

 POLITECNICO DI MILANO



IP and innovation: the academic view

U.Spagnolini

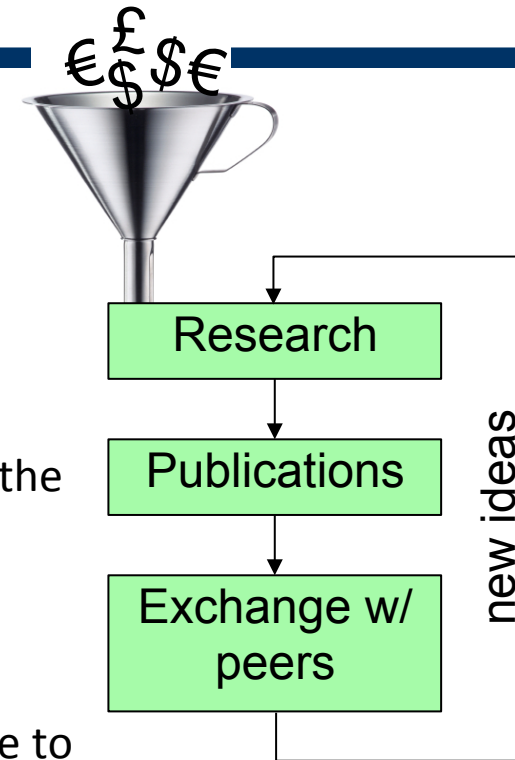


Goal of the academia:

- High quality research with students
- Publish methods/results to be peer reviewed by peers
- Exchange ideas and methods with other peers to improve the research
- Patents are not the main focus of researchers as «slow-down the cycle» (=delay publications & exchange ideas)

Goal of the industry:

- Spend in R&D with minimum risk to maximize the ratio income to R&D expenditure
- Have the most innovative and unique product that creates value



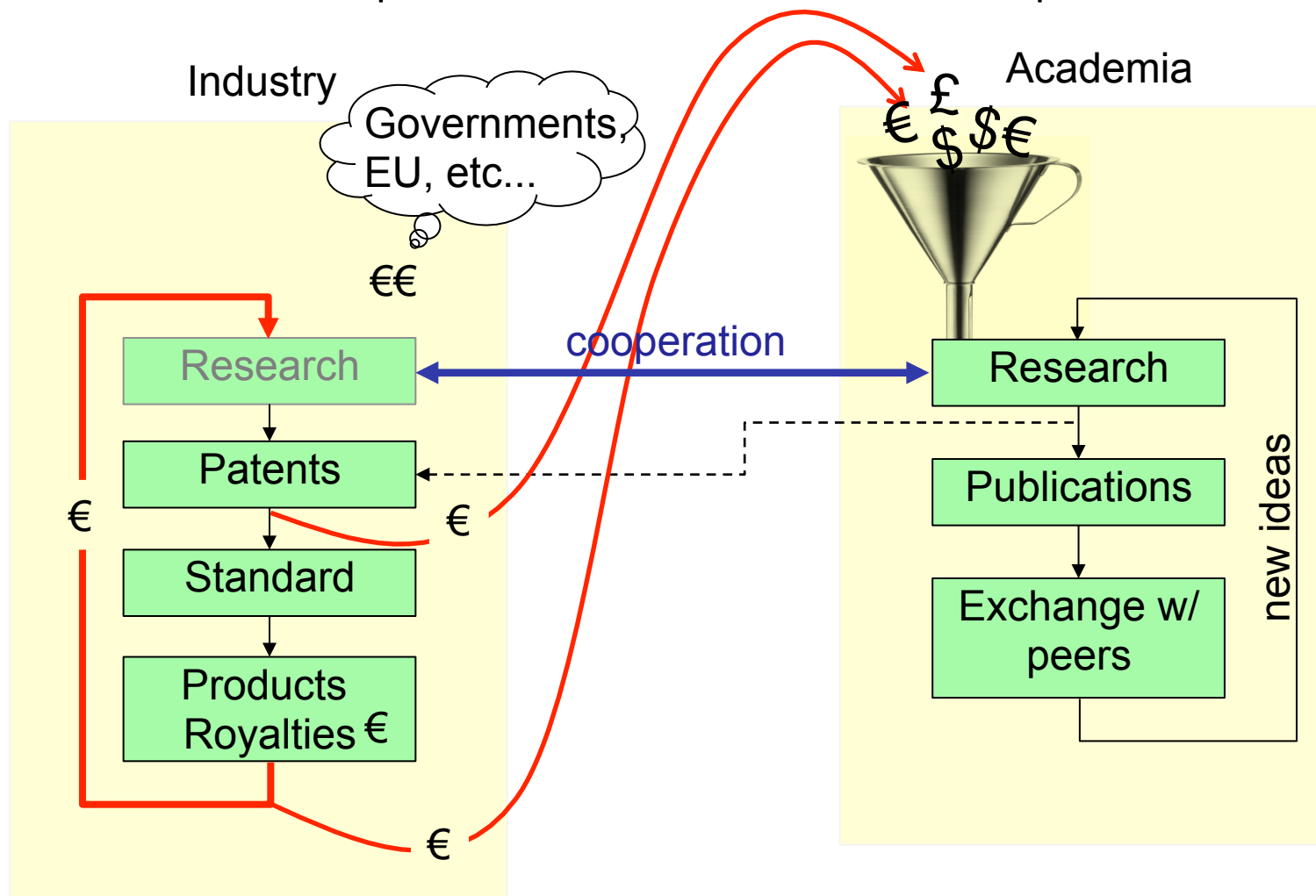
Standardization (3GPP, ETSI, ITU,...) is crucial to guarantee the interoperability among devices from different vendors (with scale economy)

