young minds"). Several soft measures may be taken such as setting up IPR think tanks that also serve as an institutional memory to Government departments; amendments in patent law mandating employers to share profits with innovator employees upon successful commercialization of patents; instituting Indian Intellectual Property Services Cadre (IIPS); introduction of IP in the curriculum in colleges, as a mainstream subject, would be immensely beneficial in building a respectable IP regime.[72]

Discussion and Conclusion

Standard essential patents are 'available' on FRAND terms & conditions thanks to the commitment from their owners. India has witnessed increased competition in the market with many incumbents entering in the space of mobile telephony as a result. At the time of patent examination process it is not known whether the patent covering technological solutions would be later categories as a standard essential patent, and hence the patent application (whether covering a standardized technology) undergoes rigorous patent examination. The Indian Patent Act does not discriminate between technologies, much in compliance with Article 27 of TRIPS. Hence, the patents rights must be enjoyable without any discrimination as to the place of technology or type of technology. Thus, it will be worthwhile to recognize that the right to seek an injunction must not be taken away from Standard Essential Patent holders which otherwise stand the risk of increased instances of patent hold -out.

Once a patent becomes a standard, the patent holder that has made a FRAND commitment and the patent implementer should engage in good faith negotiation to determine the royalty base, the roytalty rate and other terms of the license agreement. It is important that the negotiations between parties happen in good faith so that they do not engage in hold-up or reverse hold-up (hold-out). Intellectual property policies of standard development organizations could play a special role by setting up intellectual property rights policies that would limit hold-up or reverse hold-up problems more effectively. This can however only occur if consensus takes decisions. The competition Commission of India has very clearly stated that it is not a price setting authority in Intex matter. European Commission has also stated that it is not in aposition to decide 'fair'pricing under FRAND and should be better left to the negotiating parties.[73] Government of India must avoid defining FRAND terms[74] and take clues from failed attempts made by IEEE which has led to many technology providers submitting negative Letters ofAssurances, creating uncertainty and delay in the standardization efforts.[75]

All this comes at a social cost.[76] Licensing termsisarea contract issue[77] which must be best left to private parties in negotiation. There exists no precedence globally which calls for any government intervention. *Huawei* v *ZTE* case[78] offers an important message that FRAND is a two-waystreetwhere both licensee as well as licensor must act in good faith in a time bound fashion besides lamenting on the fact that FRAND terms and conditions are flexible and to bedetermined on case to case basis.

The Indian Government's "Make in India" program is driven by the objective of reducing the outflow of foreign exchange on account of imports of digital products. During the year 2014, 270 million cellular handsets were sold in India, 225 million of which—

nearly 83 percent—were imported. This amounts to a cash outflow of Rs. 75,000 cr (12.5 billion USD),[79] with an average cost per handset of 50USD. Many efforts are being made (by incorporating differential duty structure, etc.) to incentivize domestic manufacturing. More importantly, the "Make in India" program requires a strong commitment of IPR protection to motivate the design houses to innovate and generate patents, thereby enhancing their competitive strength. Dilution of the IPR system will destroy the environment of innovation thereby making India a permanent market for "only consumption". This is not in India's interest.

Hence, India must retain an adequate IPR framework based on its compliance with the TRIPS Agreement, and any attempt to weaken IPRs will harm India's competitiveness and international standing. Further, the draft version of the proposed National IP Policy contemplated by Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, states that the government ought to devise "a strong, balanced, predictable and transparent IP regime", and that foreign companies must "be encouraged to bring their IP-protected inventions and creations to India along with investment and technology transfer and establish their manufacturing, R&D and outsourcing bases in India".

References

1 http://www.iso.org/iso/home/standards.htm.

2 Mark MacCarthy, *Open Standards, Competition and Patent Policies*, Georgetown University, 2009,https://works.bepress.com/mark_maccarthy/1/download.

