Helping the world communicate

from the mobile internet to the ubiquitous internet

Yonsei University Graduate Global IT and Telecommunications Programme

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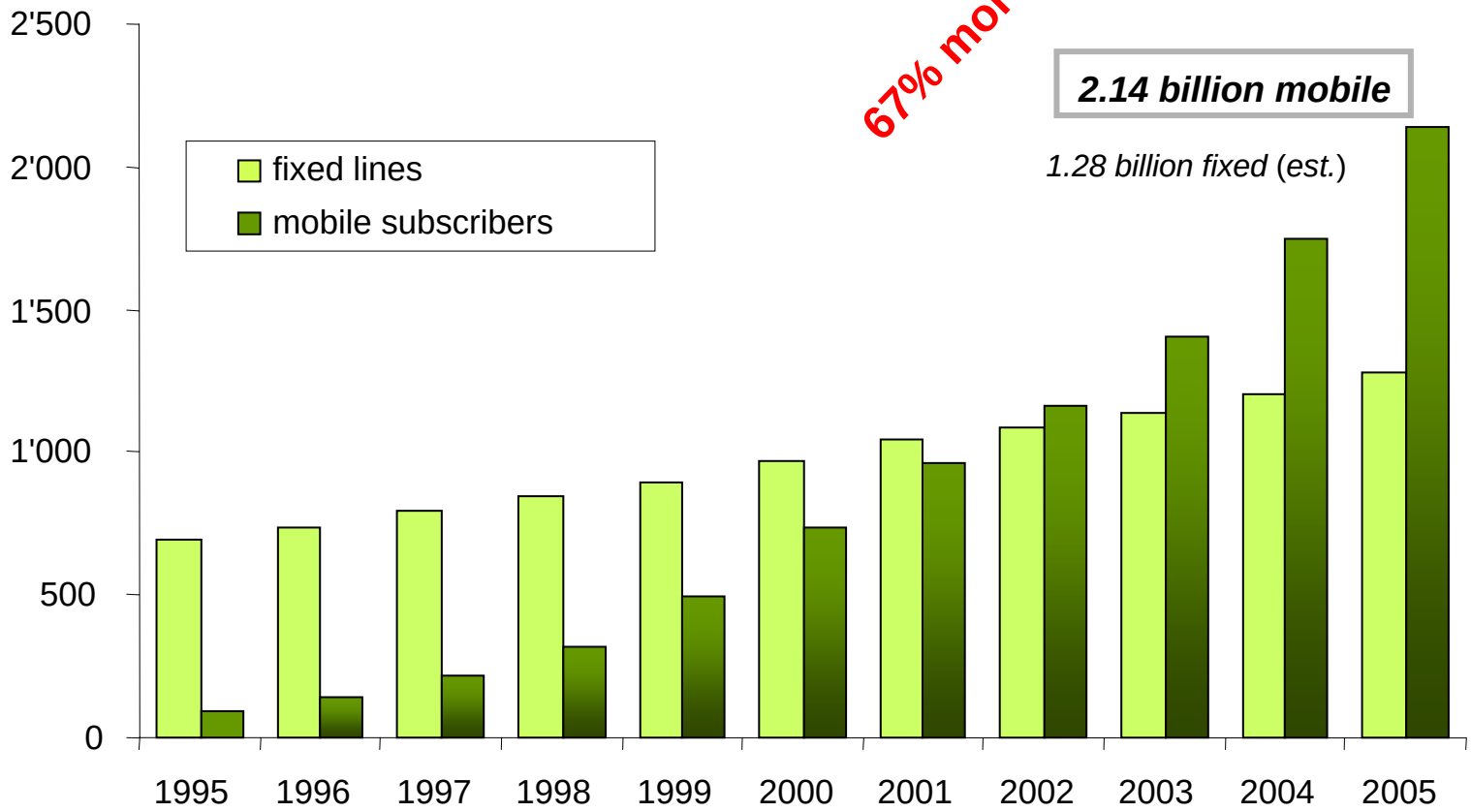
industry transitions

- from local thinking to global thinking
- from physical distance to virtual proximity
- from stable markets to fast-paced innovation
- from stringent regulation to increasing forbearance
- from low-speed to high-speed
- from frequent information flow to perpetual information flow
- from sometimes-on to always-on
- from fixed to mobile

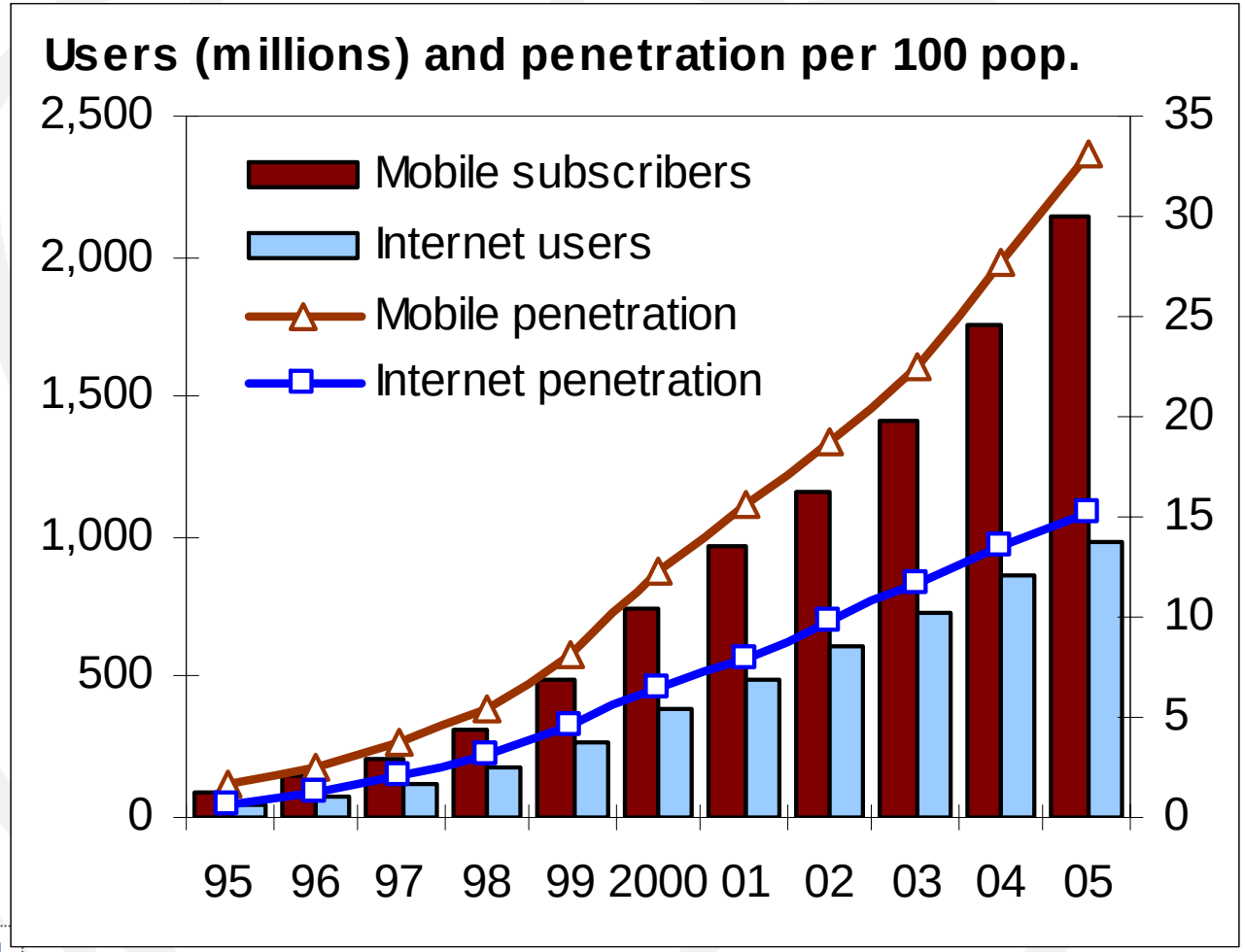
NASA

One mobile phone for every three human beings...



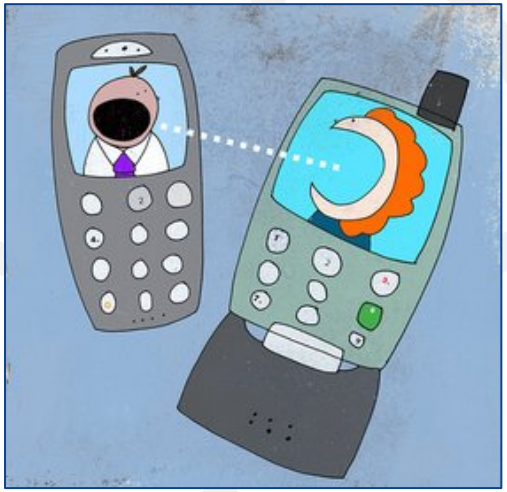
Source: ITU

… and one person out of every 6 is an internet user



the two giants of the ICT industry: Mobile and the Internet

so what of mobile + internet



Not surprisingly there is much excitement about combining the two

- A merger of:
  - mobile (wireless) technologies
  - and information and data communications services
  - with the flexibility of IP networks
- Convergence of:
  - terminals
  - networks
  - services and applications
  - corporate structures

What drives it?

- **User requirements**
  - on-the-go access to information
  - communication & file sharing
  - thirst for multimedia

