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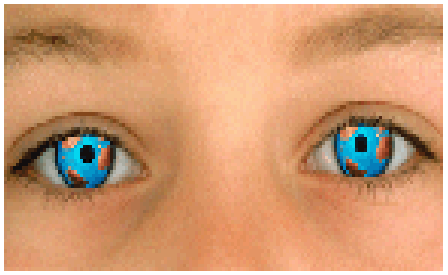
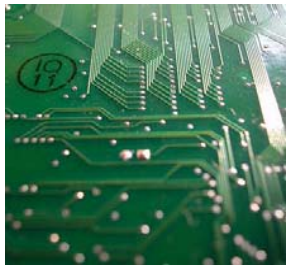
NOAA





mobiles for a smaller world

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Global Mobility Roundtable – Helsinki 2006
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(Helsinki, Finland)

International Telecommunication Union

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transitions

- from local thinking to global thinking
- from physical distance to virtual proximity
- from stable markets to fast-paced innovation
- from occasional information flow to constant information flow
- from a big world to a small world
- from big devices to small devices
- from passive users to active users
- from low-speed to high-speed
- from fixed networks to mobile networks

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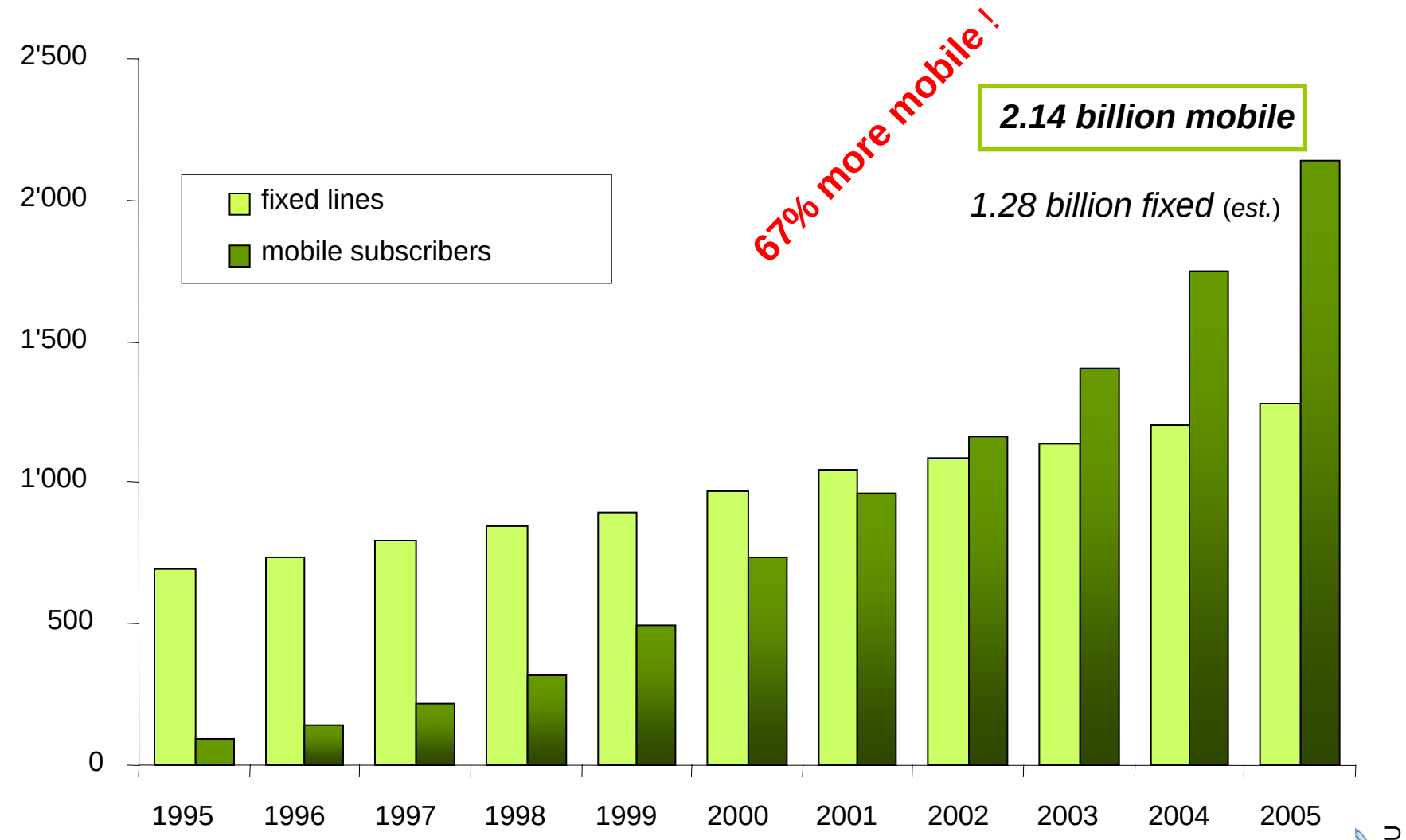
in the ICT world, bigger and better now means smaller and faster!

