Valuing IP in Smartphones and LTE

Extensive IP litigation among various smartphone ecosystem participants —most notably between Apple and Android licensees Samsung and HTC—connotes the rising importance of developing or acquiring IP, then licensing and defending it. Smartphones and tablets represent a diverse, IP-rich and rapidly changing product sector. Disputes include standards-essential patents, software and hardware designs. Purported IP valuations including those derived from essential patent ownership "determinations" are subject to great uncertainties, inaccuracies and biases. Negotiated licensing agreements can overcome these shortcomings while reflecting significantly different positions among licensors and licensees.

Licensing in and out, layer-by-layer

Valuing various contributions to the IP employed in smartphones and tablets is a multifaceted and subjective task. These are multifunctional devices that include several layers of technology and IP in radios, voice encoder-decoders (vocoders), multimedia coder-decoders (codecs), operating systems and applications software—all wrapped up in physical and systems designs, as illustrated in Exhibit 1. The former two categories tend to be standards-based and subject to open licensing on the basis of (Fair) Reasonable and Non-Discriminatory terms. While other categories are in some cases proprietary and in other cases open sourced, these technologies will also infringe the IP rights of third parties in many cases. The coexistence of proprietary IP for which a FRAND commitment may or may not have been provided, and IP provided under open source principles in these complex products is testament to the ability of companies with different contributions and business models to collaborate to bring innovative products to market. Unsurprisingly, everybody talks up the relative value of their own IP versus others'. In fact, a fair bit of spin, bluffing and in some case outright deceit is inevitable among the more concrete claims with such high stakes in this very innovative and competitive market.

Exhibit 1
Smartphone IP Lies (and Truth) Everywhere

Layer	Functions	Implementation	Notable IP owners
Radio	Modem protocols including GSM, CDMA, HSPA, LTE	Dedicated silicon baseband processors running microcode or software defined radios on more general purpose processors	Ericsson, Nokia, Qualcomm, InterDigital, Motorola/Google, Samsung, LG (the list of claimants is growing)
Multimedia	Speech vocoders, video recording/playing codecs, graphics engines	Dedicated silicon Graphics Processing Units with hardware acceleration or software acceleration	Various ICT companies. Patent pool administrator MPEG LA lists 29 licensors for the AVC/H.264 video standard
Operating System Platform and User Interface	The device's management system and human interface	Software on general purpose applications processors with voice recognition, text-to-speech and innovative hardware such as touch-screen controllers	Google (Android*), Apple iOS, Windows Phone (Microsoft), Nokia (Symbian), RIM, WebOS

Applications	Various	Software that is typically obtained in the aftermarket	Numerous. Rovio's Angry Birds is a popular game
Physical design	Aesthetic style, ergonomics	Hardware form factor and layout	Handset manufacturers. Apple is asserting its design IP
System design	Apps stores, content delivery, service management, billing	External to device including network, service provisioning and third party content providers	Various, including Apple, Google and mobile operators

**Open source software has nominally somewhat common ownership. However, it can be under significant control of its leading sponsor(s) while being fragmented with vendor-specific implementations (e.g., with Motorola's proprietary Motoblur UI replacement, HTC's Sense and Kindle Fire)*

Implementers employ others' IP though licensing-in with payment of fees, cross-licensing with their own IP or unlicensed infringement with the risks and costs of litigation. Some implementers buy IP outright; such as with acquisition of patent portfolios, and many continue to develop their own IP in R&D labs and with extensive field testing in many cases. In all cases, a crucial commercial question is the value of the various IP portfolios required to build a product.

There are seldom definitive prices for licensing IP. Reasons for this include bilaterally negotiated license agreements that consider the multiple objectives and requirements of each unique licensee/licensor combination. These depend upon individual business plans and the unique nature of IP licensing. Voluntary licensing under bilateral agreements is the best means to establish fair market values for licensing IP between a licensor and licensee. There is no reason why any particular valuation method or approach taken in negotiations with other licensees should necessarily yield a similar "price" when the business models, commercial positions, intended use of IP and non-price terms sought (including cross-licenses and other business value to be provided by a licensee) are typically different from licensee to licensee.