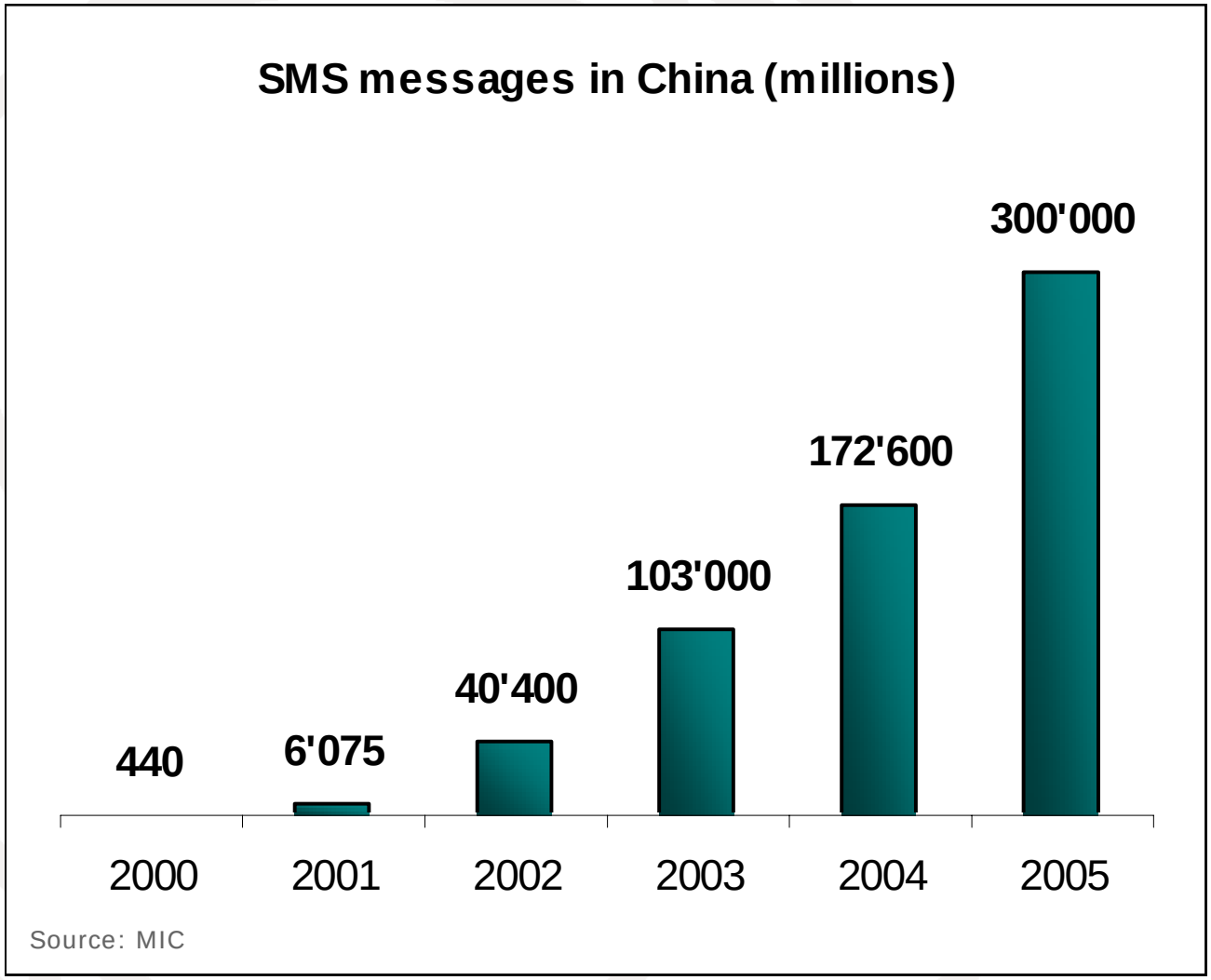
- **Market trends**
  - the mobile revolution
  - rapid take-up of internet and broadband
  - increased use of portable and palmtop computers, and multimedia devices

- **Technological Innovation**
  - high speed, cost effective mobile systems
  - integrated computing applications
  - small, powerful, application-rich user devices

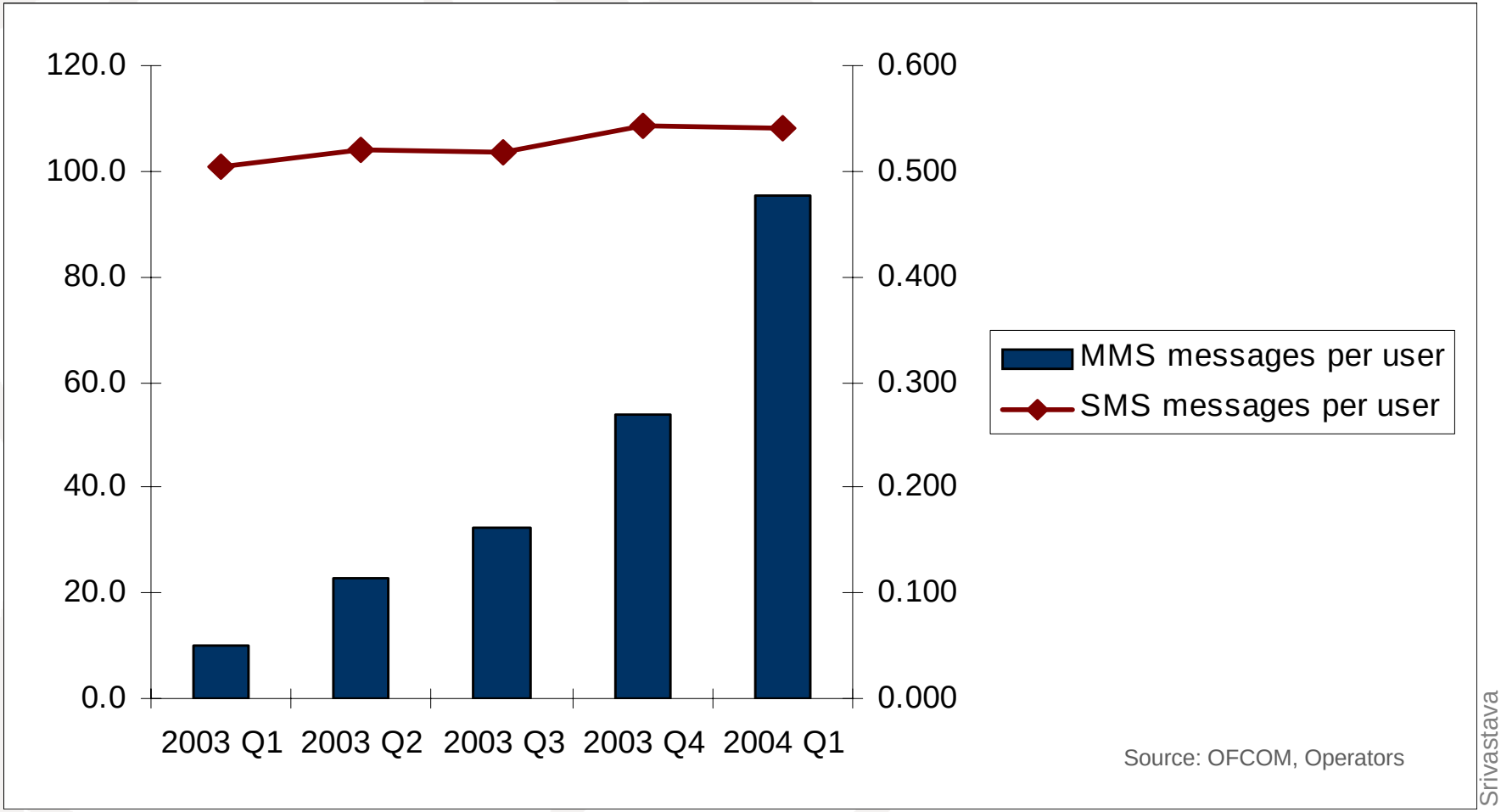
Early mobile internet: Mobile messaging mania!

- *Korea*: mid-2005 – 90 million text messages sent a day
- *United States*: youth sending around 1.6 billion text messages a month (mid-2005), but with convergence of TV and messaging in formats such as 'American Idol,' analysts predict this to increase to 2.5 billion messages a month, over 30 billion messages sent a year.
- *United Kingdom*: 2005 saw 29 billion SMS sent, compared with ~20 billion in 2003

Phenomenal SMS growth in the giant of the mobile world



and MMS begins to take off…
(e.g. UK SMS vs MMS per user)

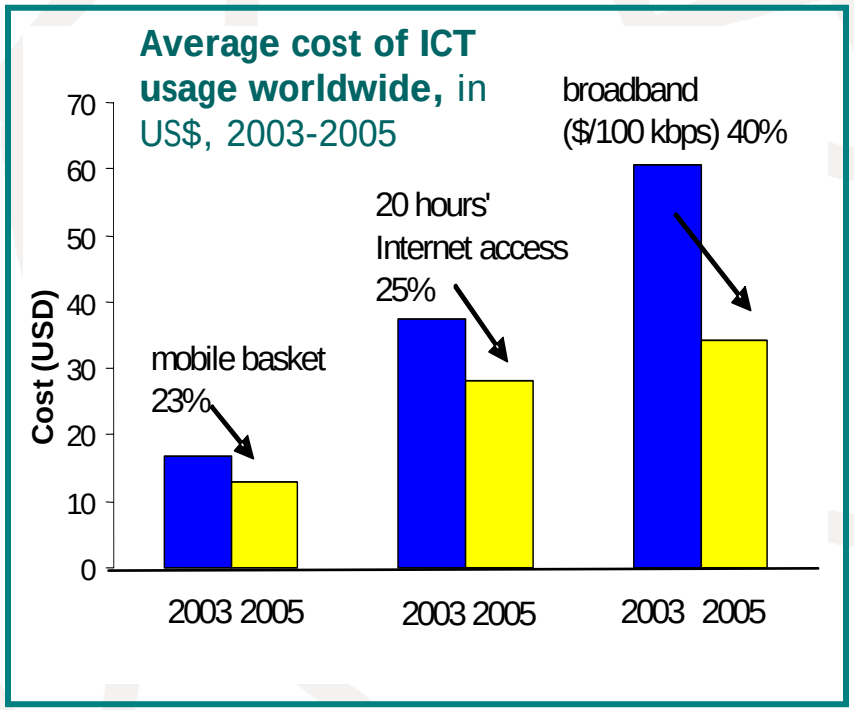


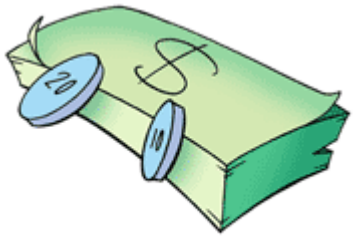
money in the pocket: certainly…but whose pocket?

- By some estimates, the total SMS revenues in 2005 were about 75 Billion USD. Compare this to:
  - *Global box office ~ 25-30 billion USD (US only 9 billion).*
  - *Global music industry revenues ~ 35 billion.*
  - *Videogaming, consoles and all software ~ 40 billion*
  - SMS outdoes them all
- However, SMS is still priced above cost!
- Operators have in fact been increasing the retail price of SMS instead of decreasing it (e.g. roaming premiums introduced after SMS became “popular”)
- How will this encourage **future services**?