mobiles certainly dominate in “quantity”…

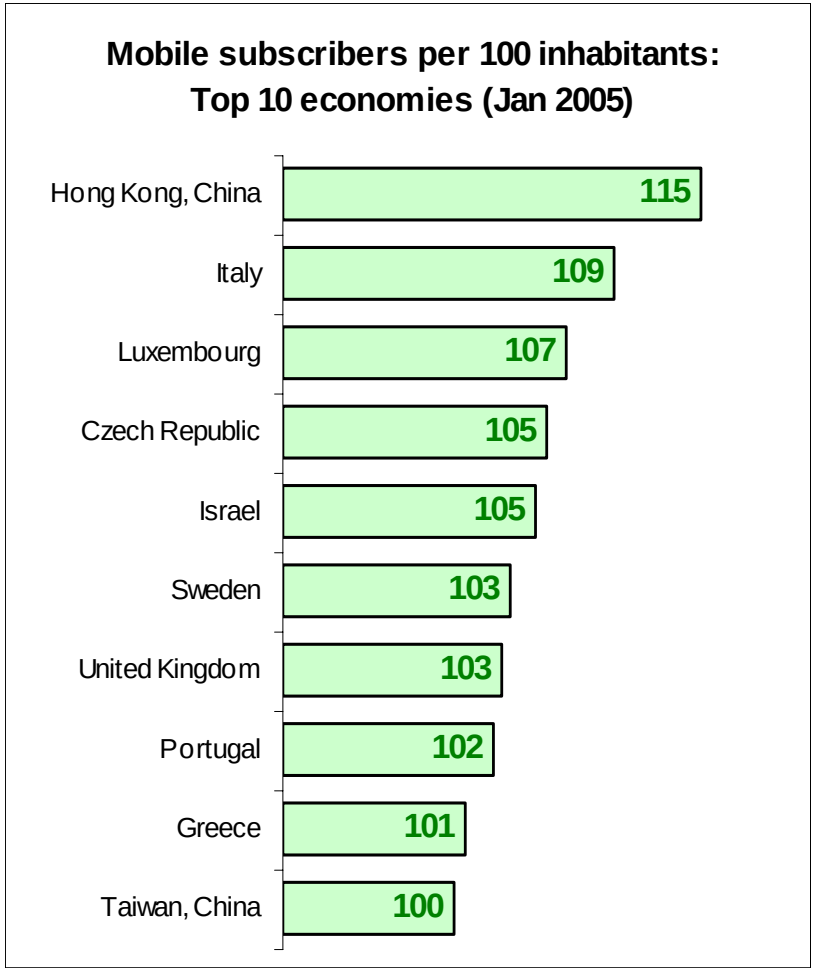


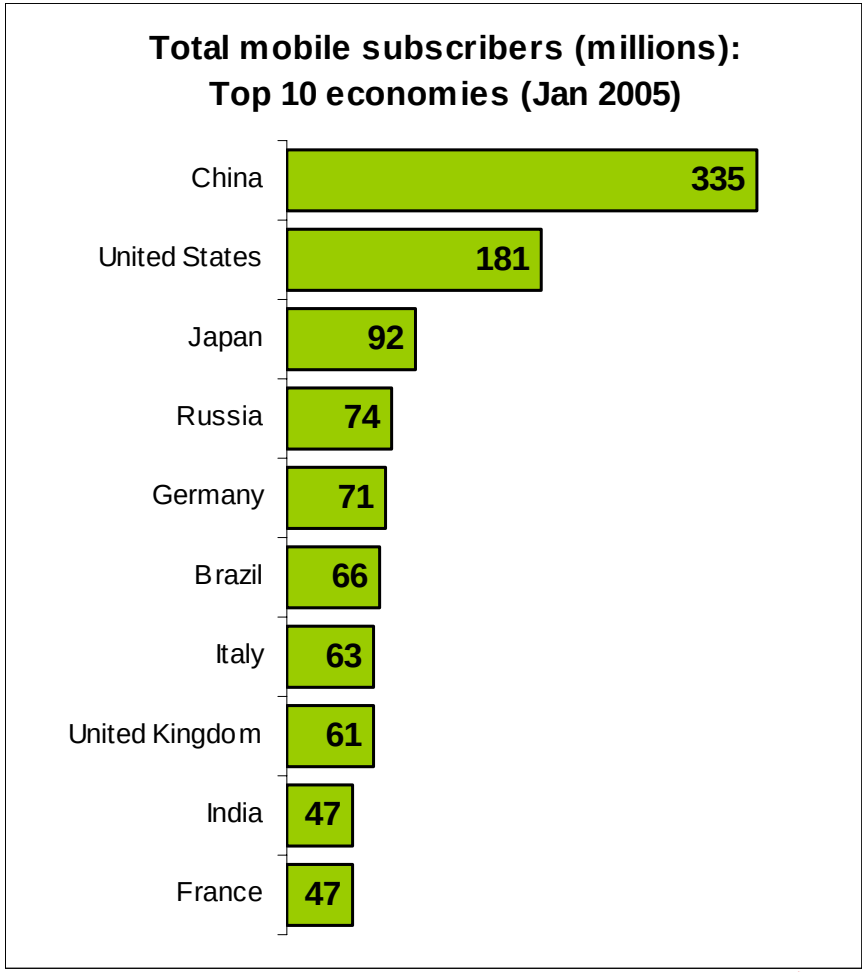
Source: ITU

…but also in "quality"

- the mobile has become a portable daily necessity not unlike e.g. a toothbrush?
- it is typically no more than one metre away from users (day & night)
- it often replaces wristwatch & alarm
- its loss causes panic and major disruption in daily life
- it is reflective of individual identity (as an extension of the self)
  (e.g. fashion accessory, personal diary, photo album)
- users are getting younger and younger
- it indeed has wide appeal and can facilitate shared experiences (e.g. moblogging, P2P exchange)
- it's the most intimate ICT device around, creating "emotional attachment" in users

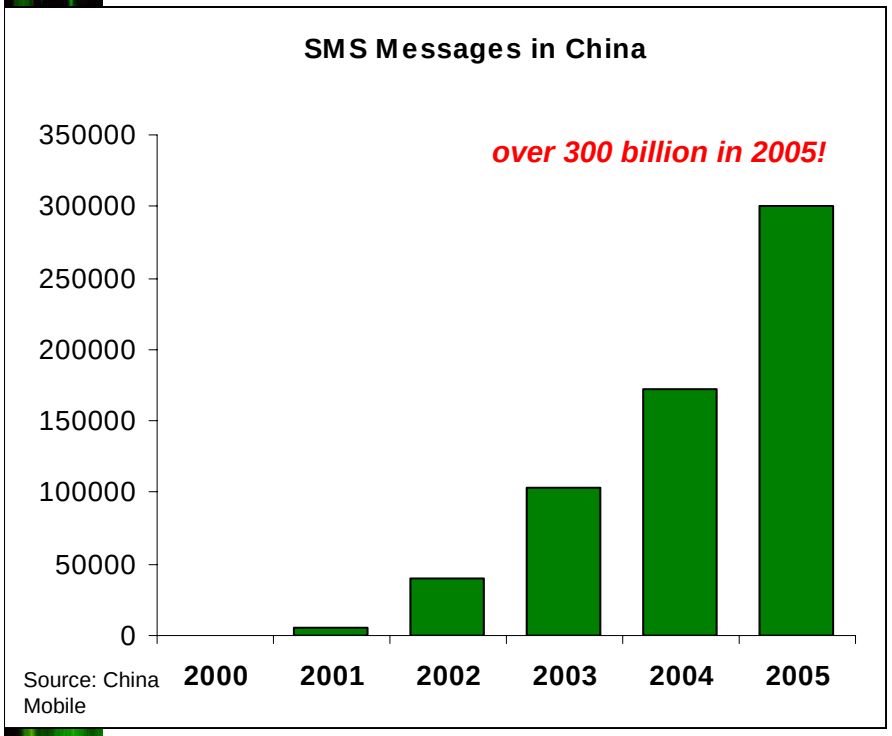
the power of the mobile has cut across geographic & income criteria