Standard deviations in valuations and licensing charges

Prescribed valuation methods are all well and good for those who agree to opt-in to the use them, but save for exceptional circumstances (e.g., court judgment following litigation and failed settlement negotiations), there is no more reason to impose any particular pricing or valuation method for intangible components of complex technology products such as IP than there is for tangible components such as silicon chips or batteries. In fact, the most economically efficient markets tend to be those that are free to price with maximum flexibility because that incentivises best allocation of resources.

Nevertheless, there have been various attempts to standardise or even regulate the way IP is valued and associated licensing rates are derived. DIN, the German Institute for Standardisation has published a standard entitled DIN 77100 - Patent Valuation - General Principles for Monetary Patent Valuation. Some patent pools, such as that for H.264, use "proportionality" with the counting of patents determined essential by the pool's examiners, and charging of patent licensing fees pro-rata. Implying value on the basis of numeric proportionality has been significantly criticised in recent years because it fails to reflect different value for each essential patents. A better approach is to determine the relative

value of patents by looking at their relative frequency of citation in subsequent patents. However, this is also far from perfect, providing only "relative values," and is subject to a significant error. Some patents may cover seminal technology, but are overlooked as prior art citations when later patents are examined, while other patents may become favourite repeated citations of patent examiners without necessarily covering significantly valuable technology.

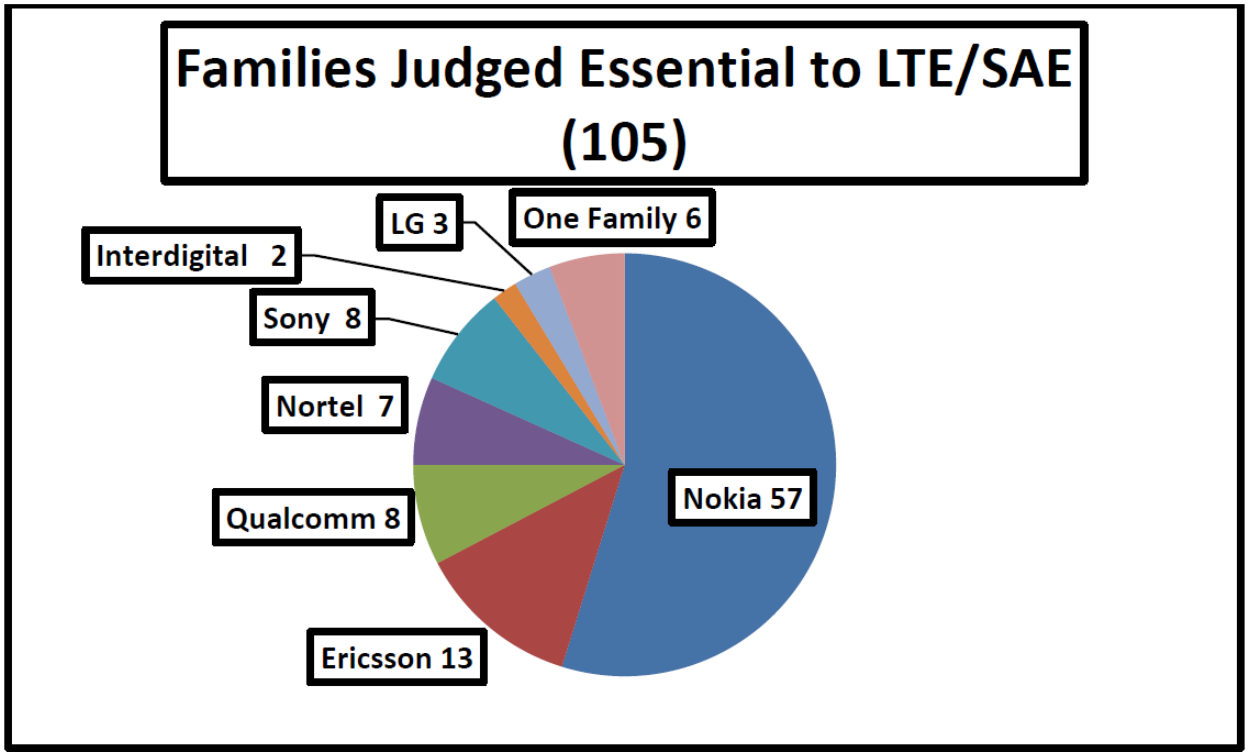
Other valuation methods are much less formulaic; they recognise the merits of valuing IP in different ways and that terms may also vary significantly depending upon circumstances (e.g., FRAND versus other IP licensing). Furthermore, IP is commonly cross-licensed (or kept for defensive purposes) with very significant netting-off (or disregard) for monetary requirements in many cases.