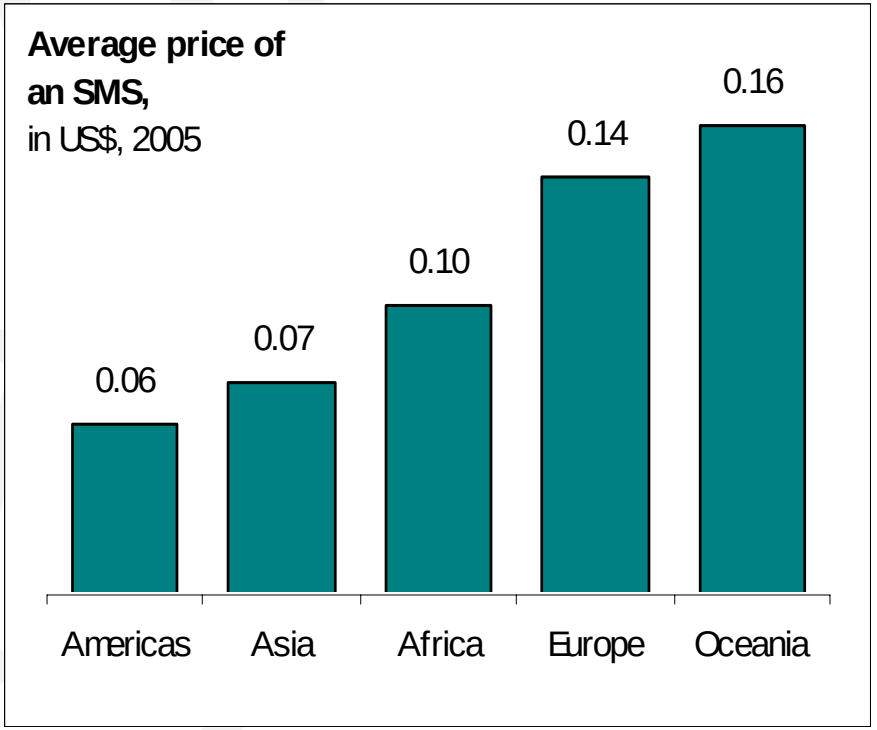
the numbers on affordability

price of mobile services hasn't decreased at same rate as broadband, internet





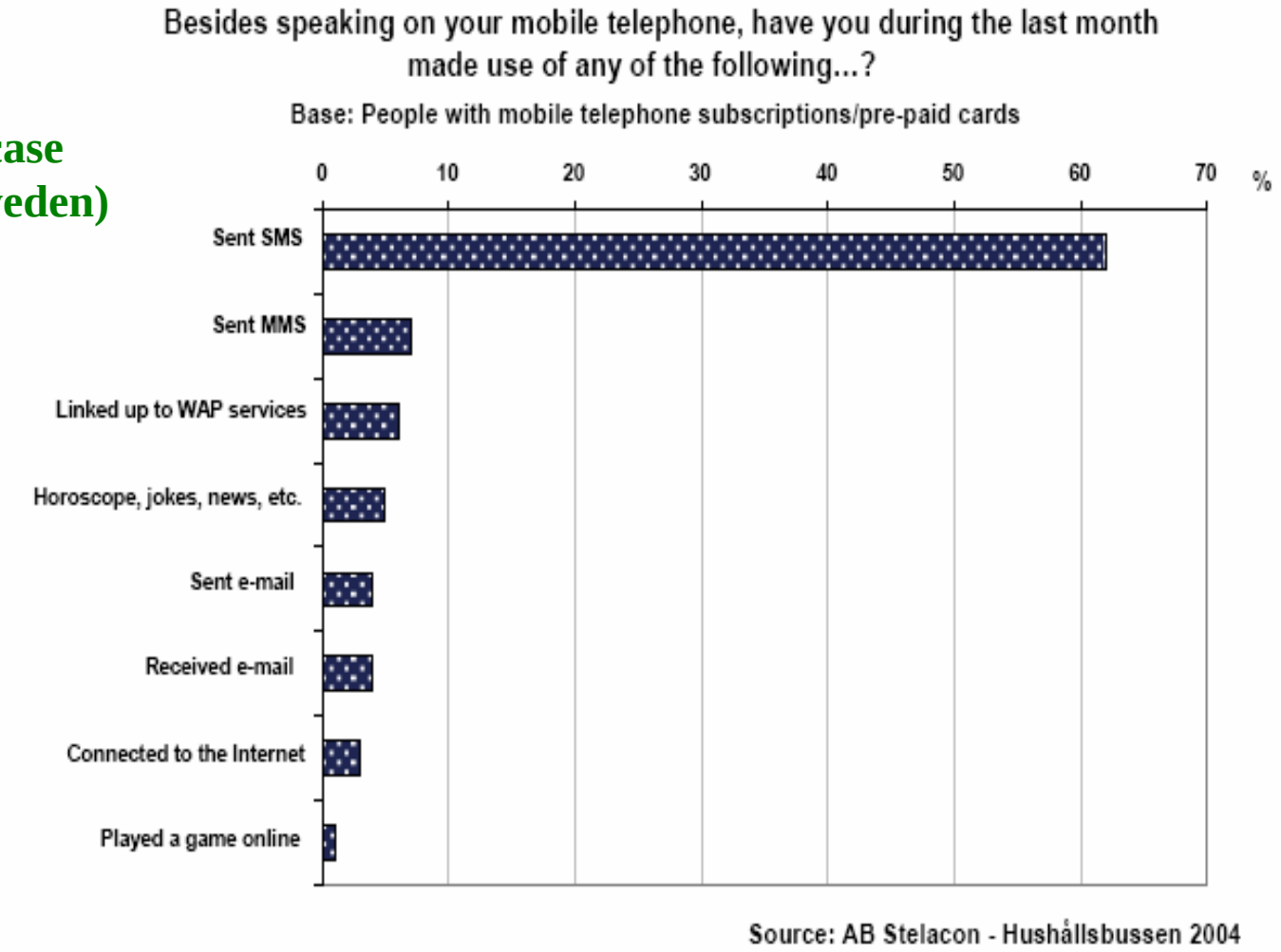
cheap-to-produce services, e.g. SMS, priced well-above cost in some regions



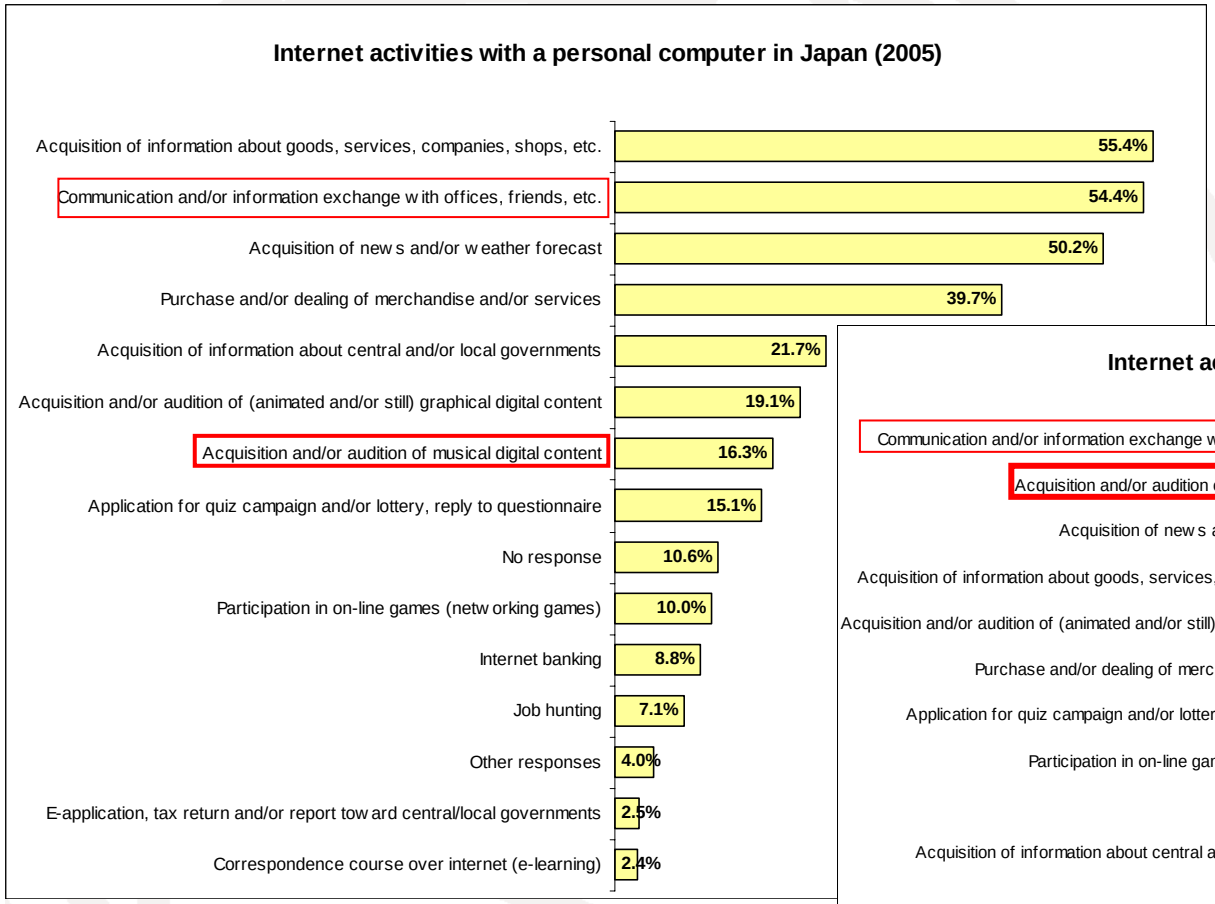
Source: ITU World Information Society Report

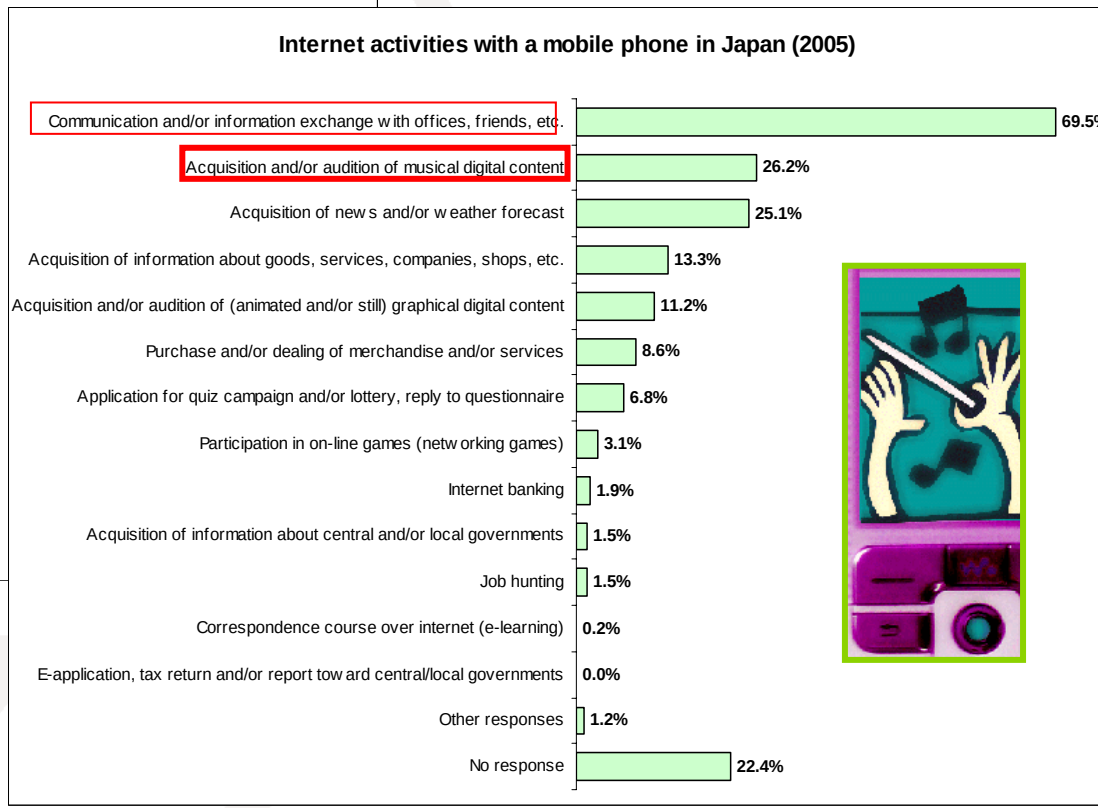
Europe seeing the impact of the lack of affordability

(the case of Sweden)



meanwhile, in Japan, digital music is more popular over mobiles than PCs!