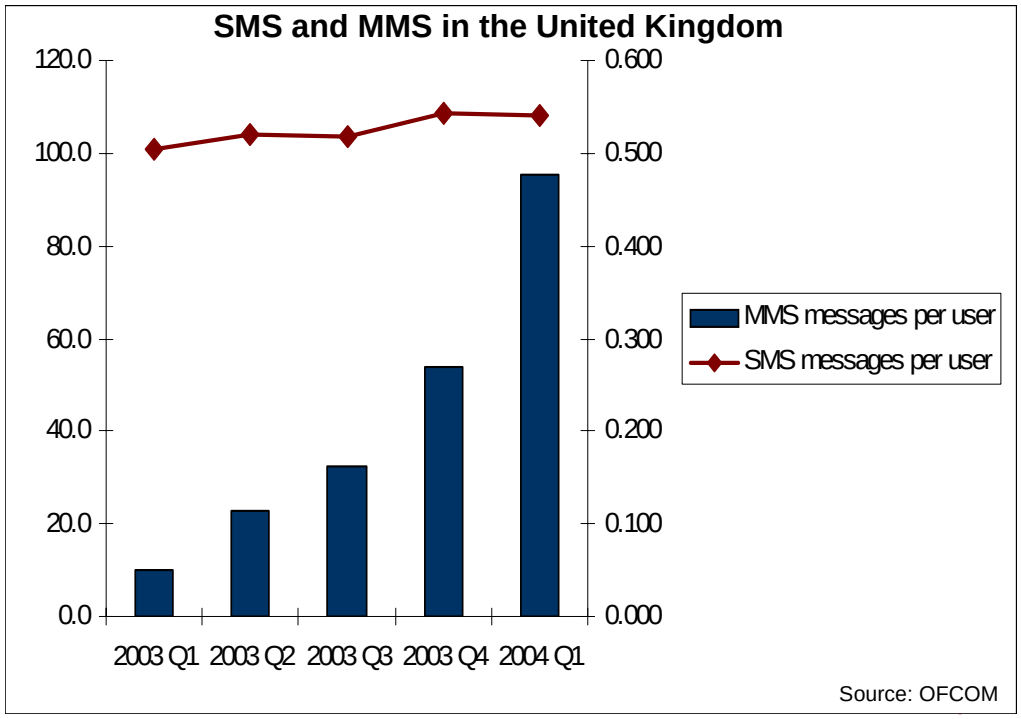


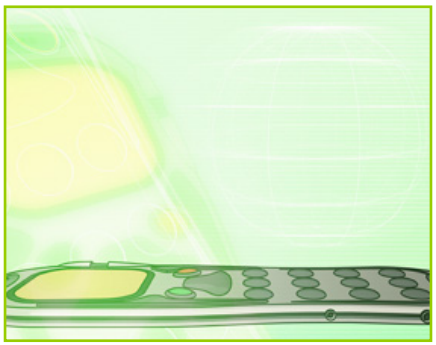
Source: ITU

the growth of messaging, to much surprise, has been staggering!



Use of data over mobiles is growing, particularly in terms of messaging, with the tremendous growth of SMS, and now MMS around the world



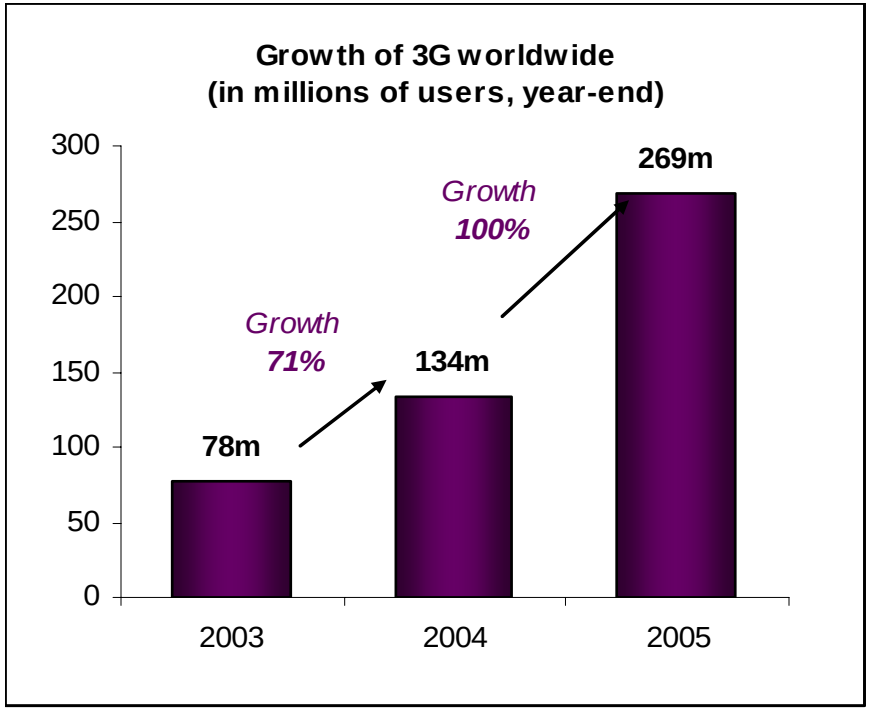


Other data and multimedia services are also beginning to take off…

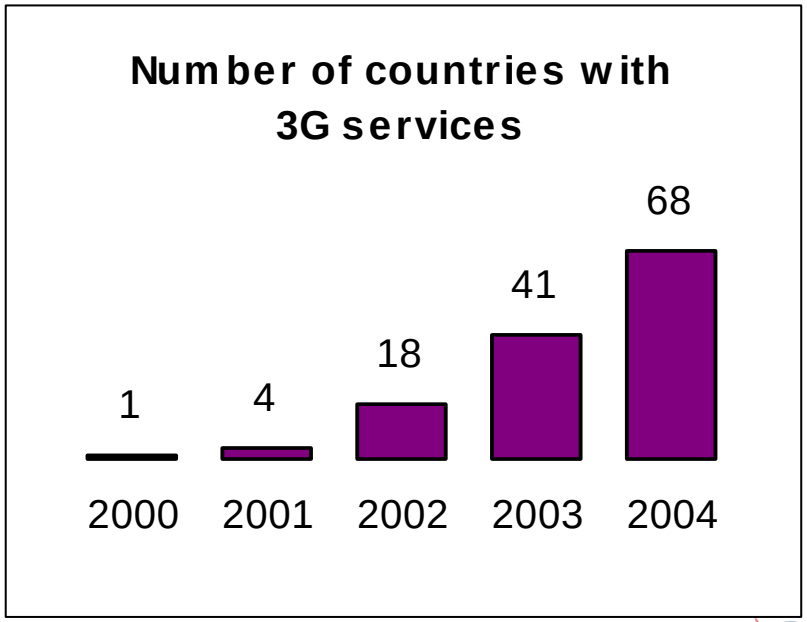
- videophone
- news & information alerts
- information/internet browsing
- downloading of wallpapers and ringtones
- digital audio and video
- mobile TV
- ticketing and transaction services
- gaming