The world is awash with ideology, theories and biases when it comes to conditioning industry opinion on valuations for licensing negotiations, litigation or proposed regulation. Different studies produce results with proportions of patents judged essential and rankings varying by more than a factor of ten. Nokia sponsored a 2010 study ranking patentee companies on the basis of families of patents declared and judged essential, by the Nokia sponsored analysts, to the latest generation of mobile technology standards. This study and its methodology are introduced as follows (citations omitted):

> *Fairfield Resources has for more than six years, with support from Nokia and other wireless industry leaders, been studying the extent to which patents declared as essential to wireless standards actually are essential, as determined by a team of experienced wireless engineers.*
>
> *The present report, using substantially the same team of experts as in our previous studies, extends our reviews to patents declared as essential to two fourth generation cellular technologies, LTE (the radio access interface) and SAE (the core network).*

Nokia came out top, followed by Ericsson and Qualcomm, and with LG, for example, trailing in 6th position, as shown in Exhibit 2.

Exhibit 2

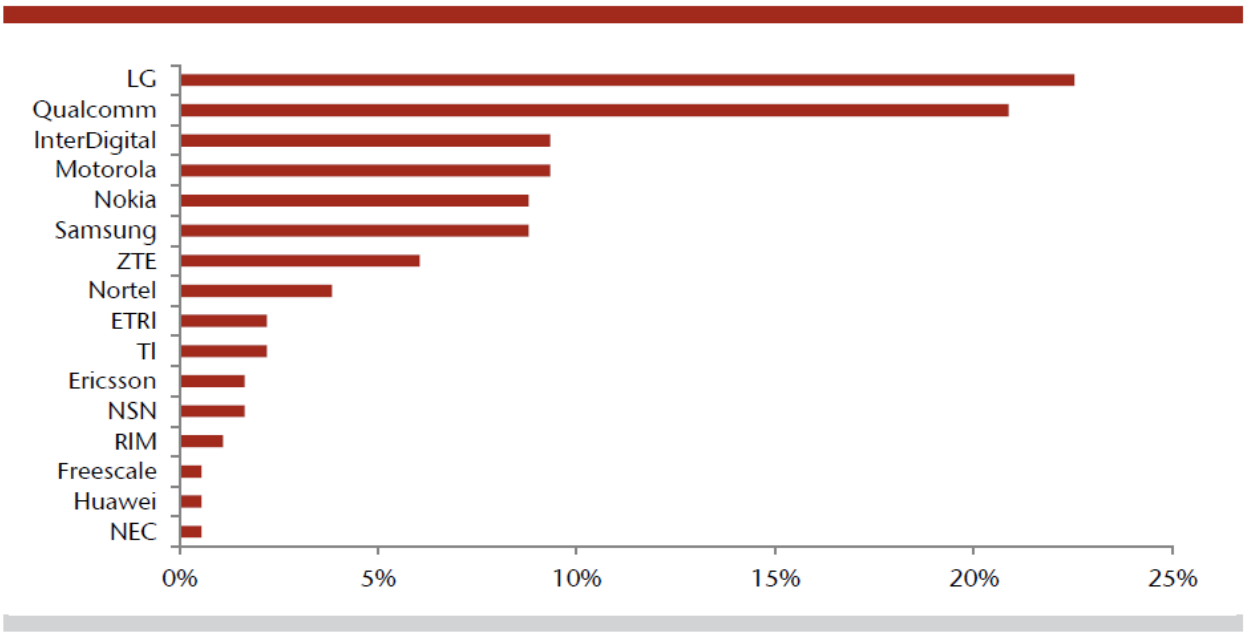


Source: Fairfield Resources International, 2010 ("study was funded by Nokia")

In marked contrast, a recently published financial research report by Jefferies & Co ranks Ericsson 11th in essential LTE patents with one twelfth the number of patents judged essential as for LG, as shown in Exhibit 3. The report describes its methodology as follows:

> *In valuing the essential LTE patent portfolios of major players in the wireless space, we utilized outside industry experts that included physics PhDs, wireless engineers, patent legal specialists, and former patent office employees.*
>
> *Our work began by first screening tens of thousands of patents and then determined a level of essentiality based on individually examining over 1,400 patents related to LTE.*

Exhibit 3
(Judged) Essential LTE Patents

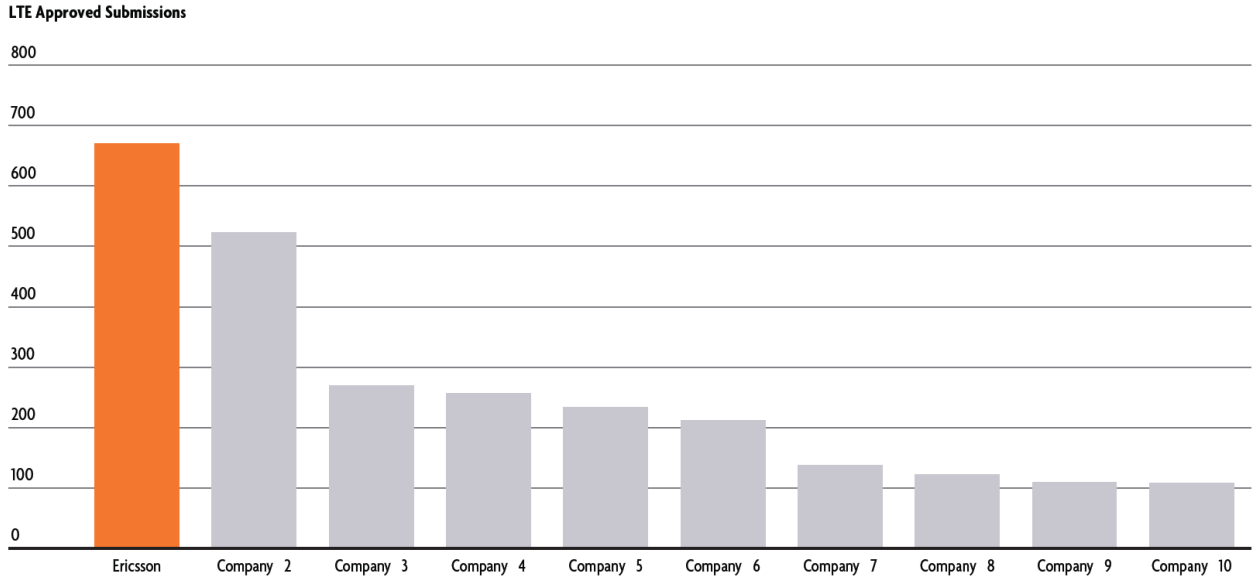


Source: Jefferies & Co, September 2011

For more than one year, Ericsson has promoted its concept of patent strength being proportional to the number of approved submissions to the Third Generation Partnership Project (3GPP) standards. Ericsson commissioned Signals Research to undertake research that shows Ericsson in the top position, as reproduced in Exhibit 4.