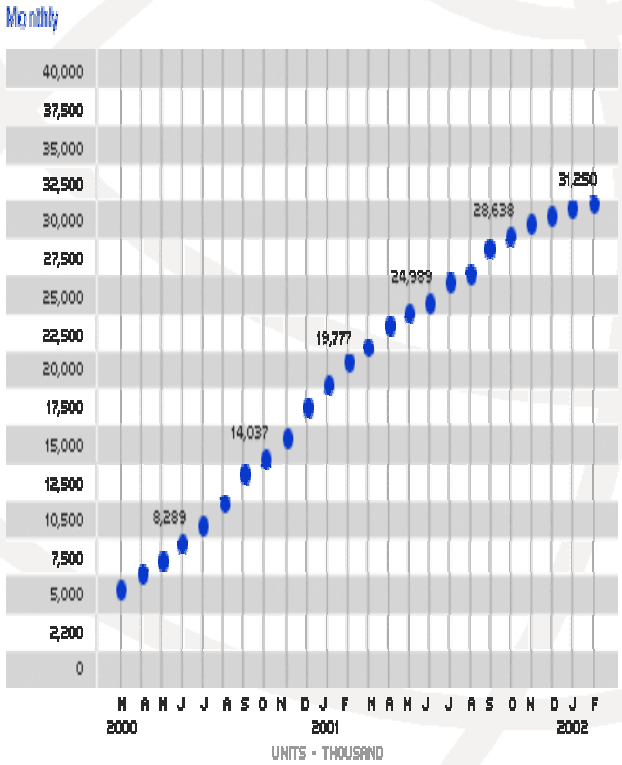
Source: MIC

Much has to do with the success of services like i-mode

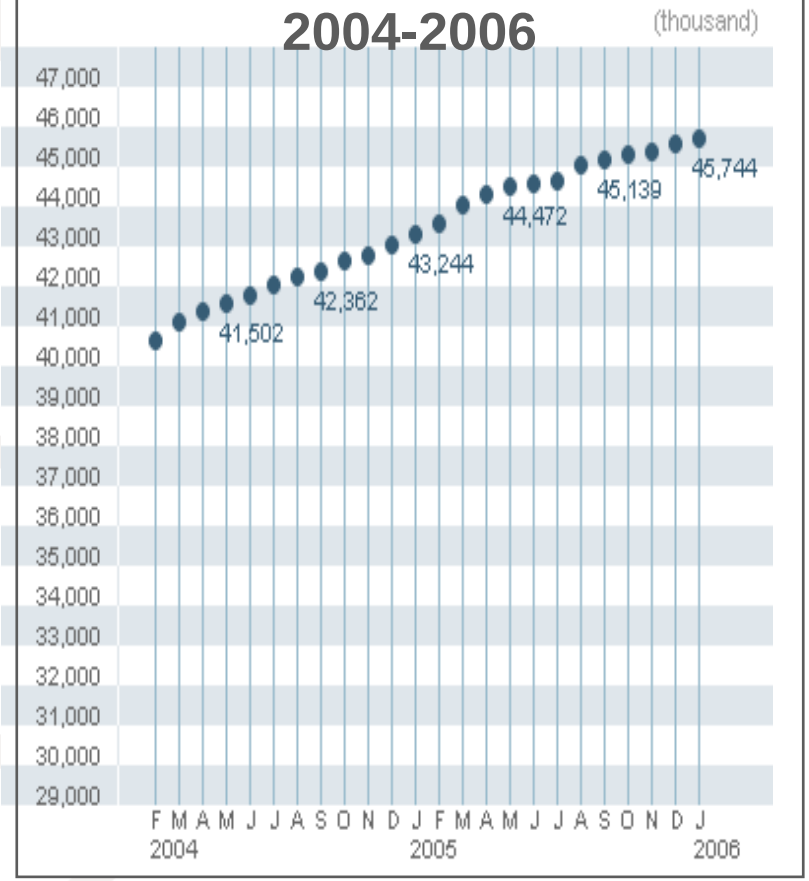
April 2002: 32 million subscribers

December 2005: 85.6 subscribers

Growth of i-mode subscribers 2000-2002

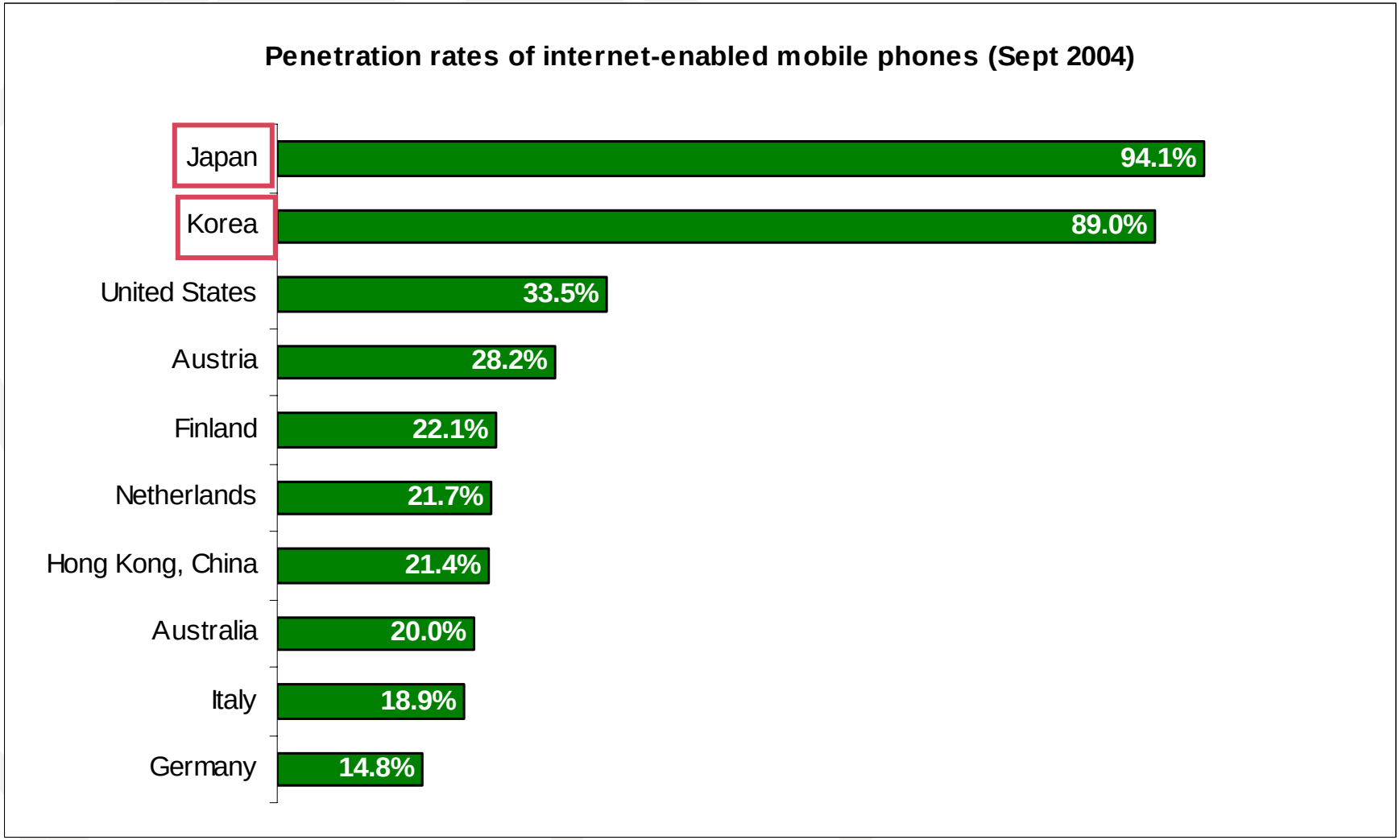


Growth of i-mode subs 2004-2006



Source: http://www.nttdocomo.com

mobile internet penetration



Source: MIC, 3G mobile, as cited in ITU New Initiatives Programme, The Regulatory Environment for Future Mobile Multimedia Services, 2006

key factors for making the internet mobile

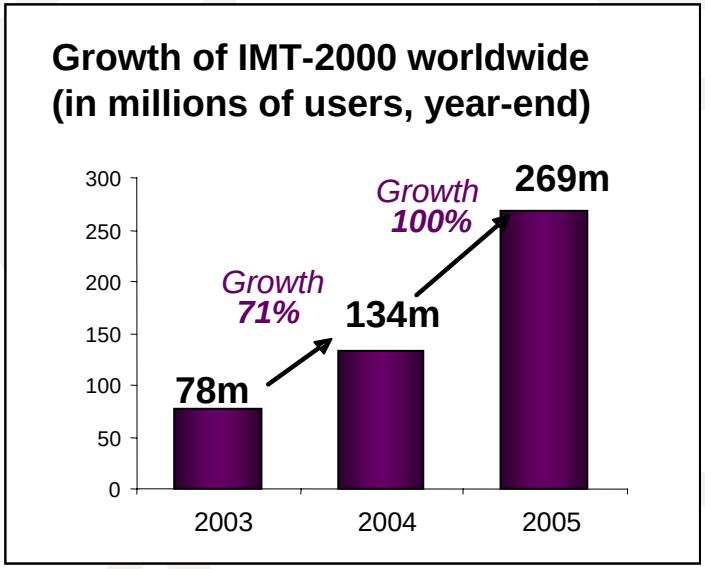
- Avoiding the replication of the fixed-line internet access experience
  - awareness of issues such as screen size
  - understanding the user
- Harmonization of content
  - Open source, open access
    - e.g. Japan
- Cultural and locally-relevant content
- Affordable, cost-based pricing
- Appropriate policy/regulatory framework
  - including the protection of IP rights

....and....