…as more IMT-2000 (or 3G) networks are deployed

estimated users

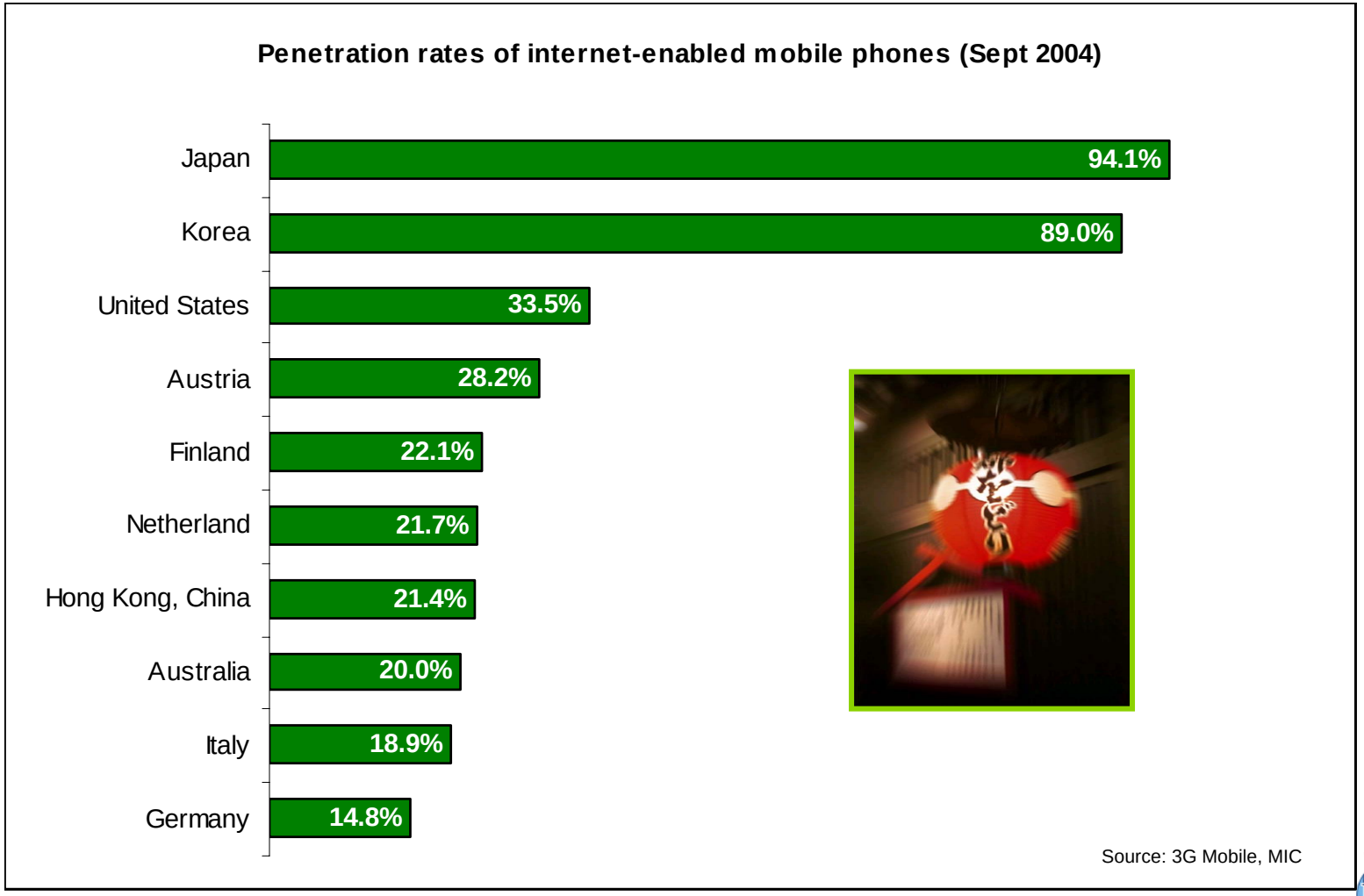


economies with networks

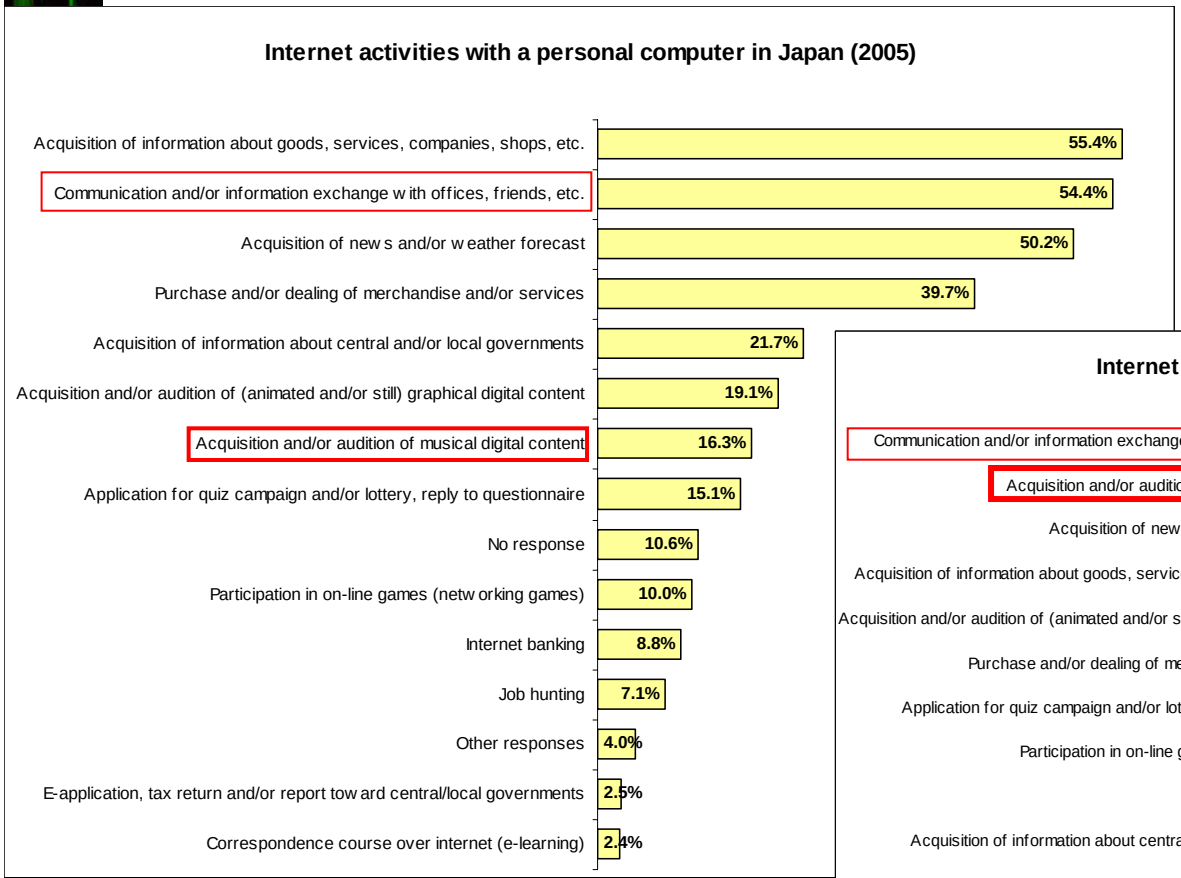


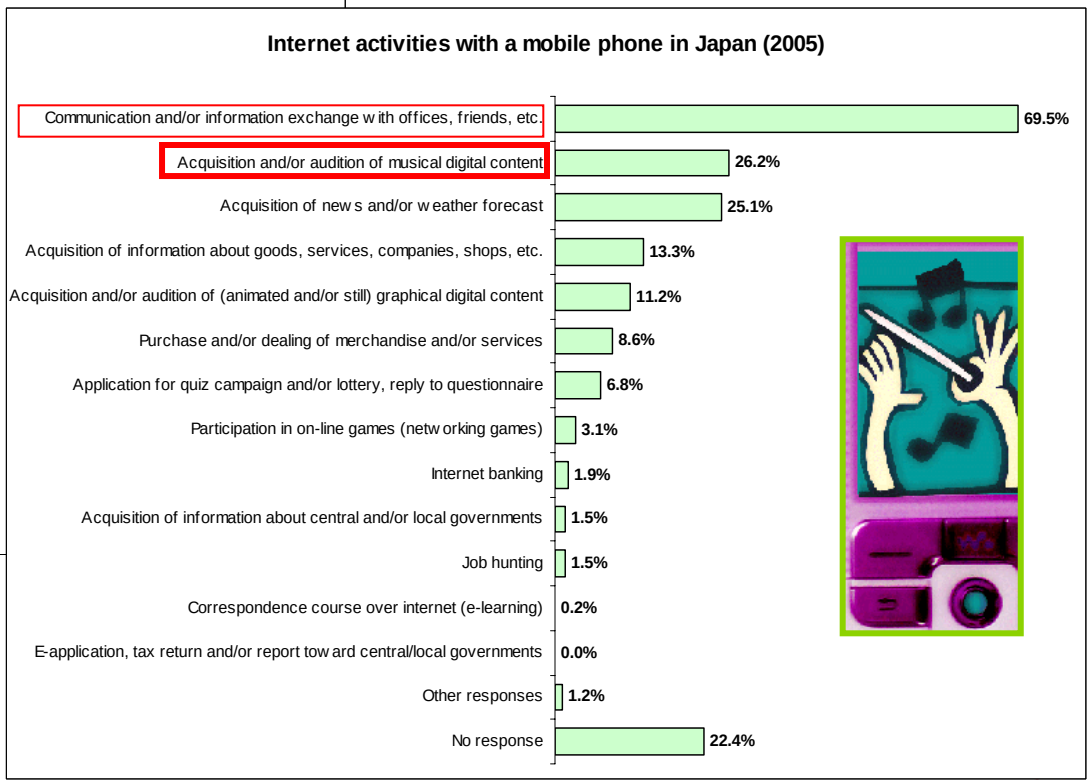