Exhibit 4

3GPP Approved Submission for the LTE Release Standard – by Company



Source: Signals Research ("on behalf of Ericsson")

The combined rankings in Exhibit 5 are a simple combination of the Fairfield Resources International and Jefferies & Co study rankings. I was unable to include the Signals Research data because the study only identifies Ericsson.

Exhibit 5
Combined Rankings for Ownership of LTE Patents or Patent Families Judged Essential

Rank	
1	QUALCOMM
2	NOKIA Connecting People
3	LG Life's Good
4	InterDigital®
5	ERICSSON
5^	NORTEL

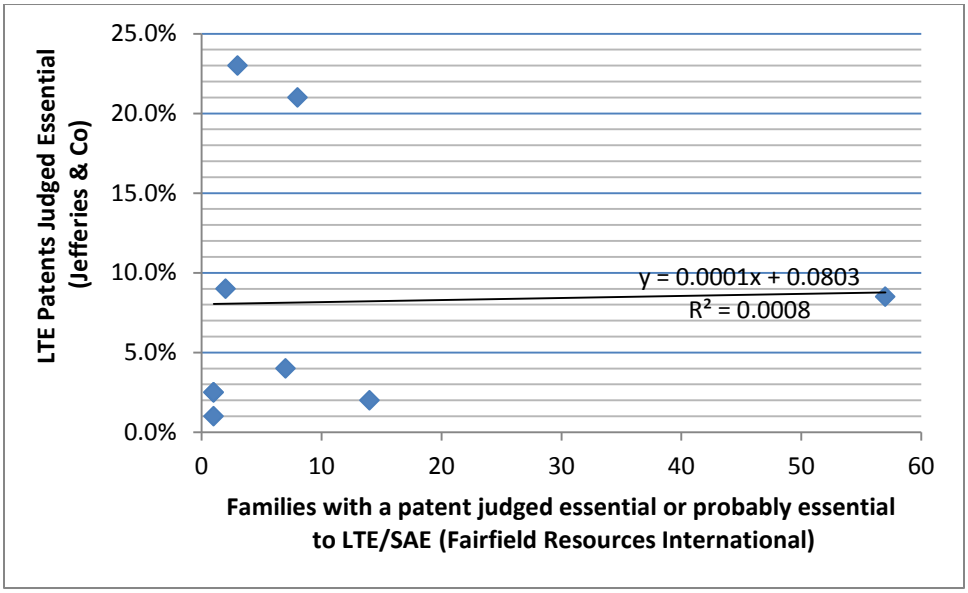
Source: WiseHarbor aggregating Fairfield Resources International and Jefferies & Co rankings
^Nortel's patents were sold for US $4.5 billion in auction to a consortium including Apple, Ericsson, Sony, Microsoft, RIM and EMC

Out for the count

Even assuming for simplicity that portfolio value can be assessed on the basis of numeric patent proportionality, assessments of essential IP ownership vary enormously between studies that use very similar methodologies. The Fairfield Resources International and Jefferies & Co studies are in considerable disagreement, despite both purporting to "determine" essentiality and then count patents or patent families. The results of these two studies bear virtually no relationship whatsoever. There is probably a stronger correlation between levels of sunspot activity and Wimbledon Championship results for British tennis players. In other words, it is as if something completely unrelated was being measured by each of these studies.

I established this disparity by comparison with regression of the data sets from the two studies. I included nine companies while having to drop nine others including Motorola, Samsung, RIM and ZTE because they were only judged to be essential LTE patent owners in one of the two studies. Exhibit 5 plots the figures and a regression curve. The R squared correlation coefficient is the very low figure of 0.0008. This represents extremely weak correlation between the two sets of results. For example, whereas the Jefferies & Co research report estimated Samsung had 9% of essential LTE patents, the Fairfield Resources International study credited it with none of the 105 Families with a patent judged essential or probably essential. Such widely different results do not inspire confidence in the competence or objectivity of the examiners or those managing these studies. At least one of these studies must be way off the mark.