3 SDOs provide a single interface or platform for the user as well as the owner in order to protect their mutual interest by obtaining a return on investment and getting access to the patented technology on FRAND terms and conditions.

4 Section 48 of Indian Patents Act, 1970, Rights of patentees - Subject to the other provisions contained in this Act and the conditions specified in Section 47, a patent granted under this Act shall confer upon the patentee-

5 (a) where the subject matter of the patent is a product, the exclusive right to prevent third parties, who do not have his consent, from the act of making, using, offering for sale, selling or importing for those purposes that product in India;

6 (b) where the subject matter of the patent is a process, the exclusive right to prevent third parties, who do not have his consent, from the act of using that process, and from the act of using, offering for sale, selling or importing for those purposes the product obtained directly by that process in India.

7 *Competition Policy and Knowledge Based Capital*, by OECD, 2013, p. 163.

8 Sharma C, *Mobile Patents Landscape: An In-Depth Quantitative Analysis*, 2015, www.chetansharma.com/mobile-patents-landscape-an-in-depth.

9 Boston Consulting Report, 2015, The Mobile Revolution: How Mobile Technologies Drive a Trillion-Dollar Impact.

10 http://www.iso.org/sites/ConsumersStandards/1_standards.html.

11 https://www.unece.org/fileadmin/DAM/trade/wp6/documents/2010/Presentations/Holocek.pdf.

12 Bekkers R, Bongard R & Nuvolari A, An empirical study on the determinants of essential patent claims in compatibility standards, *Research Policy*, 40 (2012) 1001-1015.

13 Competition Policy Brief, European Comission, 2014, http://ec.europa.eu/competition/publications/cpb/2014/008_en.pdf.

14 http://www.etsi.org/images/files/ipr/etsi-ipr-policy.pdf ETSI Directives Version 36, June 2016.

15 http://www.3gpp.org/Specifications-groups/ran-plenary/46-ran2-radio-layer-2-and-radio-layer.

16 https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=2440. http://www.3gpp.org/ftp/Specs/archive/36_series/36.331/36331-e00.zip: One can find that only this spec (out of many for RAN2, out of many 3GPP WGs) is more than 600 pages long. All-in-all, the 3GPP specs are 10's of thousands of pages.

17 http://www.3gpp.org/specifications-groups.

18 http://www.3gpp.org/specifications-groups.(Three technical specification groups are:TSG RAN (Technical Specification Group Radio Access Network);TSG SA (Technical Specification Group Services and Systems Aspects; TSG CT (Technical Specification Group Core Networks and Terminals).

19 http://www.3gpp.org/DynaReport/TSG-WG--r1.htm

20 http://www.3gpp.org/ftp/Specs/html-info/TSG-WG--R2.htm

21 http://www.3gpp.org/ftp/Specs/html-info/TSG-WG--R3.htm

22 https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=464 (10 releases).

23 https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=1266 (3 releases).

24 https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=1256 (2 releases).

25 https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3068 (7 releases)

26 The Mobile Revolution: How Mobile technologies drive a trillion dollar impact, a report by Boston Consulting Group, 2015.

27 Available from official 3GPP secretariat statistics and refer to the effort spent in 3GPP meetings, http://www.3gpp.org/ftp/tsg_sa/TSG_SA/TSGS_73/Docs/SP-160535.zip.

28 Highlights from the International Conference on Innovation, IP and Competition in the ICT Sector, organized by O P Jindal Law School, 20th-21st August, Hotel Taj Mansingh, New Delhi.

29 Signals Research Group, The essentials of IP, from 3G through LTE release, 12 May 2015.

30 Alcatel-Lucent, Telecommunications Equipment Company, IP-optimized Mobile gateway – The evolution of delivering differential mobile broadband services.

31 Data at Indian Brand Equity Foundation website, http://www.ibef.org/industry/telecommunications.aspx.

32 http://www.iccindiaonline.org/policy_state/28aug/2.pdf.