Source: ITU

Japan and Korea lead the pack on mobile internet use



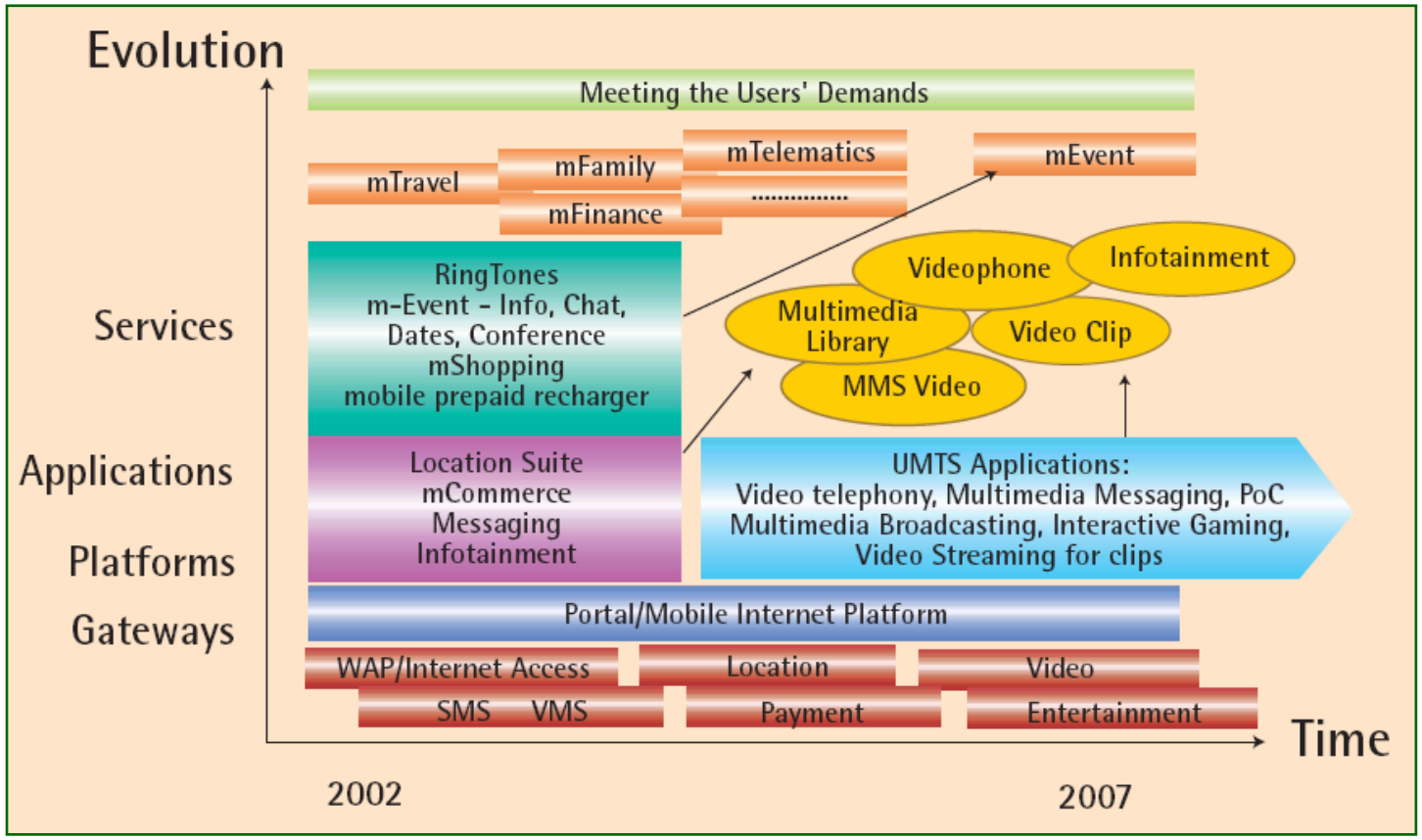
in fact, digital music is more popular over mobiles than PCs in Japan!