(in ICT we do not consider the case 1patent=1product=1company)



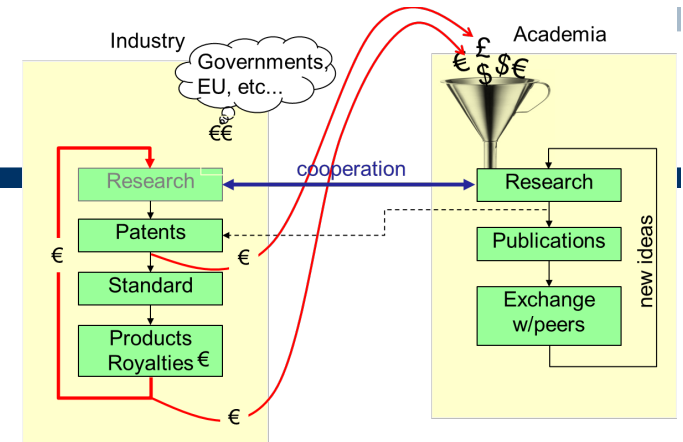
Innovation cycle: industry vs academia

A simplified model of the innovation loops





Patent as “technical contract”



Assuming that a researcher is *willing* to patent an idea:

- Researcher is focused to highlight the innovative methods as these are valued by peers (but **NOT** Patents)
- Patent is *just* a technical contract where “words” are used in Claim structure to protect the innovation (wording is the only part used by Court to defend your rights)
- Patent attorney does not just “translate the scientific paper into legal words” but rather forecasts all legal issues that might raise to legally defend the idea in Court in future (Patent Attorney writes the technical contract)

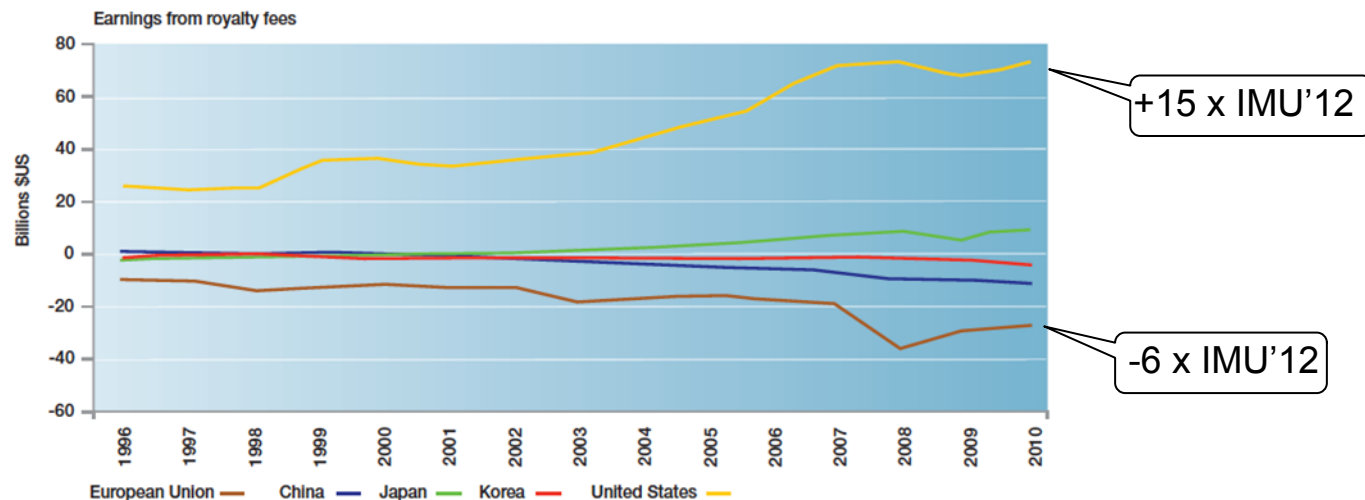
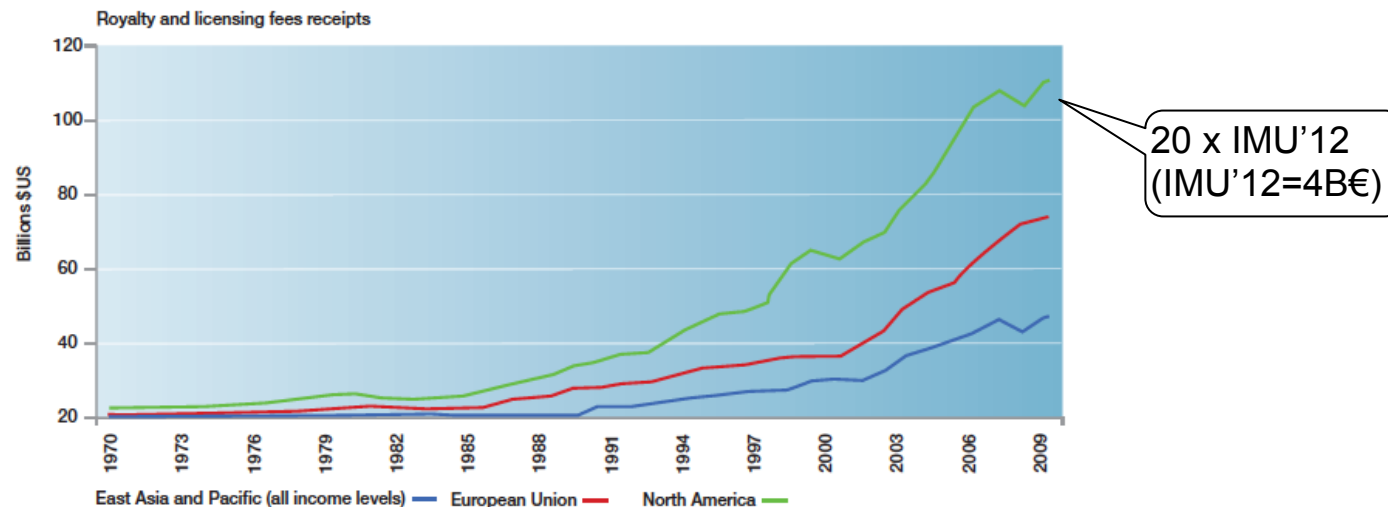
Patent is different from a scientific publication (and not always coincide)