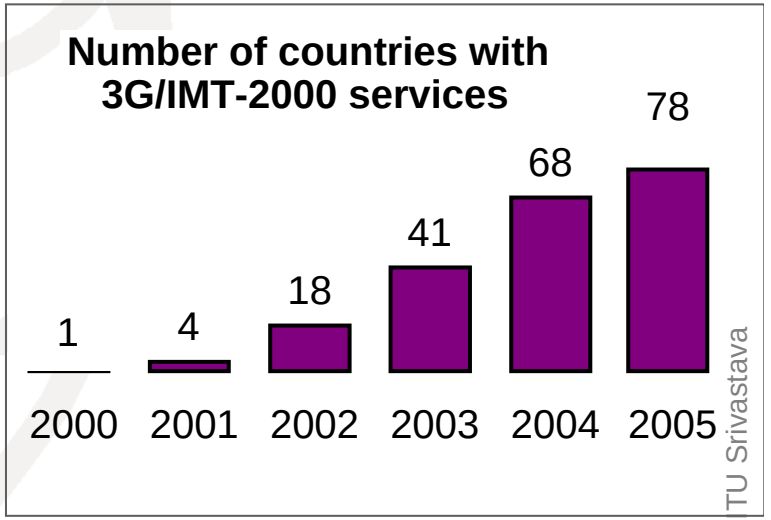
...and speed: the next G

Growth of W-CDMA and CDMA 20001x

Users



Countries with networks



W-CDMA subscriber growth (Jan 2005 – December 2005)

44.42 million W-CDMA subs worldwide at year-end 2005

Source: 3G today

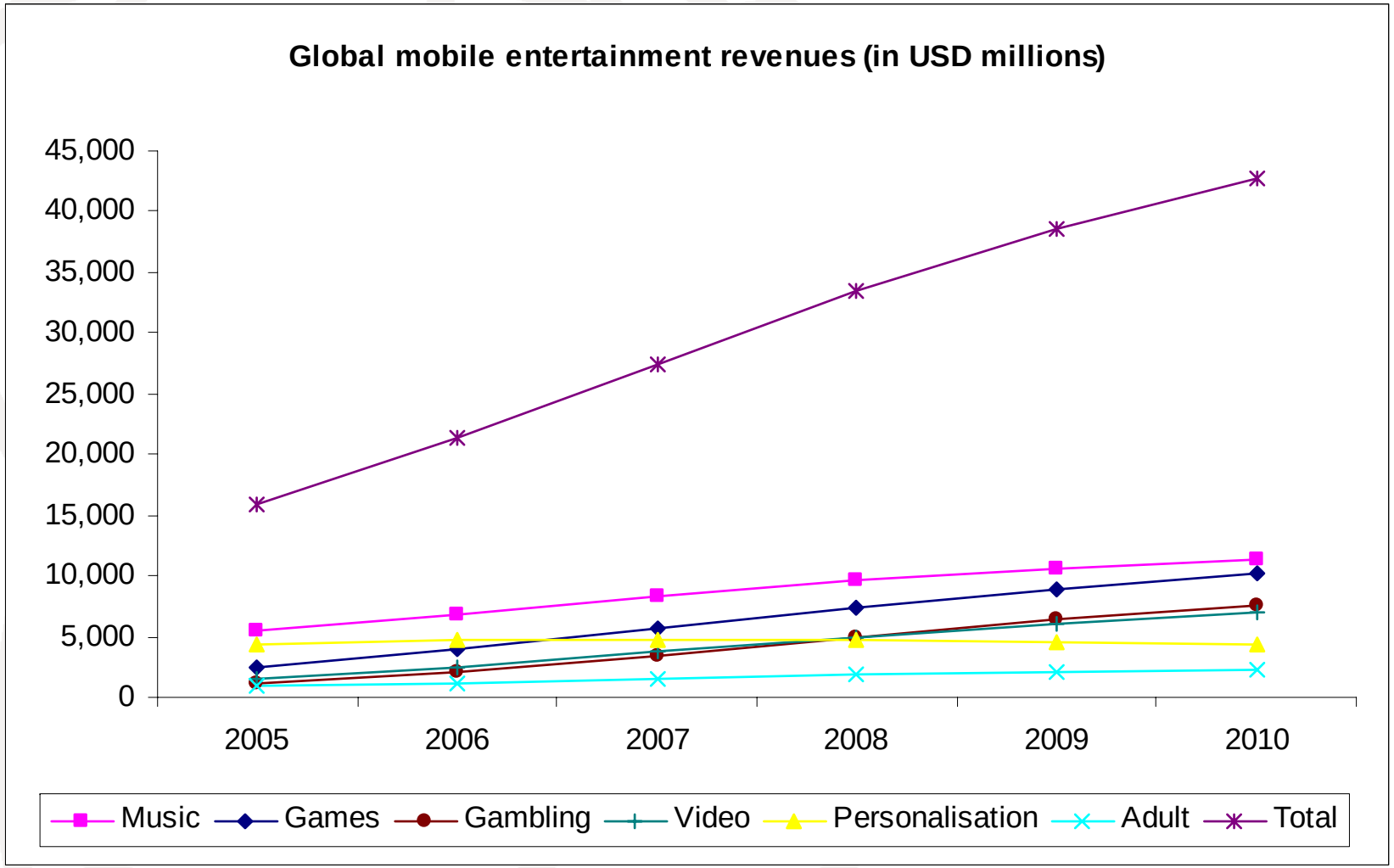
IMT-2000:

W-CDMA, CDMA 2000 1x, CDMA 2000 1x EV-DO

- **IMT-2000 Subscribers:**
  - 324 million "IMT-2000" users in total in March 2006
- **A head start for CDMA 2000?**
  - CDMA2000 1x seems to have a head start on **W-CDMA** for now
  - CDMA 2000 1x was a more natural shift from 2G cdmaOne - the jump from GSM to **W-CDMA** was a more substantial upgrade
  - another reason cited is the high licensing fees for 3G in Europe (UMTS)

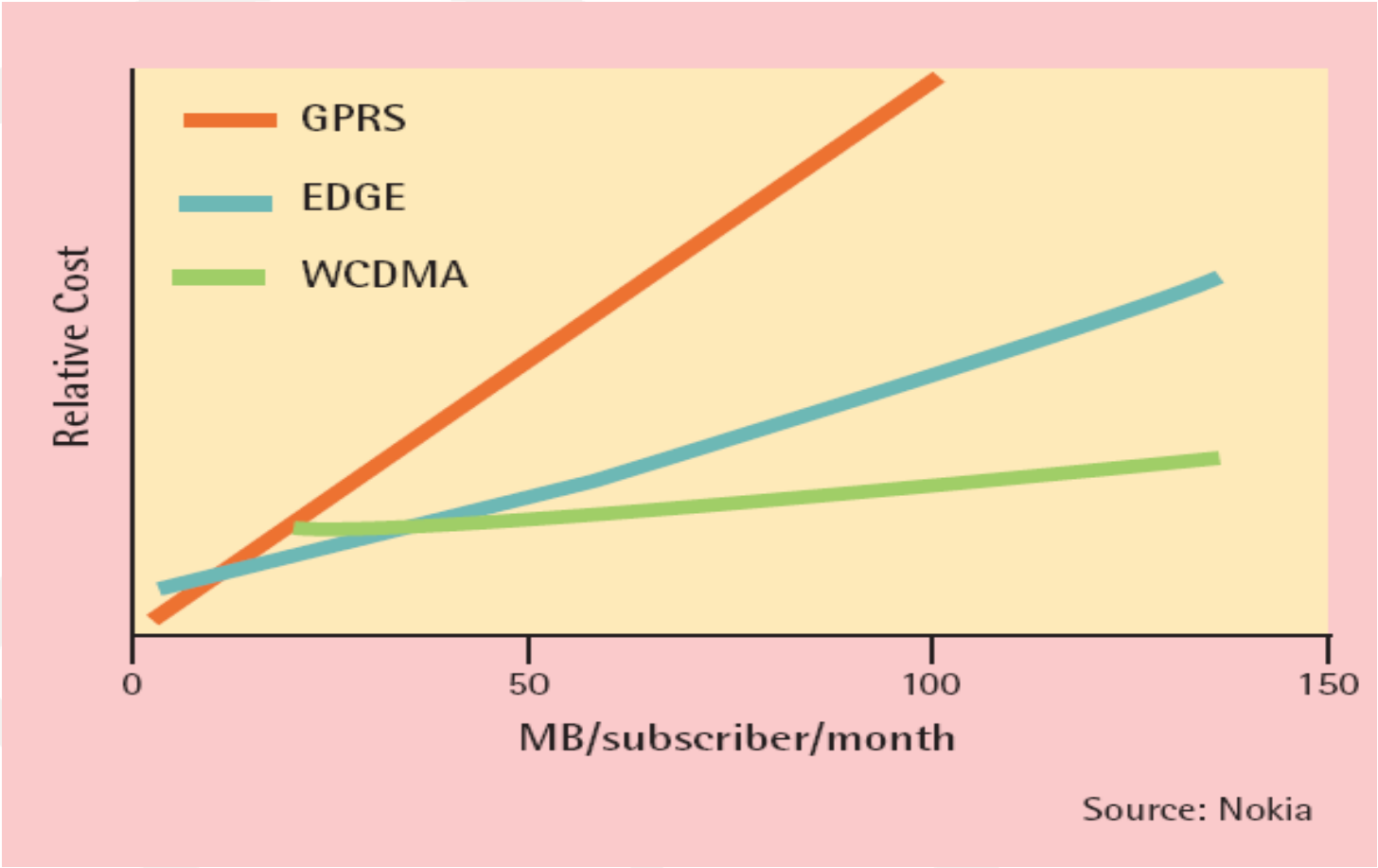
- **Classification:**
  - Although ITU includes CDMA2000 in the IMT-2000 family, it can be said that it is more appropriate to refer to CDMA 2000 1x EV-DO when talking about mobile broadband
  - there are more W-CDMA subs than CDMA 1x EV-DO
    - of which 86.2 million W-CDMA (56.1) & 1x EV-DO (30.1) only
- **Speeds:**
  - **W-CDMA**: Average 250-300 kbit/s, theoretical 2 Mbit/s
  - **W-CDMA HSDPA**: Average 2 Mbit/s, theoretical 14 Mbit/s
  - **CDMA 2000 1x:** Average 60-100 kbit/s, theoretical 153 kbit/s
  - **CDMA 2000 1x EV-DO**: Average 400-800 kbit/s, theoretical 2.4 Mbit/s