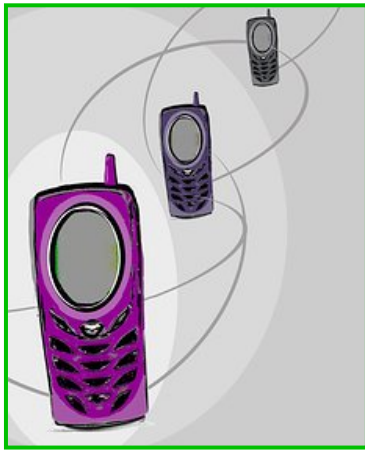
Source: MIC

mobile services will diversify, as operators/providers struggle to meet user demand…



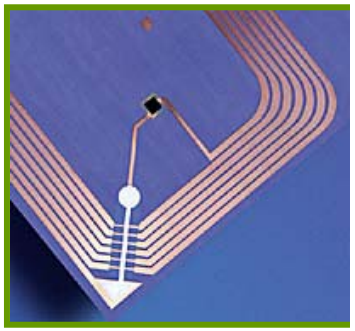
Source: ITU/UMTS Forum

…and a new "ubiquity" for mobile and radio technologies is emerging



- terrestrial radio & cellular are the densest radio systems in the world
- so dense, that the ratio of radios to humans is nearing 1 to 1
- but soon we will enter a new age
  - in which this ratio could exceed 1000 to 1
- short-range wireless technologies, such as RFID & wireless sensors, are at the core of this revolution

radio-frequency identification (RFID) and connecting the world's things

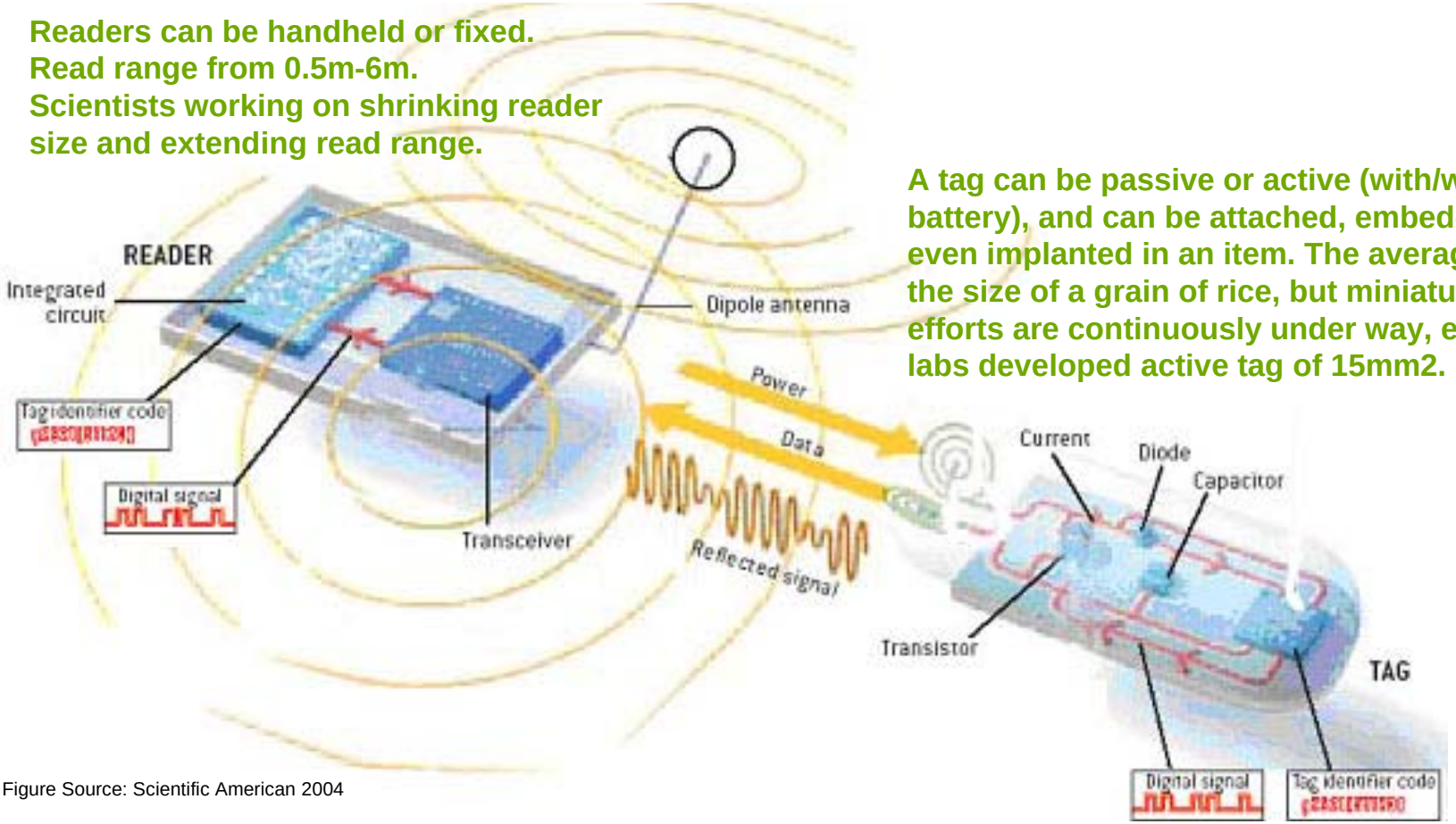


- anytime & anywhere connection by anyone might soon include **"anything"…**
- RFID systems map the real world in the virtual world, as they enable the "tracking" of items in real-time without line of sight
- the internet that now connects computers & people might one day connect things to each other, through this kind of ubiquitous computing
- this network of things can give any small thing its own **"identity"** in cyberspace
  - things as such become "**nodes**" in the internet, creating what has been named an "**internet of things**"

RFID in a nutshell

A typical RFID system is made up of a **tag** or transponder (which contains the data), **middleware** (which forwards the data) & **reader** (which reads the data)

Readers can be handheld or fixed.
Read range from 0.5m-6m.
Scientists working on shrinking reader size and extending read range.



A tag can be passive or active (with/without battery), and can be attached, embedded or even implanted in an item. The average tag is the size of a grain of rice, but miniaturization efforts are continuously under way, e.g. YRP labs developed active tag of 15mm2.