Example: A and B communicate in noisy environment but they need to set a common language

- **Researcher view:** find the “best algorithm” to let A and B communicate (methods, limits, equations!)
- **Patent Attorney view:** in order to let A and B communicate, they need to agree before. Claim the hand-shake signaling is a stronger patent (=easier to be defended in Court) than the algorithm and equations!



Few facts: the in-flow/out-flow of royalties

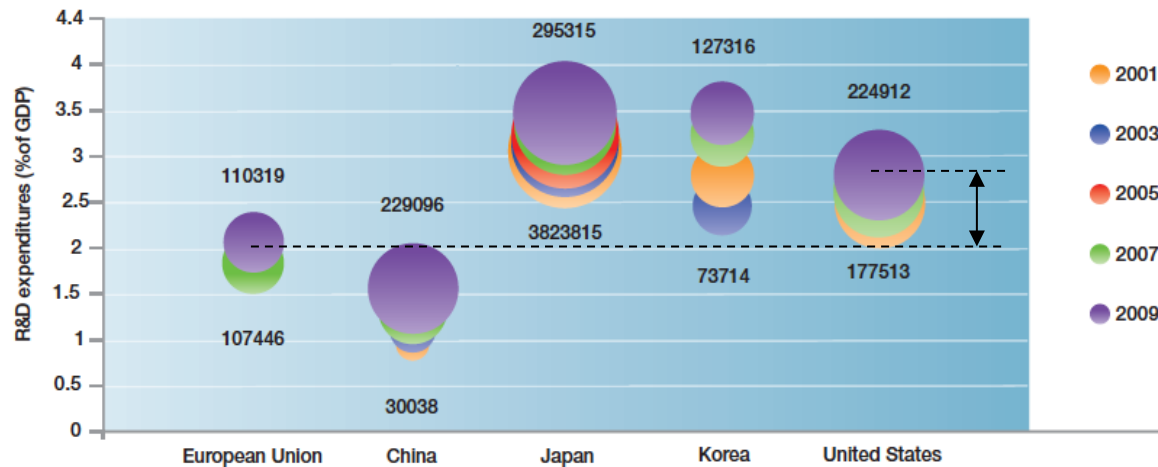


Data source: IMF

IMU (Imposta Municipale Unica) is a property tax on the estate in Italy, approx 4BEuro in year 2012



Figure 3. R&D expenditure in percentage of GDP, compared to number of resident patent filings from 2001 to 2009