33 http://www.trai.gov.in/WriteReadData/Recommendation/Documents/Letter_to_Secretary_DOT_24_may_2016.pdf.

34 A recent report by the Stockholm School of Economics concluded that a 1% point increase in broadband penetration

increases new business registration by 3.8%. also see http://www.telecomreview.com/index.php?option=com_k2&view=item&id=968:ericsson-networked-society-forum-2013-bringing-connectivity-to-life.

35 ETSI website on IPRs, http://www.etsi.org/about/how-we-work/intellectual-property-rights-iprs.

36 ABI Research, LTE Standard Leadership and Terminal – Essential patent Portfolios Analysis within the 3GPP, August 2016

37 BekkersR, DuystersG and VerspagenB, Intellectual property rights, strategic technology agreements and market structure. The case of GSM,*Research Policy*, September 2002, 3, p. 1146.

38 Sample list includes Apple, Samsung, Huawei, BlackBerry, Xiaomi, Microsoft Mobile, LG, Pantech, Acer, ZTE, Bq, GeeksPhone, Gradiente, Positivo, DataWind, Amoi, BBK, Coolpad, Cubot, Gfive, Gionee, Haier, Hisense, , Konka, Letv, Meizu, Qihoo 360, Wasam, Technology Happy Life, Ningbo Bird, Smartisan, Zopo Mobile, Lenovo, Jablotron, Verzo, Jolla, Archos, Wiko, Videocon, Groupe Bull, MobiWire, AEG, Grundig Mobile, Telefunken, Tiptel, Celkon, IBall, Intex Technologies, KarbonnMobiles, Lava International, LYF, Micromax Informatics, Onida Electronics, Spice Digital, Xolo, YU Televentures, Nexian, Evercoss, MITO, Polytron, Advan, Brondi, NGM, Olivetti, Onda Mobile Communication, TelitKyocera Communications, NEC, Panasonic,Sansui, Sharp Corporation, Sony Mobile Communications, DoCoMo, Just5, M Dot, Ninetology, Kyoto Electronics, Lanix, Zonda, Fairphone, John's Phone, Philips, Koryolink, QMobile, Voice Mobile, Advance Telecom, Dell, etc.

39 SuisseC, The Wireless View 2014: Smartphones – A Slowing Disruptive Force, (6 January 2014) at 16.

40 https://doc.research-andanalytics.csfb.com/docView?language=ENG&source=emfromsendlink&format=PDF&document_id=805847640&extdocid=805847640_1_eng_pdf&serialid=VKIqPfyGKvPXILC6%2bF%2bpFCXU1PjBAqhenh6L1lN6AVE%3d.

41 A Knowledge Paper on Standard Essential Patent released during ASSOCHAM's Conference on Interface between Competition Laws and IPR laws in India, 2015, prepared by Khaitan& Company.

42 A report by IIM-B and Counterpoint Research, Maximizing value in Indian Handset Industry, 2016, http://www.iimb.ernet.in/ic-np-mii.

43 Hoover IP2, Working paper series 16009, by Alexander Galetovic and Stephen H. Haber "The Fallacies of Patent Hold Up Theory". November 2016.

44 "Meaning of FRAND, Part 2: Injunctions by J. Gregory Sidak, Journal of Competition Law & Economics, http://www.criterioneconomics.com/meaningof-frand-injunctions-for-standard-essential-patents.html.

45 The Smallest Salable Patent-Pricing Unit experiment, general purpose technologies and the coase theorem, Prof. Nicolas Petit, Professor of Law, University of Liege.

46 Anne Layne-Farrar, Patent Hold Up and Royalty Stacking Theory and Evidence: Where do We Stand After 15 Years of History?, http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP/WD(2014)84&doclanguage=en.