Figure Source: Scientific American 2004

why & where to use an RFID tag and what it contains

- RFID transponders contain "unique" identifiers, e.g. "electronic product code"
  - (unlike bar codes which identify a "type" or "series" of items, and cannot track an individual item in a series)
- information contained on RFID tag can identify the item but also include many more details such as origin, price, washing instructions, banking details, medical records…
- already used extensively in transport and supply-chain management
- tags are now being used across sectors, from sports to health care, from libraries to retail
- it is also being discussed in the context of tracking bank notes and passports, and can also be implanted under human skin (e.g. applied digital solutions' "verichip")

the convergence of mobile communications & ubiquitous computing

- RFID systems are a natural extension of the convenience and ubiquity of today's mobile phone
- mobile phones could incorporate both readers and tags
- players like Nokia plan to deploy a consumer phone later this year
- …and in Japan, DoCoMo mobile phones have already been using radio-frequency Felica chips for payment since 2005

- in europe, early services now available in business
  - e.g. the Nokia 5140 GSM Kit
- the convergence of mobile phones and RFID are being strengthened further by standardization efforts such as NFC (Near Field Communications)

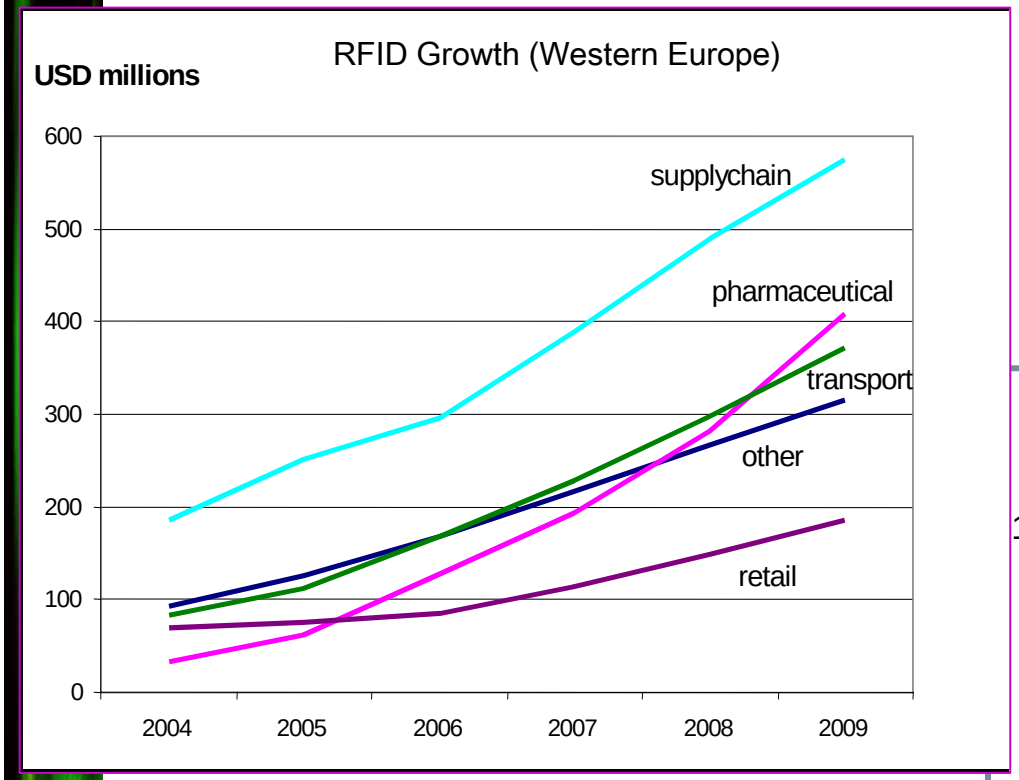
from ‘tagging’ things to ‘sensing’ things

- sensors take the tracking and information capabilities of the RFID tag a step further, by “replacing” human senses
- they enable the detection of physical characteristics such as temperature, odour, velocity, pressure, liquidity, vibration, glucose levels, presence of bacteria etc…
- as such, they serve to create an even more detailed and accurate map of the real world in the virtual world, and can “respond” to the environment around them
- sensors combined with RFID can create applications in sectors ranging from health and pharmaceuticals to retail and lifestyle