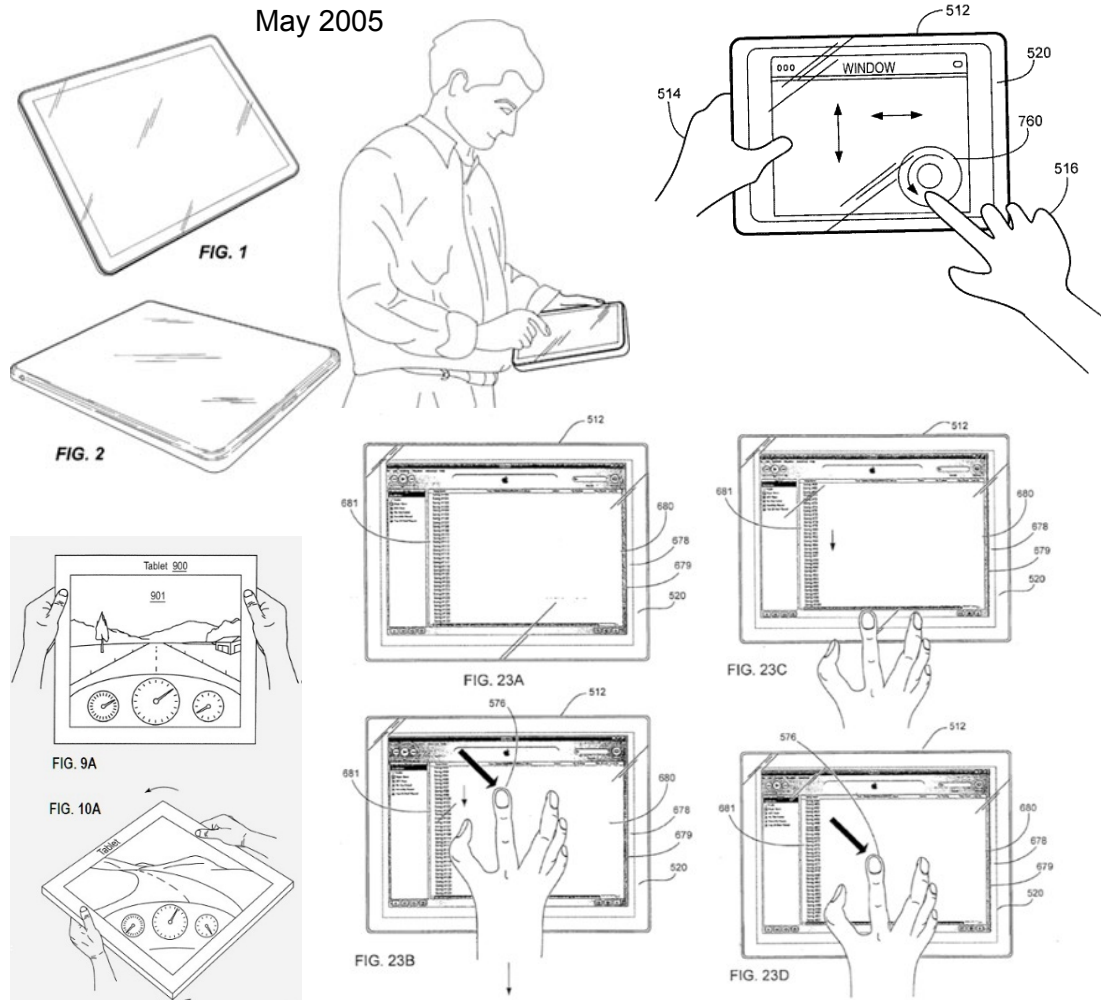


Data source: World Bank

R&D expenditure alone is not enough to justify the unbalance between EU and US



Tablets and IPs



May 2005

Apple Tablet

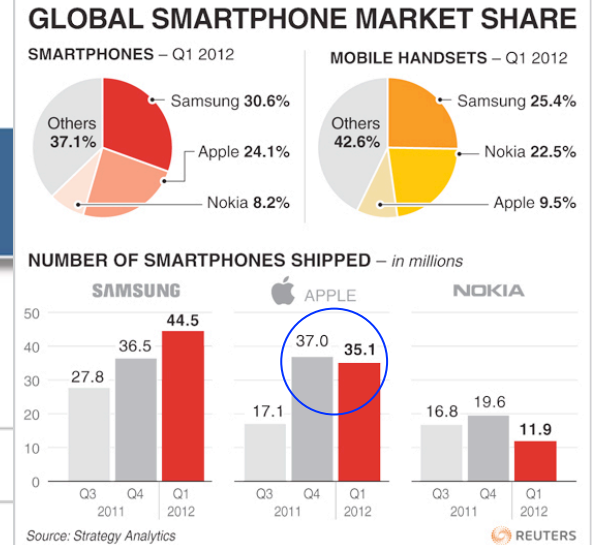
The rumor timeline

We've taken every rumor we could scrape up on Apple's mythical device and put them together in one gigantic chart. Can you spot the trends?