Exhibit 5
Extremely Weak Correlation between two Studies' Results



Source: WiseHarbor using data sets identified. Graph includes 9 plots (ETRI and TI coincide)

Valuation the old fashioned way

As illustrated above, we are nowhere near consensus, even with valuation of essential-IP for just one standard (i.e., LTE). As illustrated in Exhibit 1, there are many layers and elements of IP that might need to be licensed or cross-licensed including multiple radio protocols (e.g., GSM, CDMA, HSPA, LTE), various codecs and many other capabilities. Furthermore, implicit or explicit licensing and cross-licensing valuation is a rather different matter to valuation for outright sale of IP ownership.

With multiple standards and the various IP in smartphones, valuation for licensing and cross-licensing is something that reflects many variables including the unique circumstances of the licensing counter-parties. This requires negotiating monetary and non-monetary terms the old-fashioned way – by bilateral negotiation.

Beauty is in the eye of the beholder

There are three textbook ways to value intellectual property, just as one would with real estate – the income approach, the cost approach, and the market approach. For example, rates agreed in previous licensing agreements can in many cases form a good basis for determining reasonable royalties for the same IP in other agreements. In reality, these methods are skewed by business considerations.

Sellers have the lowest price they will accept and buyers have highest price they will pay. So long as the former is lower than the latter, there is the possibility of a deal. Price is usually down to negotiation and in some cases regulation or court judgement. In many markets there are clear benchmarks (e.g., the

spot market price for crude oil or real estate comparisons) that significantly guide both sellers and buyers. In contrast, the marketplace for licensing or outright purchase of patents is not so clear cut for many reasons:

- Whereas one consignment of oil can be a perfect substitute for another, and similar-sized houses in the same area may be very close substitutes, by definition, no two patents are alike. Most traded goods and services, including manual and professional labour, can be valued on the basis of prices in markets for comparables or substitutes. This is in many cases not possible with patented IP.

- Patent market trading volumes are rather thin. The unique positions of relatively small numbers of potential outright buyers means that even the expected outcomes of auctions such as that for Nortel's patents, that raised $4.5 billion, were very uncertain. Consensus press speculation had been for a price of around $1 billion in the months running up to the auction. InterDigital suffered a large decline of approximately 20% in its stock price on 15th August 2011, when Google announced its intent to acquire Motorola Mobility. This was presumed to substantially reduce the likelihood of aggressive bidding for InterDigital that had been expected of Google.

- Cross licensing can accommodate significant asymmetries in the value of IP owned and scale of downstream implementation. For example, a vertically-integrated technology company with high value IP and large product sales might strike an equitable deal, for no royalty payments either way, with a vertically-integrated player who has relatively low value IP and small product sales.

- Value to a patent owner can be as much or more in defensive terms to mitigate royalty out-payments or deter patent infringement litigation as it is in the ability of patents to generate royalty income. In fact, whereas many major owners do not even have licensing programmes; instead, their patents provide the possibility of counter-suing should their owners be threatened with litigation.

- In the mobile sector, licenses are typically offered on a portfolio basis including standards-essential patents, for not just one but several standards (e.g., GSM, WCDMA and LTE). Sometimes non-essential patents, that are useful in implementing technically and commercially competitive products, are desired by the licensee and are also included in license agreements.