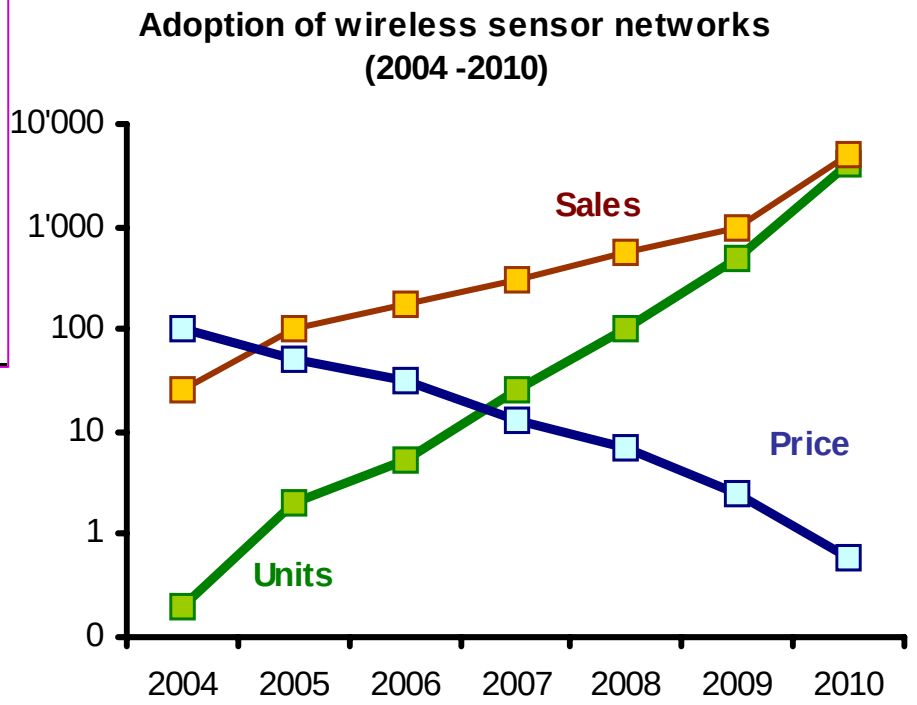




sensors and RFID on the rise



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



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

the potential of RFID and sensor-enabled smart mobiles

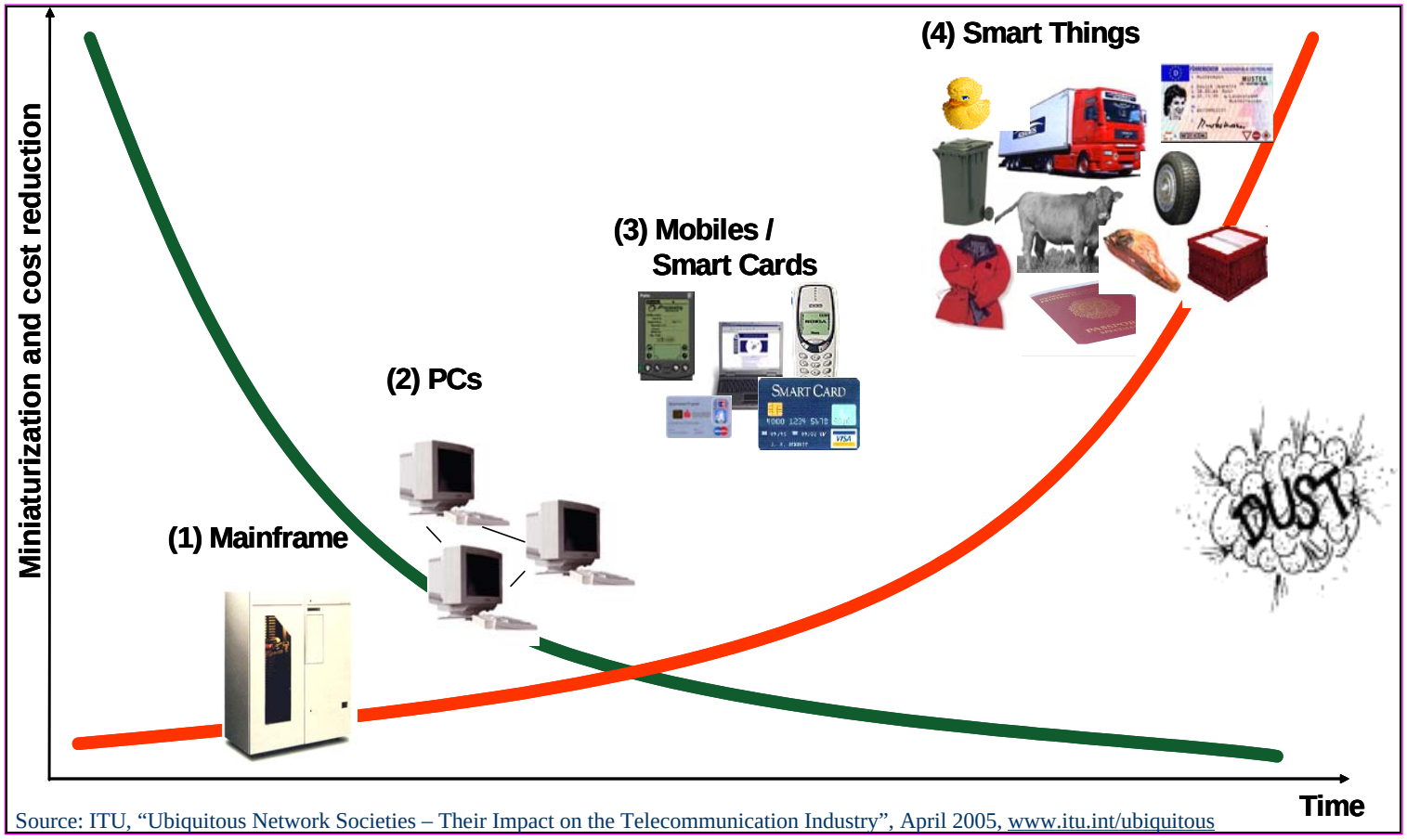
- **the diabetic's mobile**
  - equipped with a sensor to test glucose level, an RFID reader to read information on booklets/articles or prescription drugs, and an RFID tag containing vital medical information

- **the shopper's mobile**
  - the sensor senses restaurants nearby, the RFID reader easily scans product information and the embedded tag enables up-to-date information on sales and promotions in the shopper's vicinity and facilitates e-transactions

- **the kid's mobile**
  - the sensor senses detects the proximity of peanuts (if child has an allergy) or any other danger (e.g. smoke, gas), the RFID reader can enable the child to read printable tags on assignments, and the embedded tag sends out location information to concerned parents or teachers as well as serving as a micro-payment platform (e.g. for buying snacks or drinks without having to carry cash)

a smaller and smarter world?

with developments in miniaturization and nanotechnology, smaller and smaller things could become "networked" (nano-wireless?)



Source: ITU, "Ubiquitous Network Societies – Their Impact on the Telecommunication Industry", April 2005, www.itu.int/ubiquitous

with benefits to be reaped, there are challenges to be overcome…

- the increasing complexity and pervasiveness of technology poses a number of challenges
- these challenges exist at many levels:
  - technical
  - business/corporate
  - regulatory/legal
  - social

- an understanding of the challenges is vital to the development of a healthy mobile multimedia market, one which can leverage the potential of new emerging technologies

…important challenges

- **Technical**
  - interoperability and standards development
  - flexible and dynamic spectrum use
- **Business/corporate**
  - understanding the user
  - finding scalable business models
  - providing simple solutions for bundling and billing
- **Legal/regulatory**
  - spectrum allocation
  - fostering competition
  - balancing the interests of the consumer with those of business and the government
  - managing digital rights
  - user awareness, education and “user readiness”
- **Social**
  - as technology increasingly pervades human existence, ensuring that innovation does not take precedence over fundamental socio-ethical principles
  - dealing with the impact of ubiquitous technologies on human interaction, human identity, and human dignity

overlapping considerations

opportunity: towards gentler technology

- technology should remain a means to an end, a mere tool at the service of humanity
- it should not serve to label individuals
- it should not threaten private spheres of existence, or serve to deliver harmful messages or materials
- it should be accessible to all, and made available in a non-discriminatory, open and transparent manner
- in our journey to a ubiquitous “internet of things”, we must ensure that user interests remain at the core of technological development and innovation
- user-centric innovation is not only in the interest of users, but also of businesses and governments

opportunity: towards global dialogue

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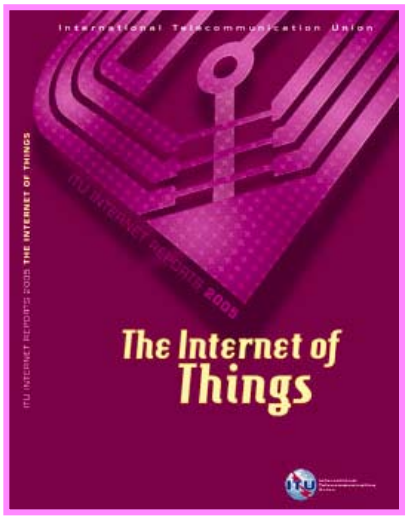
- global dialogue between key players during deployment of new mobile RFID systems, but more importantly, during the design phase
- better understanding of the technology through global knowledge-sharing
  - e.g. what <u>are</u> the threats: hype vs. reality
  - e.g. privacy assessment exercises across sectors and functionalities
- standardization of privacy-enhancing technologies (PETs)
- development of digital identity management principles and tools that are wider in scope, global in implementation and technology neutral
- global dialogue on policy and governance issues

e.g. **ITU**'s work on public awareness, information exchange and standardization
European Commission Public Consultation on RFID and



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Small is beautiful….

Wisdom demands a new orientation of science and technology towards the organic, the gentle, the non-violent, the elegant and the beautiful

- E.F. Schumacher

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