as high-speed networks are deployed, services will diversify



Source: Informa

...and costs will drop

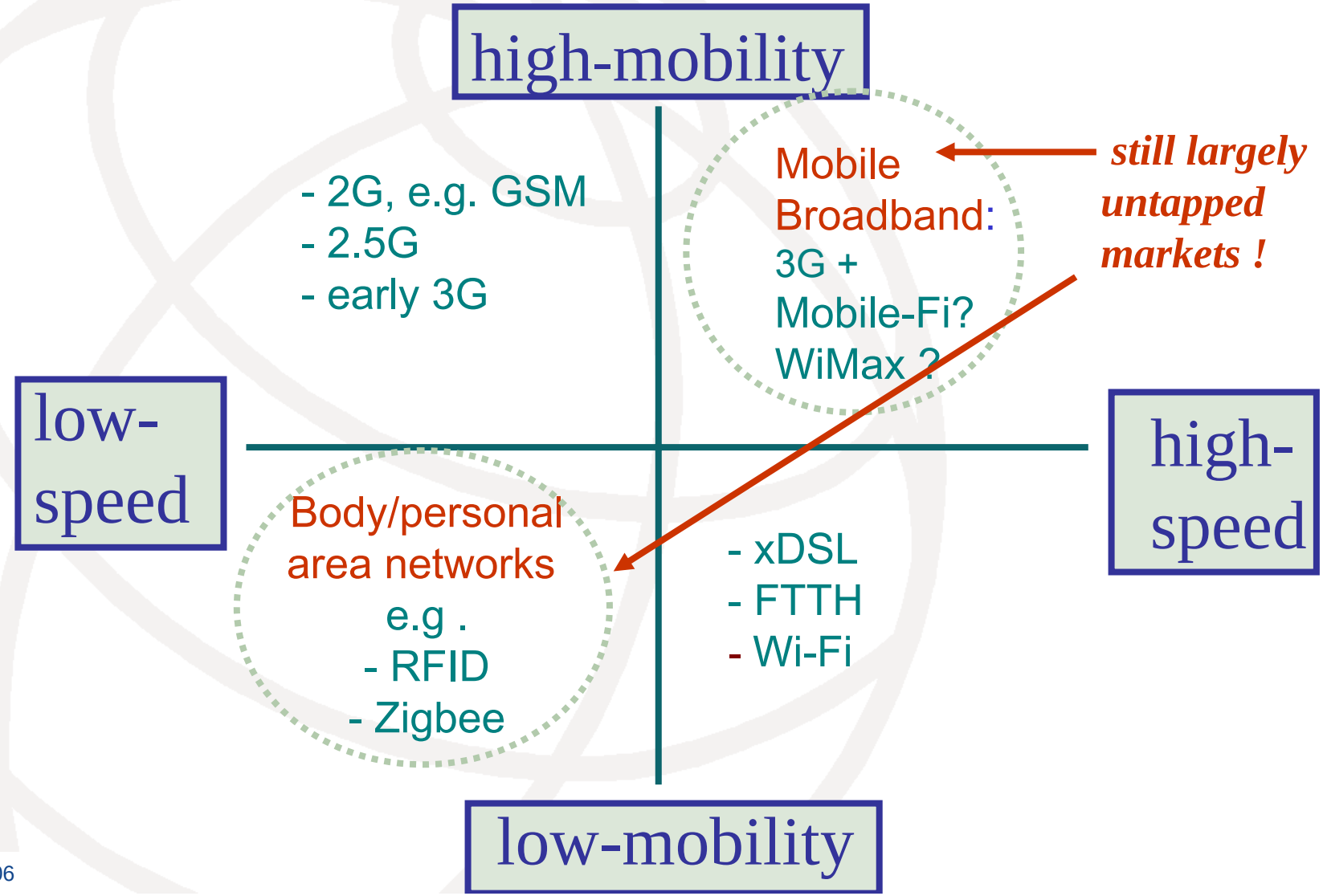


Source: Nokia, as cited by UMTS Forum

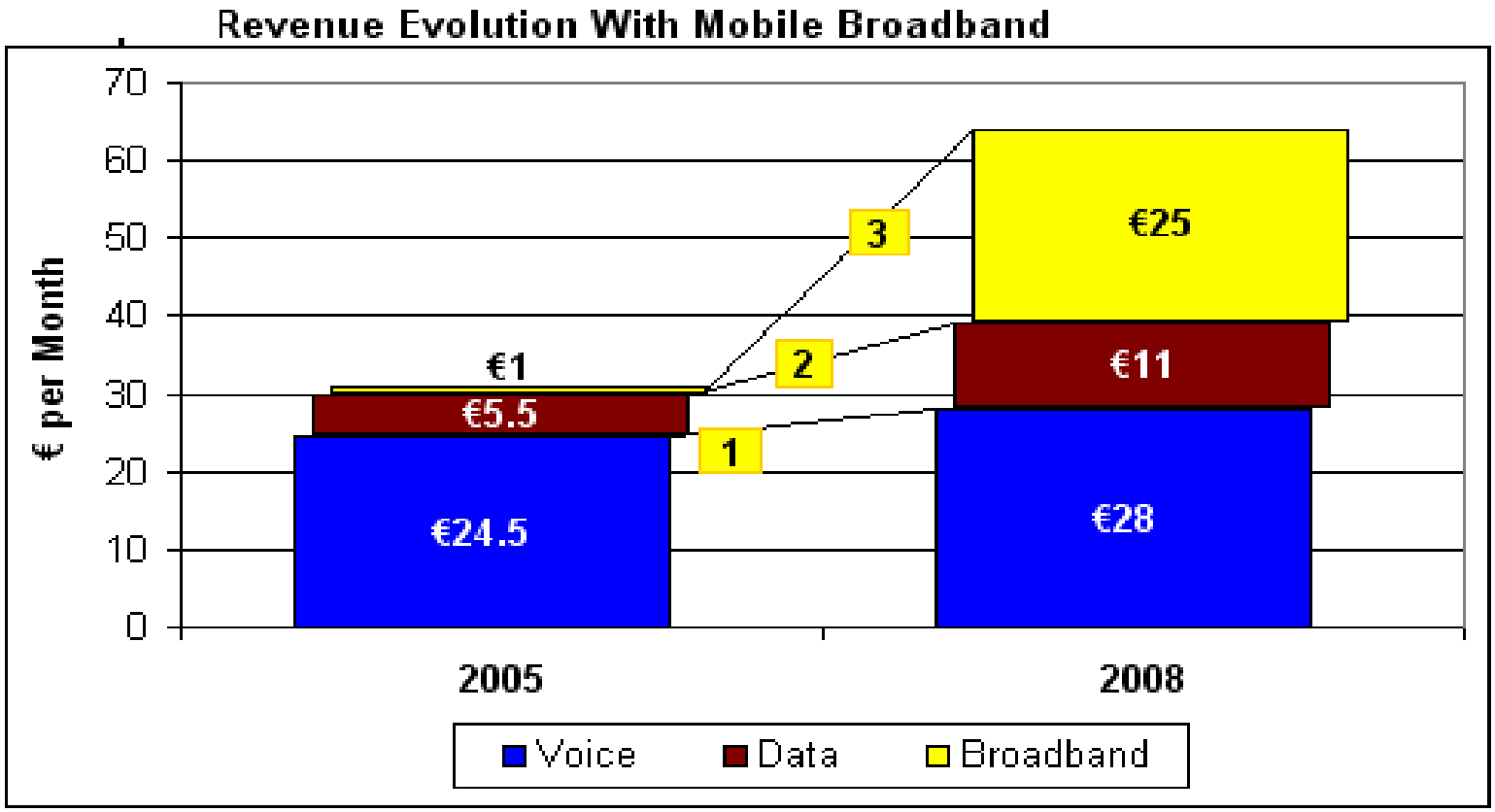
but that question remains: are/will retail prices drop sufficiently?

mobile internet, *portable* internet

the trade-off? mobility and speed



mobile broadband untapped revenue opportunities



Source: *Unstrung Insider*

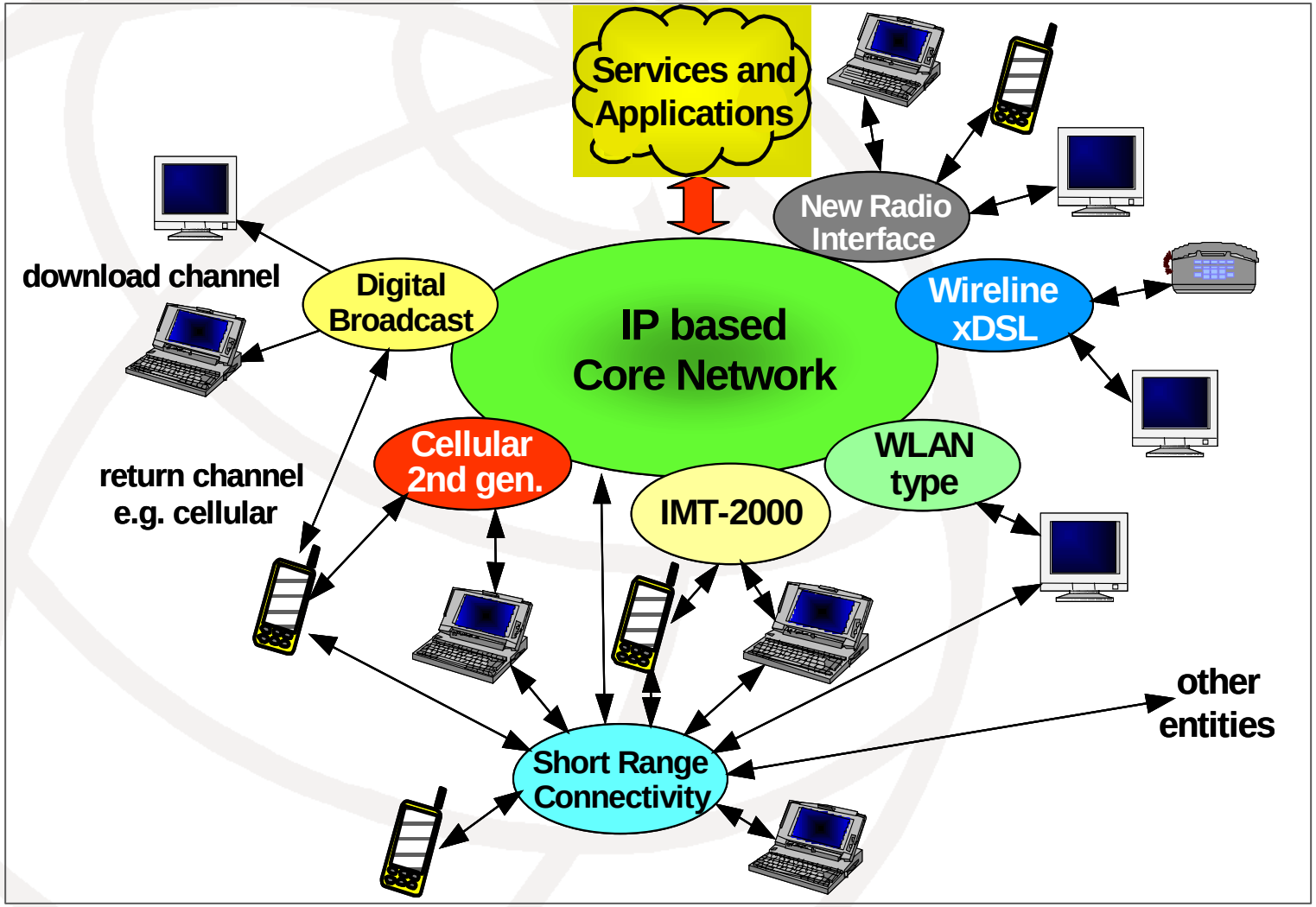
In addition to 3G+, new developments for mobile data include: 802.16 & 802.20

- IEEE 802.16 or WiMax
  - Worldwide Interoperability for Microwave access
  - Capacity: max 70 Mbit/s over 50 km
- IEEE 802.20 also known as “Mobile-Fi”
  - Optimized for high-mobility environments

End-user devices: the mobile still dominates – why?