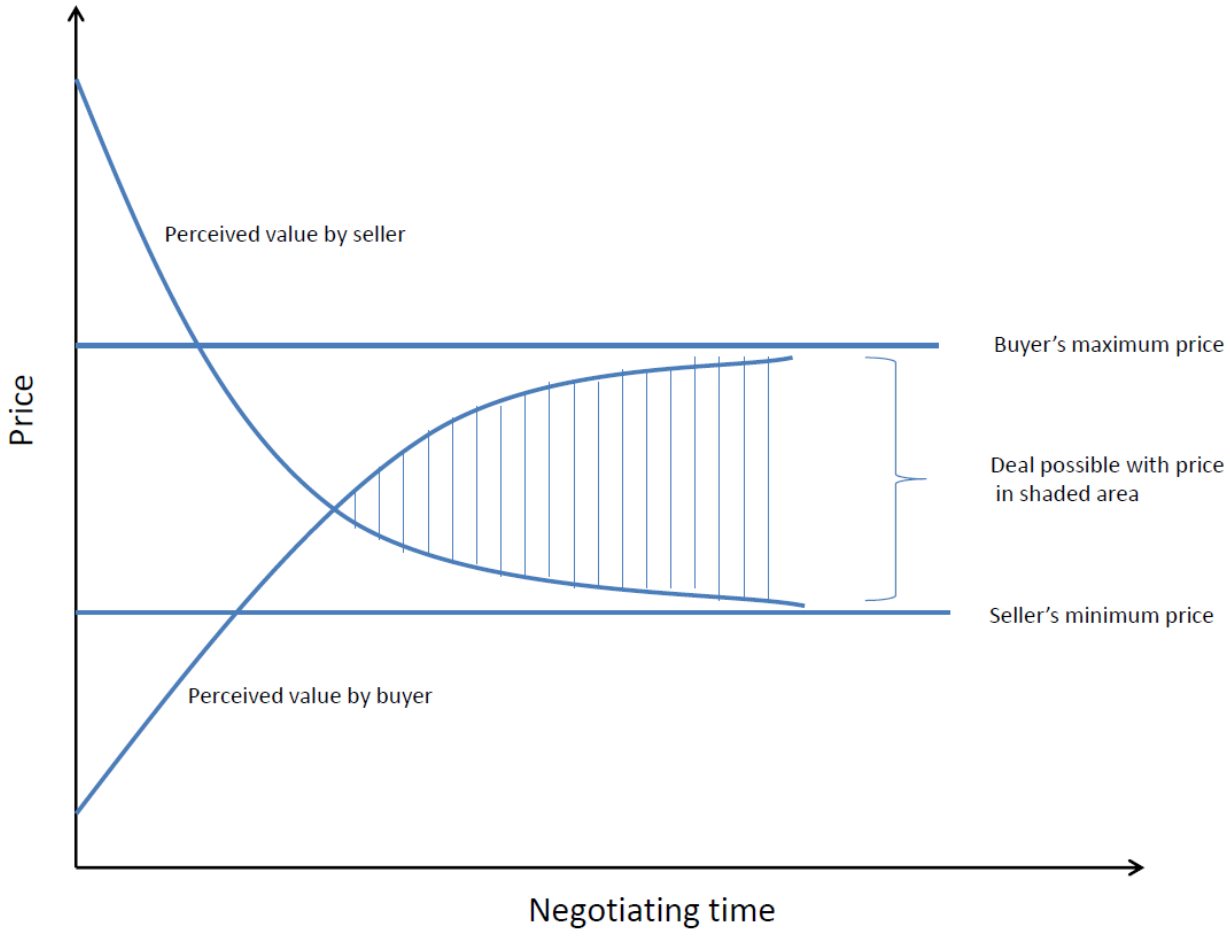
- Prices paid in cash include up-front payments and running royalties. The latter are rarely fixed monetary prices. Instead they are typically a percentage of the sale price of the licensed products or sometimes a fixed fee per unit of product sold. This represents the sharing of reward, if not risk, between the two parties on the basis of how much the IP is actually used.

- The scope of licenses is often limited by "field of use" – by geography, type of product – and for limited periods of time.

- IP trades are private affairs, the terms for which are typically not disclosed, whereas the transaction prices for many other assets (e.g., domestic real estate in the US) soon become public information.

Exhibit 6 illustrates how pricing expectations for the two parties to a negotiated sale might typically progress.