47 Working Paper Series, No. 16009, The Fallacies Of Patent Holdup Theory, Alexander Galetovic, Universidad De Los Andes and Stephen H. Haber and Keith Mallinson, WiseHarbor, on cumulative mobile-SEP royalties. For IP Finance, 19th August 2015, http://www.wiseharbor.com/pdfs/Mallinson%20on%20cumulative%20mobile%20SEP%20royalties%20for%20IP%20Finance%202015Aug19.pdf.

48 Patent Hold Up and Royalty Stacking Theory and Evidence: Where do We Stand After 15 Years of History, 2014, www.oecd.org/.../?cote=DAF/COMP/WD(2014)84&docLanguage=En

49 In the Matter of Certain Wireless Devices with 3G and/or 4G Capabilities and Components thereof, Inv. No. 337-TA-868, US ITC, June 13, 2014, page 123. *Ericsson INc,* v *D-Link Systems, Inc.* Case NO. 6:10-CV-473, US District Court for the Eastern District of Texas Tyler Division, 6 August 2014.

50 Alexander Galetovic et seqq, Patent Holdup: Do Patent Holders Holdup Innovation?, Working Paper Series No.14011, May 2014, page 5.

51 The Mobile Revolution, How mobile technologies drive a trillion dollar impact, A Report by Boston Consulting Group, 2015, page 9.

52 *Huawei Technologies Co. Ltd*. v *ZTE Corp*., Case No. C-170/13 (Court of Justice of the European Union, July 16, 2015), http://curia.europa.eu/juris/document/document.jsf?doclang=EN&text=&pageIndex=1&part=1&mode=lst&docid=165911&occ=first&dir=&cid=3858.

53 MariniellloM, "European antitrust control and standard setting",2013; and https://communications.crowell.com/29/ 649/july-2015/european-court-of-justice-rules-on-abuse-of-dominance-in-the-context-of-sep-injunction-proceedings---client-alert---crowell-and-moring.asp?sid=9c56541e-c63c-4aad-8816-6021fda63091 (*HuwaivZTE* decision)

54 Perilious deviations from FRAND Harmony – Operational Pitalls of the 2015 IEEE Policy, by KaznelsonRon D *et al*., IEEE SIIT, 2015, 9th Intl Conference on Standardization and Innovation in Information Technology, Sunnyvale, CA, Oct 8th 2015.

55 ETSI says IEEE's IPR policy is not compatible with its own, 3 December 2015, http://www.worldipreview.com/news/etsi-says-ieee-policy-is-not-compatible-with-its-ipr-policy-9280

56 Anne Layne-Farrar, Patent Hold Up and Royalty Stacking Theory and Evidence: Where do We Stand After 15 Years of History?, http://www.oecd.org/officialdocuments/public-displaydocumentpdf/?cote=DAF/COMP/WD(2014)84&doclanguage=en.

57 MallinsonK, WiseHarbor, on cumulative mobile-SEP royalties. For IP Finance, 19th August 2015, http://www.wiseharbor.com/pdfs/Mallinson%20on%20cumulative%20mobile%20SEP%20royalties%20for%20IP%20Finance%202015Aug19.pdf.

58 *Lucent Technologies, Inc.* v *Gateway, Inc*., 580 F.3d 1301, 1336 (Fed. Cir. 2009) (emphasis added).

59 http://www.3gpp.org/ftp/Specs/archive/36_series/36.331/36331-e00.zip.

60 http://www.etsi.org/images/files/ipr/etsi-ipr-policy.pdf, ETSI Directives Version 36, June 2016, It requires holders of standard-essential patents to grant licenses to "sell, lease or otherwise dispose of EQUIPMENT," where EQUIPMENT is defined as "any system, or device fully conforming to a STANDARD." As components or subsystems generally are neither a system nor a device that fully conforms to such standards, patent holders have no obligation under the ETSI IPR Policy to grant licenses at the component level.

61 http://www.etsi.org/news-events/news/968-2015-05-news-tsdsi-india-signs-cooperation-agreement-with-etsi.