	Description	CPU	OS	Size	Launch	Price	Source
NOV 18 2002	Large iPod, no keyboard	Motorola PowerPC	OS X	8" diag.	Early 2004 MacWorld		Matthew Rothenberg eWeek
MAY 23 2005	Whiteish, funky icon menu, touch pen	Intel / PPC Hybrid	OS X "stripped down"		"soon"		Rob Bushway, CutMeLoose
NOV 26 2006	Home automation, Apple Hi-Fi, dockable, HDMI	Intel			Mid-2007		Smarthouse
SEP 26 2007	Modern day Newton, multitouch			1.5x iPhone 720x480	First half of 2008		Apple Insider
APR 27 2009	Media pad, music, HD video, pictures, place calls over WiFi			Smaller than Kindle 9.7"	Summer 2009		BusinessWeek, China Times
JUL 24 2009	Jumbo iPod touch with 3G data	ARM Custom	OS X	10"	Q1 2010	\$699 - \$799	Apple Insider
SEP 15 2009	Built-in HSDPA	P.A. Semi		9.6"	Feb 2010	\$799 - \$999	Taiwan Economic News
SEP 29 2009	3G and non-3G, "looks like an iPhone 3G"	P.A. Semi	iPhone OS	10.7" 720p	Announced Jan '10, ships May - Jun		iLounge
OCT 07 2009	Built by Foxconn with e-book functionality			10.6"	Q1 2010		Digitimes
NOV 19 2009	Conde Nast working on version of Wired for Apple Tablet			9.7" LG OLED, 10.6" LCD	Second half of 2010	\$2000 OLED, \$800 - \$1000 for LCD	Digitimes, All Things D
DEC 09 2009	Publishing and e-book focused			10.1" LCD	Mar or Apr 2010	\$1,000	Yair Reiner, Oppenheimer
DEC 28 2009				10" glass	Announced Jan, launch Mar or Apr		Digitimes, WSJ China
DEC 30 2009	iPhone-like, video conferencing, 3G, 3D, virtual keyboard			10.1"	Announced in Jan	Less than \$1,000	Kai-fu Lee, former Pres. of Google China
JAN 04 2010	Kindle-like wireless		iPhone OS	10 to 11" touchscreen	Announced Jan 27, Mar launch	\$1,000	John Paczkowski, All Things D
JAN 07 2010	Big iPhone, but not just a big iPhone, pretty		iPhone OS (modified)		Launched in Mar		Business Insider
JAN 11 2010	Apple pre-orders 10" LCD and OLED			10.1" multitouch LED / OLED			TG Daily
JAN 19 2010				9.7"			China Times
JAN 19 2010				Not 10.1" AMOLED			Ars Technica
JAN 19 2010	Looks like an iPhone			10" glass			Mac Observer
JAN 20 2010	WiFi, not 3G. Hybrid of iPhone, iPod, and Mac	ARM-based	iPhone-esque	10 to 11"	June	\$999	Shaw Wu via Apple Insider
JAN 22 2010	Touchscreen MacBook built by Samsung	P.A. Semi	OS X cloud-based	7 to 9"			Richard Doherty, UBS Investment



Value of damages and patents (an example)



Apple vs Samsung (Aug.'12)

Apple vs Samsung 119M\$ (May '14)



- One smartphone stacks multiple patents (up to 250.000!), and Standard compliancy guarantees the interoperability of multivendor devices (scale economies) but there is an apparent contradiction as **any Standard compliant device (=uniformity) stacks multiple patents where each inventor must be guaranteed**

How to rule this complex equilibrium?

- Every industry offers to others its patents to be part of the Standard (e.g., GSM, UMTS, LTE,...) at FRAND (Fair, Reasonable, and Non-Discriminatory) licensing conditions.
- Licensing a patent in FRAND terms is mandatory before the innovation is considered to become part of standard specifications approved by technical Working Groups
- Every patent can be self-declared (to ETSI) as Essential for the Standard and it is in a database of Essential Patents (www.etsi.org/services/ipr-database)
- Any patent self-declared as «essential» is not always truly essential.