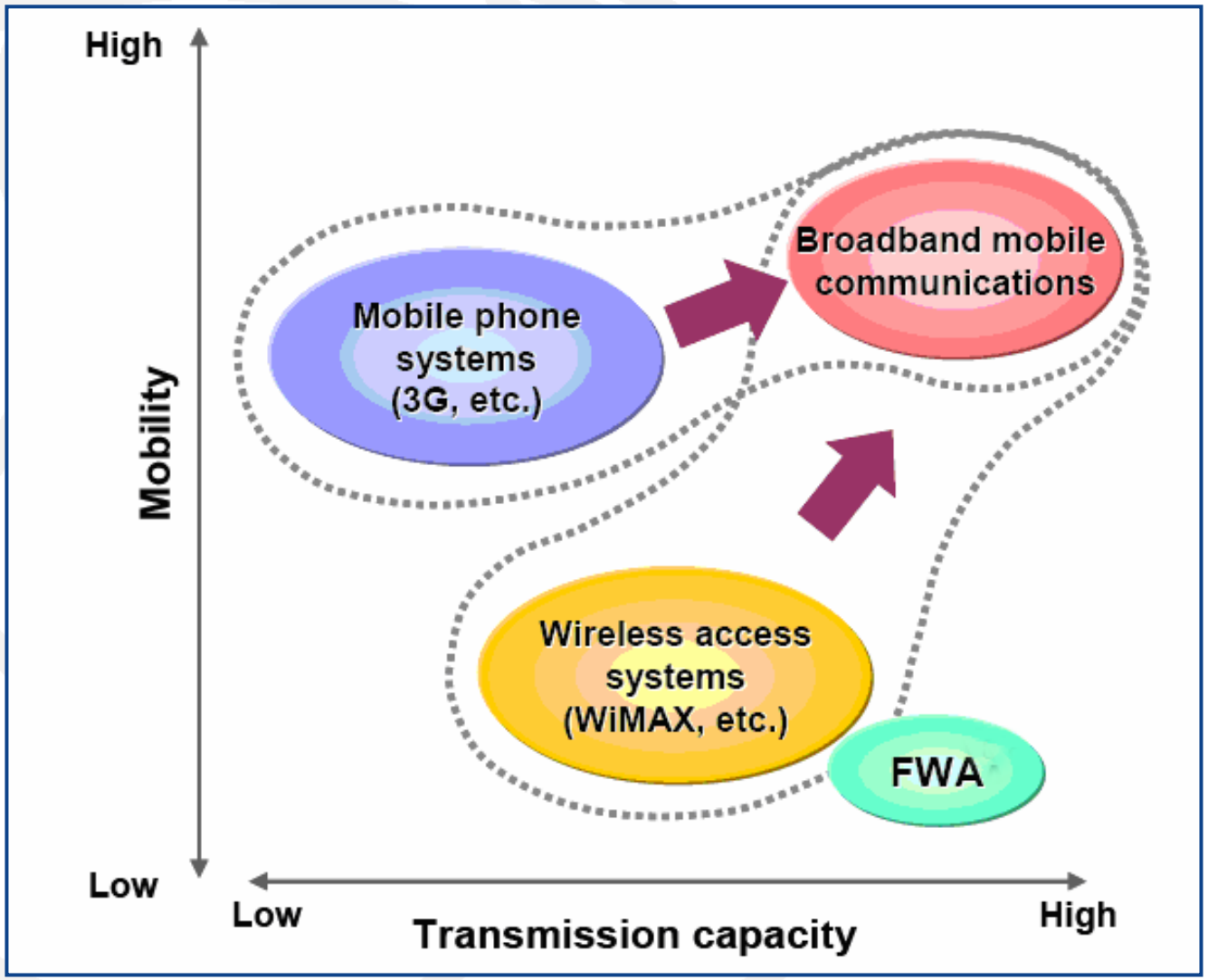
- *Economies of scale*
  - 2 billion and growing
- *Wide Appeal*
  - young, old, male, female, rich, poor…
- *Size and portability*
  - Smaller than the laptop
- *Emotional Attachment*
  - many can't leave home without it
- *Fashion and identity*
  - Accessory, personal diary, status symbol
- *Physical proximity*
  - At day, at night, standing still, on the move

complementary strategies ...



Source: ITU WP 8F

...for a converging objective



mobile, portable…

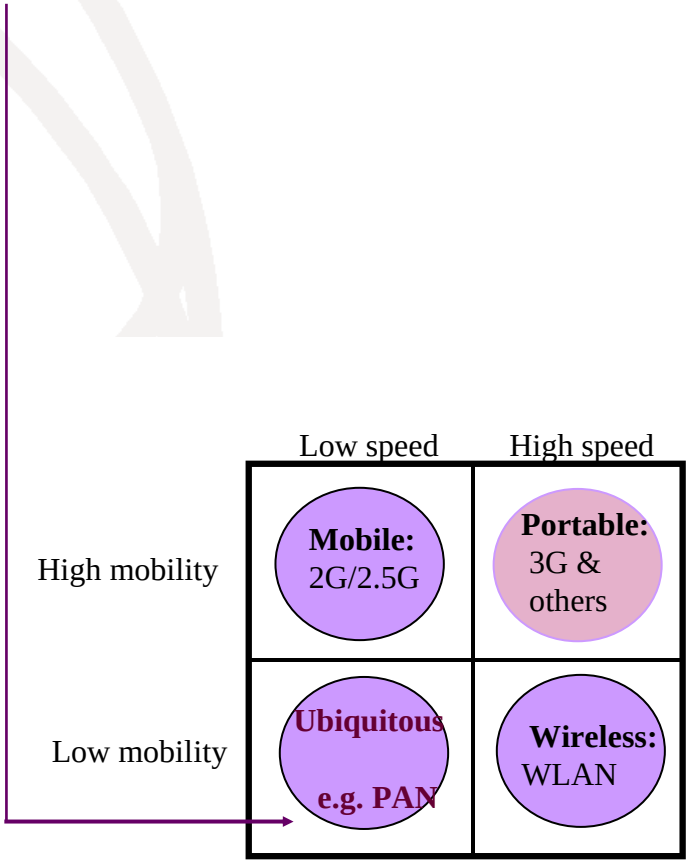
what's next – the ubiquitous internet?

Ubiquitous Networks and Ubiquitous Computing

- Ubiquitous computing
  - Embedding computational power into everyday items
  - "intelligence" moves to the edges
    - e.g. smart objects/structures, intelligent appliances
- Ubiquitous networks
  - always-on, anyone, everywhere network access
  - Giving network access to "anything"
  - In this way, everything becomes 'networked'
  - NGN networks will most likely be the core/backbone infrastructure for deploying ubiquitous networks

short-range technologies key to ubiquitous networking

- typically in the “low-mobility, low speed” area
- Some replace wires, other serve to multiply network connections
- Examples:
  - Bluetooth
  - Ultra Wide Band
  - Zigbee
  - RFID (radio frequency ID)
  - Sensors



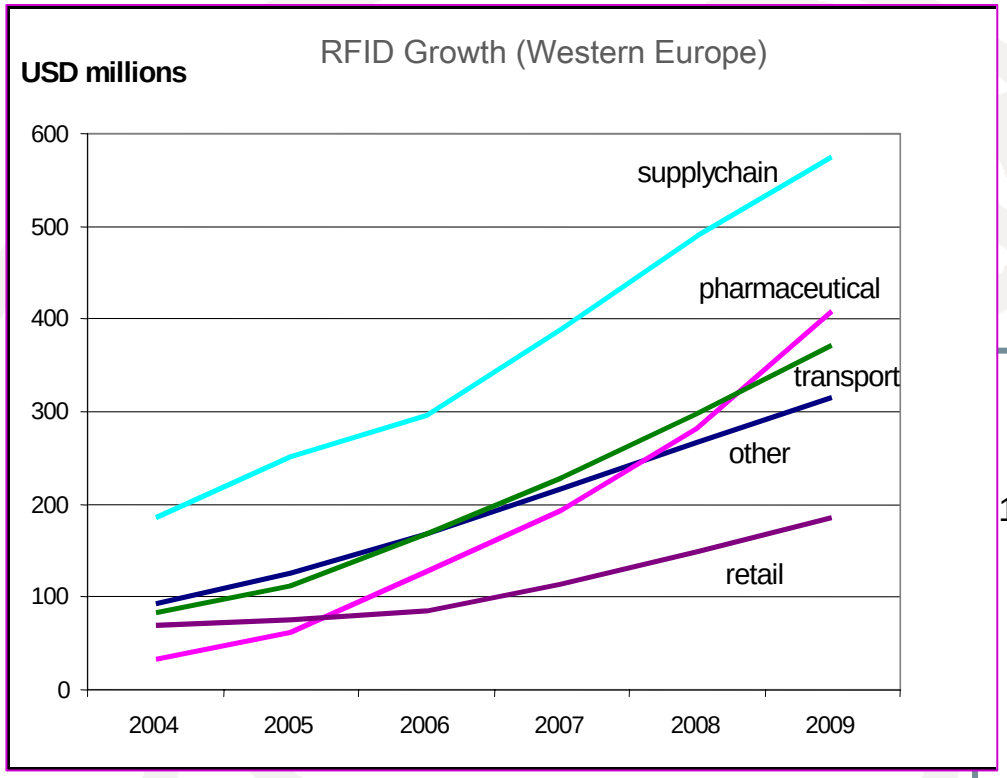
the radio revolution

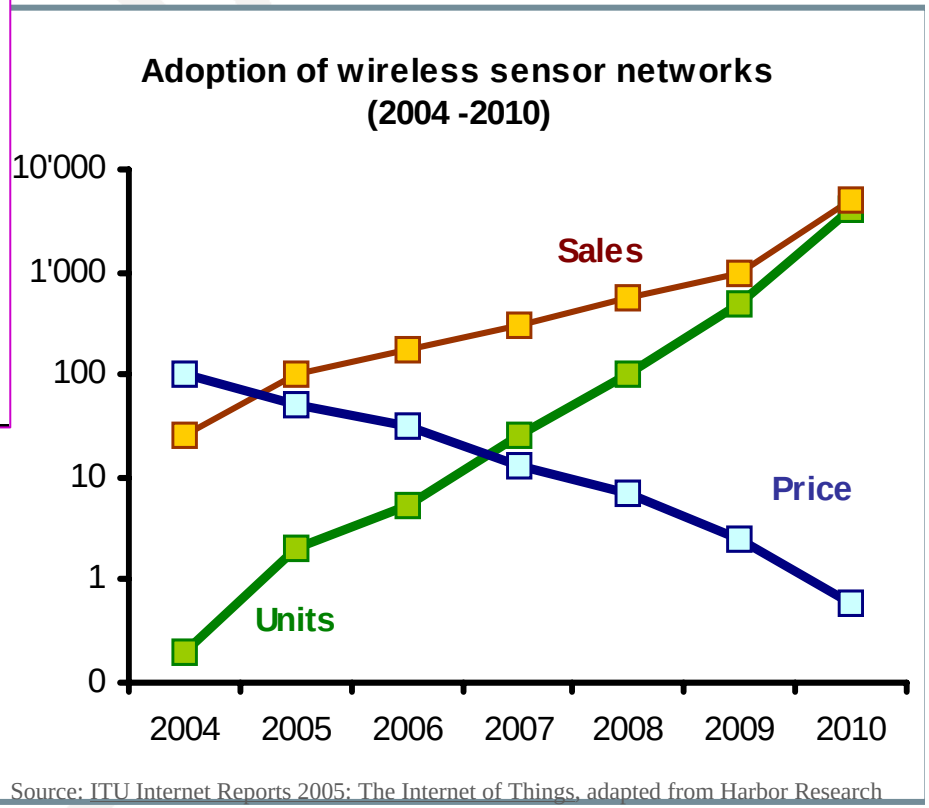
- densest radio systems in the world are terrestrial radio and cellular
- …but we are soon entering a new era:
  - the ratio of radios to humans is nearing 1 to 1
  - in which this ratio could exceed 1000 to 1
- radios would be all around us, becoming “ambient” in the environment , through technologies like RFID
- … thereby radically transforming technology access
  - Making it “indistinguishable” from daily life