62 *Commonwealth Sci. & Indus. Research Organisation* v *Cisco Sys., Inc*., No. 2015-1066, 2015 WL 7783669, at *7 (Fed. Cir. Dec. 3, 2015).

63 *Commonwealth Sci. & Indus. Research Organisation* v *Cisco Sys., Inc*., No. 2015-1066, 2015 WL 7783669, at *11(Fed. Cir. Dec. 3, 2015).

64 See Debunking the Smallest Salable Unit Theory, CPI Antitrust Chronicle July 2015 (2), Richard J. Stark Cravath, Swaine & Moore LLP.See Cristina Caffarra& Pierre Régibeau, Patent Explosion and Patent Wars: Hold-Up, Royalties and Misunderstandings over 'Market Value', EUR. COMPETITION L. ANN. 307 (2012)

65 The Smallest Salable Patent-Pricing Unit experiment, general purpose technologies and the coarse theorem Prof. Dr. Nicolas Petit Professor of Law, University of Liege, 2016.

66 http://investor.qualcomm.com/secfiling.cfm?filingid=1234452-15-31&cik=.

67 Judgment by Justice Manmohan Singh of the Delhi High Court in the case of *Telefonaktiebolaget LM Ericsson* v *Intex*, 2015.

68 Editorial: Dial a Cartel, 12th March 2016, http://www.financialexpress.com/article/fe-columnist/editorial-dial-a-cartel/224082/.

69 Regional Court of Düsseldorf, judgments of 3 November 2015, case nos. 4a O 93/14 and 4a O 144/14.

70 Section 36(1) of the Act; http://www.cci.gov.in/sites/default/files/workshop_pdf /14peter.pdf; http://www.competition-commission.gov.in/speeches_articles_presentations/3-economics_32.pdf.

71 Make in India, Electronic Systems: Sector Policy, http://www.makeinindia.com/sector/electronic-systems-design/.

TapiaC, Assessing the quality of European patents, *IAM Magazine*, Issue 80, 2016, 47-48.

72 http://www.dnaindia.com/money/report-mobile-phone-market-to-reach-250-million-units-in-india-this-year-2167735.

73 ICT industry contributes close to 21% of its turn over in R&D. Boston Consulting Report, 2015, The Mobile Revolution: How Mobile Technologies Drive a Trillion-Dollar Impact.

74 Chopra S,Time to walk the talk: Establishing an effective intellectual property rights regime to promote a culture of innovation, *Consultant Review Magazine*, https://www.consultantsreview.com/.

75 Eliana CargésTolón, deputy chief economist in the Internal Market department, 2015.

76 ASSOCHAM open letter to PMO suggesting Government to not regulate SEP and prices, 2016.

77 FICCI open letter to Minister Commerce and Industry. https://mentor.ieee.org/802.11/dcn/15/11-15-0950-00-00ah-july-2015-tgahclosing.Report.pptx and Perilious deviations from FRAND Harmony – Operational Pitalls of the 2015 IEEE Policy, by Ron D. Kaznelson et al., IEEE SIIT, 2015, 9th Intl Conference on Standardization and Innovation in Information Technology, Sunnyvale, CA, Oct 8th 2015 see page 4 and 10.

78 *Microsoft* v *Motorola* (696 F.3d 872, 884 (9th Cir. 2012) recently affirmed 2015) ("The district court's conclusions that Motorola's RAND declarations to the ITU created a contract enforceable by Microsoft as a third-party beneficiary . . . and that this contract governs in some way what actions Motorola may take to enforce its ITU standard-essential patents . . . were not legally erroneous.") (emphasis added).

79 Case C-170/*13 Huawei Technologies Co. Ltd* v *ZTE Corp & ZTE*, 2015, Court of Justice of the European Union

80 http://www.business-standard.com/article/economy-policy/mobile-phone-manufacturing-plays-spoiler-115012200036_1.html.