3GPP&3GPP2 essential patents

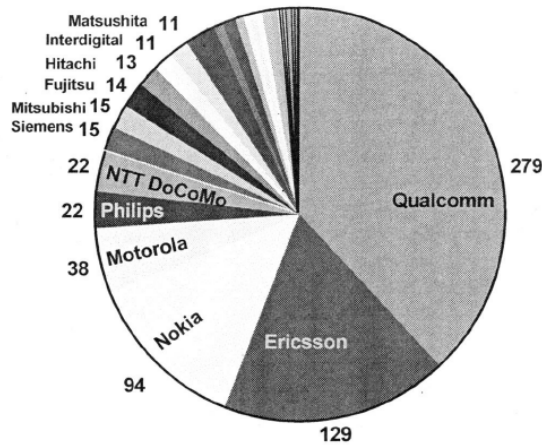


Fig 1: 3GPP Ownership of declared IP

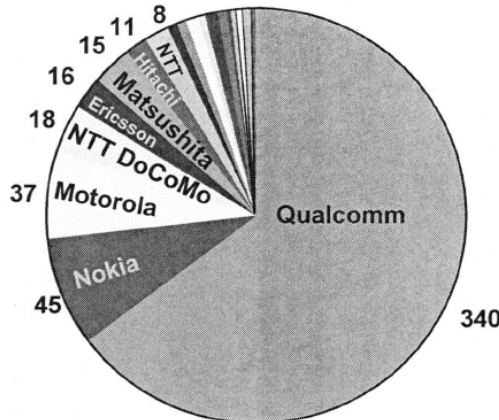


Fig 2: 3GPP2 Ownership of declared IP

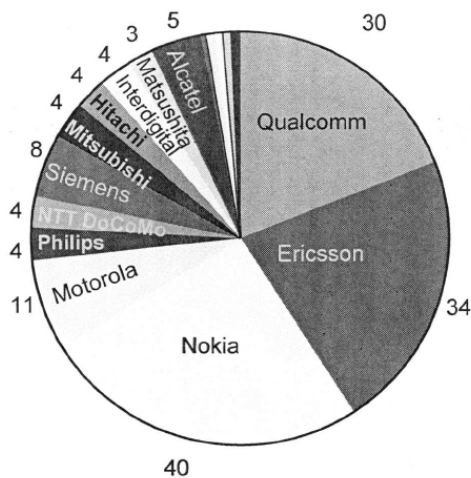


Fig 5: IP judged essential, 3GPP ownership

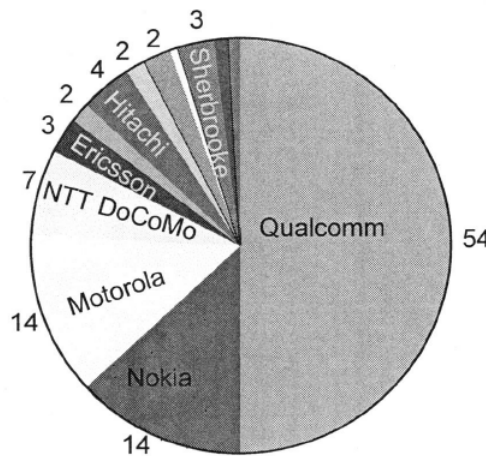


Fig 6: IP judged essential, 3GPP2 ownership

Table 3: Technical categories

Technical category	Patents declared Essential to WCDMA		Patents declared Essential to CDMA2000	
	number	percent	number	percent
antenna	20	2.7	17	3.2
call management	24	3.3	14	2.7
cdma	113	15.4	86	16.3
channel coding	50	6.8	30	5.7
circuits	21	2.9	59	11.2
data	13	1.8	12	2.3
fax	3	0.4	3	0.6
handover	80	10.9	49	9.3
layer 2	29	4.0	22	4.2
location	40	5.5	21	4.0
network	59	8.1	32	6.1
radio resources	119	16.3	80	15.2
security	22	3.0	17	3.2
source coding	79	10.8	49	9.3
synchronization	40	5.5	21	4.0
tdma	4	0.5	1	0.2
terminal	7	1.0	6	1.1
not related to 3G	9	1.2	8	1.5
Total	732	100.0	527	100.0

[Goodman & Myers, IEEE 2005]

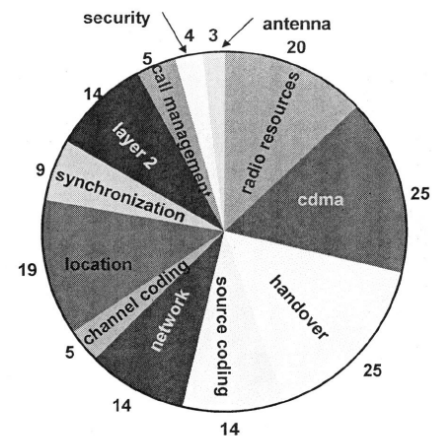


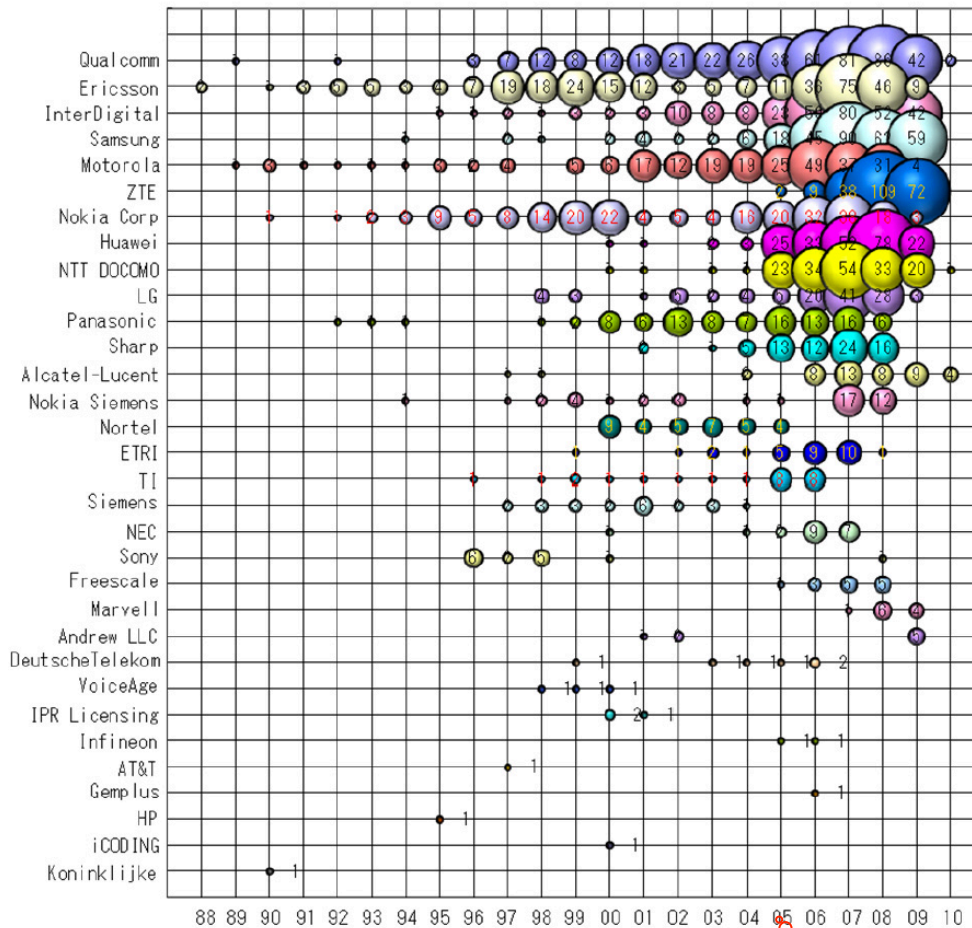
Fig 3: IP judged essential, 3GPP categories