RFID and sensors at the core of this revolution

- RFID
  - Through systems including tags and readers, RFID can identify and track items
  - RFID tags can be very small (~ a grain of rice and even smaller)
  - Networked RFID allows for smaller and smaller things to be connected
- Sensors
  - Sensors and networks of sensors can complement RFID by enabling the collection of additional and relevant data, e.g. temperature, pressure, presence of bacteria etc...

growth of radio & sensors



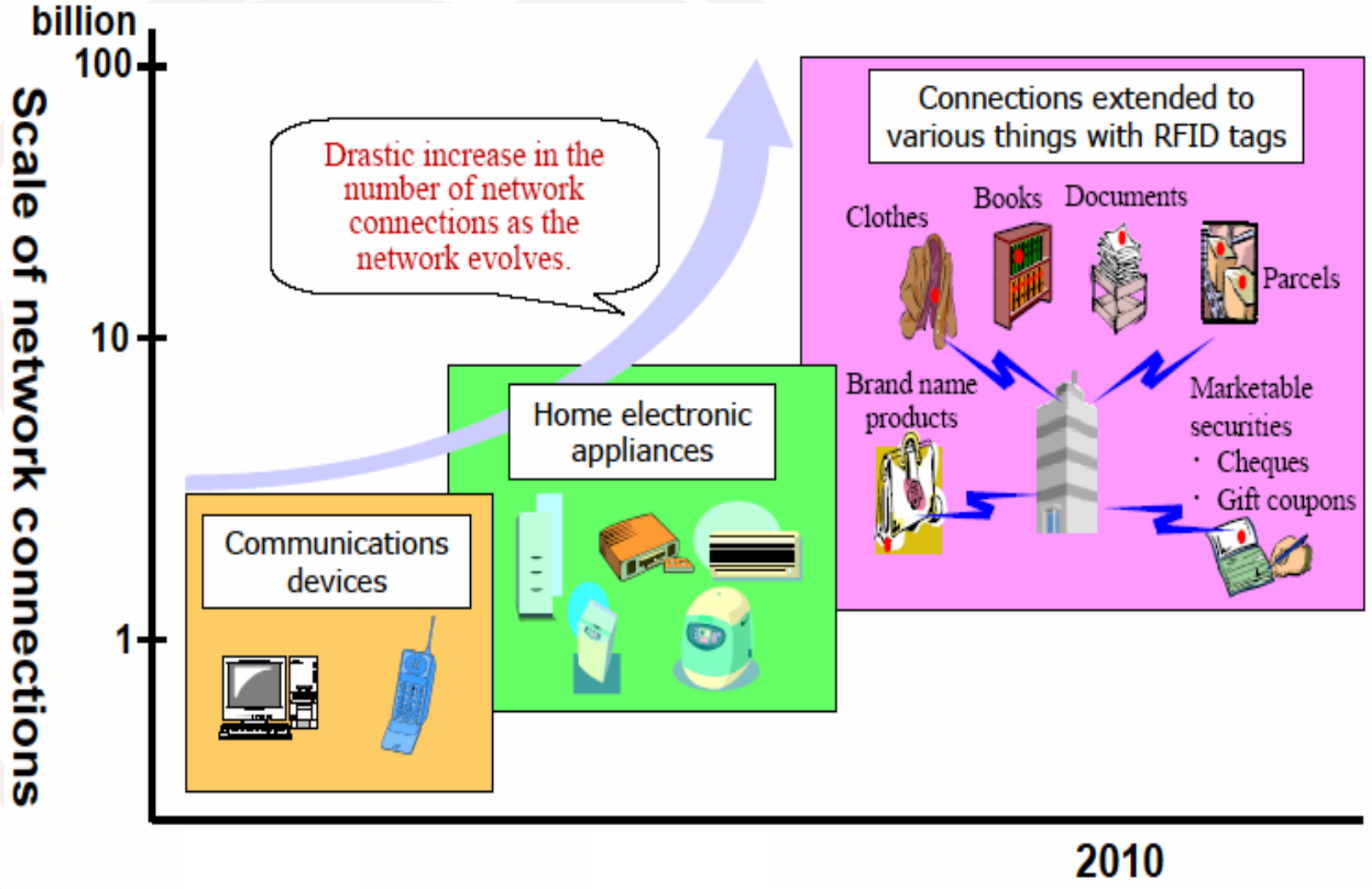


Source: ITU Internet Reports 2005: The Internet of Things, adapted from Harbor Research

more convergence: mobile RFID

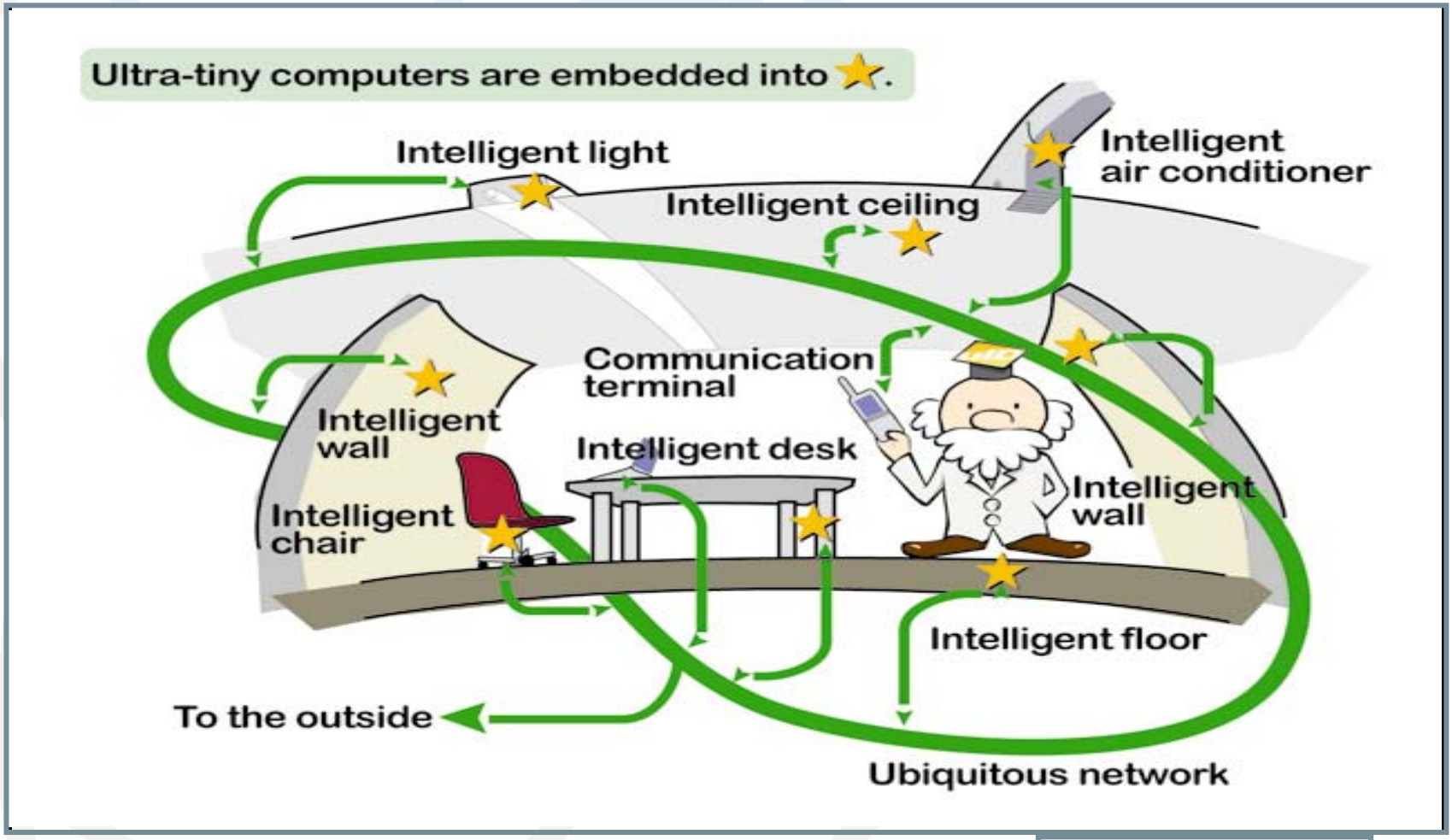
- Mobility is a natural extension of RFID deployment
  - Ability to track and monitor everyday things using a device one would carry anyway
  - data verification at the point of delivery and real-time data transfer (where fixed readers can't reach)
  - extends the reach of the "ubiquitous internet"
- The integration of RFID capabilities in mobile phone is already underway, e.g .
  - the release a couple of years ago of Nokia mobile RFID kit for business, and the imminent release of the consumer phone
  - the US DoD planning to purchase mobile RFID devices
  - standardization is advancing in forums such as NFC

radio tags expanding the network



Source: Adapted from Murakami, ITU-T NGN Forum

creating smart spaces for a ubiquitous internet



Source: Ubiquitous ID Center

Some important challenges ahead

- Pricing, affordability and new billing models
- Fostering competitive services and healthy content market
- Harmonization of regulatory approaches
- Spectrum coordination, flexibility
- Standards for mobile ubiquity (RFID, NFC etc.)
- Network integrity/security
- Governance of resources
- Privacy and data protection

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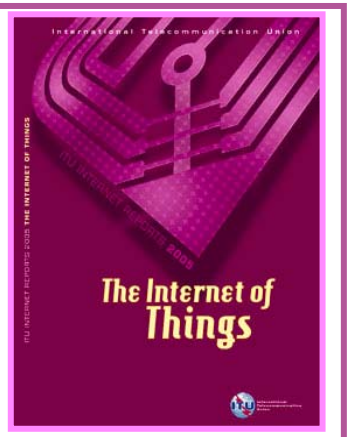
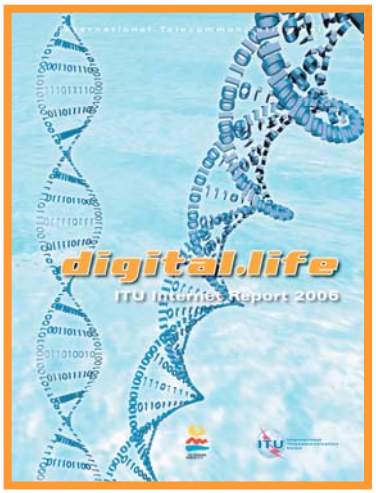


International Telecommunication Union



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