Exhibit 6
Value Perceptions through negotiations and agreement



In litigation, courts have in many cases also relied on multiple factors, such as those set out in the Georgia Pacific case, to determine reasonable royalties for use of intellectual property.

Cheque-writers are not necessarily the losers in patent settlements

It is unclear how numerous IP litigation suits involving many smartphone ecosystem players including Apple, Microsoft, RIM, HTC, Samsung, Motorola and plenty of others will all end. However, settlements are occurring and some recent disclosures provide figures that can help us discern how significant patent licensing fees can be.

Apple's June 2011 settlement with Nokia was widely reported as victory for Nokia (and therefore defeat for Apple) following strong opinions from a prolific and influential blogger. I disagree. Apple probably paid around 0.8% of its total previous cumulative sales revenues on iPhones and 3G tablets. The agreement included ongoing licensing fees, as well as a one-time payment made from Apple to Nokia. The details of the deal were not disclosed, but Nokia's second quarter financials revealed a rare glimpse with EURO 430 million in royalties reported, suggesting Apple's one-off payment was no more than that. With my assumption that running royalties for future sales are likely to be at similar rates, these charges put a pretty small dint in Apple's exceptionally strong finances. Gross profit margins on iPhones have approached 60% in recent quarters versus, for example, around 25% at Motorola Mobility.

With Nokia's historic emphasis on standards-essential IP development in 2G, 3G, and with Apple a new market entrant in 2007, it was inconceivable Apple was going to get away without paying anything. Ongoing litigation with Apple was the last thing Nokia needed with its strategic and financial problems. The question was simply how much and when? According to a Nokia press release announcing the settlement, [d]uring the last two decades, Nokia has invested approximately EUR 43 billion in research and development and built one of the wireless industry's strongest and broadest IPR portfolios, with over 10,000 patent families." Nokia is in a desperate financial position with its smartphone market share plummeting. The one-off payment came in very handy at a particularly difficult time for Nokia and in reducing losses to EURO 368 million for the second quarter and running royalties will buoy future profitability. In contrast, Apple's R&D spending is very modest for such a large technology-based company. It spent $645 million on R&D last quarter, versus $1.69 billion for Nokia.

By coincidence, the settlement is equivalent to approximately the same amount per handset HTC has reportedly agreed to pay Microsoft in patent licensing fees for manufacture and sale of HTC's Android phones. In May, industry blog Asymco calculated Microsoft had made $150m from sales of HTC Android handsets in a licensing agreement that yielded $5 per handset. Most recently, Samsung has also taken a license with Microsoft to enable the former to sell Android-based devices. As reported by the UK's Guardian newspaper "Samsung will have to pay Microsoft a small fee – likely between $10 and $15 – for each Android smartphone or tablet computer it sells." If that is the yardstick, Apple struck a bargain with Nokia!

Innovation, market entry, competition and choice

"If I have seen further [than certain other men] it is by standing upon the shoulders of giants." Sir Isaac Newton.

It is a popular and yet unproven and erroneous refrain that smartphone IP litigation and licensing costs are stifling innovation and foreclosing market entry. Evidence does not support such theories. On the contrary, licensing costs are modest; smartphone innovation is extensive and shows no signs of slowing

with faster connections, more powerful processing and richer applications. (F)RAND-based licensing has fostered investment in the mobile technologies that underpin the smartphone revolution. HTC is an example of a relatively new market entrant with little in the way of patents when it started and yet its smartphone market share rose to a very significant 8% last year. Apple had no history in the essential-IP that is required to implement 2G and 3G radio standards, and yet it has been able to license the IP it needs for a very small proportion of its revenues and build market share of approaching 20% in four years. It took 20 years of cumulative industry development to make a mobile phone cheap enough to be adopted by half the world's population and another five years before technology was up to the task of creating a smartphone. Maximum mobile data rates have increased 1,000-fold since the introduction of GPRS around 2000 until the launch of LTE with 50 Mbps speeds in some cases. Concurrent improvements in silicon processing, display technologies and software capabilities are also vital.

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