Approx. 21% of declared patents are actually essential



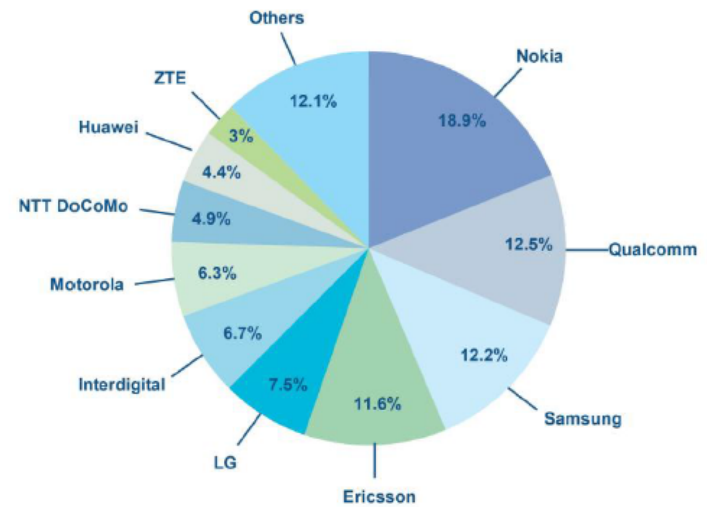
Royalty in LTE?

Number of patents vs time shows an exploding situation where players are preparing for a **big**-business



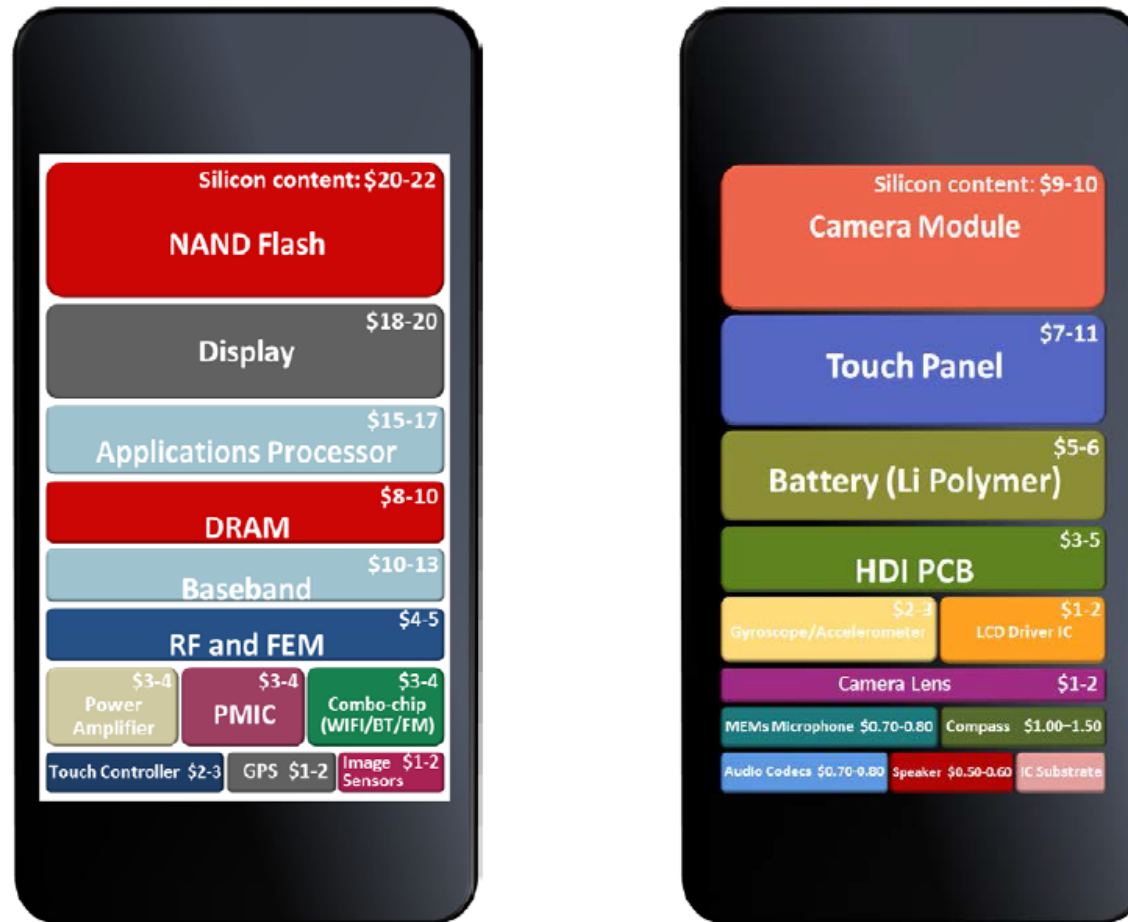
Start of LTE standardization

Highly Essential Patents Ranked Based on Ratio of High Novelty Patents





Royalty vs Hardware in a \$400 smartphone?¹²



Hardware: \$120-150

From: The Smartphone Royalty Stack by A.Armstrong, J.J.Mueller, T.D.Syrett (draft paper)



Royalty vs Hardware in a \$400 smartphone?¹³

Company	Royalty (\$400 device)	Royalty Rate/Unit
Lucent Technologies	\$10,000 + 5% of product ¹¹⁰ (requested)	~\$20.00
Agere	5% of product (requested) ¹¹¹	\$20.00
Motorola	2.25% of product (requested) \$0.008 (court awarded) ¹¹²	\$9.00
Innovatio IP Ventures	\$0.03 (court awarded for Xbox) ¹¹³ \$3.39 - \$36.90 ¹¹⁴ (requested)	\$7.20 ¹¹⁵
Sisvel Patent Pool ¹¹⁶	\$0.0956 per Wi-Fi chip (court awarded)	
	€0.71 per device (if licensee grants Nokia a license to its 802.11 SEPs) (requested)	\$1.18
	€0.86 per device (if licensee does not grant Nokia a license to its 802.11 SEPs) (requested)	
Via Licensing ¹¹⁷	Per Unit Sliding-Scale Fee Based on Volume, ranging from \$0.55 to \$0.05 (requested) ¹¹⁸	\$0.55
Ericsson	\$0.50 (requested) \$0.05 per patent per product (court awarded)	\$0.50 ¹¹⁹
Total		\$50.23

WiFi: \$50.23 (12.5%)

From: The Smartphone Royalty Stack by A.Armstrong, J.J.Mueller, T.D.Syrett (draft paper)



Royalty vs Hardware in a \$400 smartphone?¹⁴

Company	Announced LTE Rate	Royalty (\$400 device)
Qualcomm	3.25% of device ³¹	\$13.00
Motorola	2.25% of device	\$9.00
Alcatel-Lucent	Up to 2% of device	\$8.00
Huawei	1.5% of device	\$6.00
Ericsson	1.5% of device	\$6.00
Nokia	1.5% of device	\$6.00
Nortel ³²	1% of device	\$4.00
ZTE	1% of device	\$4.00 ³³
Siemens	0.8% of device	\$3.20
Via Licensing	Per Unit Sliding-Scale Fee Based on Volume ³⁴	\$2.10 per unit (sales over 10M units)
Sisvel Patent Pool	0.99 Euros per device ³⁵	\$1.36
Vodafone	Free ³⁶	\$0.00
Total		\$54.30

LTE: \$54.30 (13.5%)

From: The Smartphone Royalty Stack by A.Armstrong, J.J.Mueller, T.D.Syrett (draft paper)



Royalty vs Hardware in a \$400 smartphone?¹⁵

Technology	Potential Royalty Demands
Cellular Baseband Chip (Standardized)	\$54
Wi-Fi/802.11	\$50
AAC	\$0.20
MP3	\$0.95
H.264	\$10.60
Operating system software (Microsoft or Android)	\$5-8
Total (approx.)	\$121-124

Royalty: \$121-124 (30-31%)

Hardware: \$120-150 (30-38%)

From: The Smartphone Royalty Stack by A.Armstrong, J.J.Mueller, T.D.Syrett (draft paper)



A new role of academia in ICT innovation

16

- Gain more sensitivity to the patenting process in ICT
- Sell research/innovation and take risks/benefits (not just selling patent applications)
- Gain insight in the Intellectual Property scenario



A new role of academia in ICT innovation

17

- Gain more sensitivity to the patenting process in ICT
- Sell research/innovation and take risks/benefits (not just selling patent applications)
- Gain insight in the Intellectual Property scenario

