trends and challenges in the digital age

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Note: The views expressed in this presentation are those of the author and do not necessarily reflect the opinions of the ITU or its membership. Lara Srivastava can be contacted at lara.srivastava@itu.int
A look back
1844: “what hath God wrought”

…in 1844 - the first interurban telegraphic communication from Washington to Baltimore, ‘morsed’ by Samuel
In 1864, radio is predicted and in 1887, it is detected...

- Heinrich Hertz was the first to detect radio waves by causing a spark to leap across a gap that generated electromagnetic waves ...
- He had mathematically predicted their existence in 1864
In 1865, the ITU was born as:

the International “Telegraph” Union

141 years ago!
this means...

• That the ITU is the oldest international organization in the world…
  – … with its work spanning three centuries

• The organization pre-dates the United Nations, and is now one of its specialized agencies

• A recent report by Booz Allen Hamilton and leading scholars ranks the ITU among the “World's Top 10 Most Enduring Institutions”, one that has:

  “changed and grown in unswerving pursuit of success and relevance - yet remained true through time to its founding principles"
we have come a long day since the ITU was first created. …from the first mobile phone?

1910: Lars Magnus Ericsson and his wife Hilda
today’s hi-tech world
today’s digital age would’ve seemed like science fiction back then…

- the birth of a World Wide Web of information, a revolution in itself (one billion internet users)
- growth of high-speed network infrastructure
- global proliferation of small mobile devices in our pockets – gateways to the world
- an emphasis on “always-on” communications and information access
- advances in computing to render information even more “ubiquitous”
an age which has brought about many transitions, challenges:

- from relatively static market environments to dynamic fast-paced innovation
- from heavy-handed regulation to increasing forbearance
- from “divergence” to “convergence”
- from local to global
- from low-speed to high-speed
- from sometimes-on to always-on
- from fixed to mobile
mobile certainly dominates

2.14 billion mobile!

1.28 billion fixed (est.)
...and speed is on the rise

Top 15 Broadband economies, Jan 2006
Total penetration (per 100 capita), by technology

Iceland: 26.7
Korea (Rep.): 25.0
Netherlands: 25.0
Denmark: 25.0
Hong Kong, China: 23.4
Switzerland: 23.1
Finland: 22.5
Norway: 21.9
Canada: 21.0
Sweden: 20.0
Taiwan, China: 20.1
Belgium: 18.3
Israel: 17.7
Japan: 17.6
United States: 16.0

[Bar chart showing broadband penetration per 100 capita by technology for 15 countries]
all signs of the times!

- Innovation in **digital** technologies and popularity of **portable ICT** devices
- **Speed**, speed and more speed
- Growing value of **information**, esp. timely and “on-the-go” information
- “**Lifestyle**” and “**Personalization**” of ICTs
- **Mobility** as an integral element
the near saturation of traditional markets…

Telecom services revenue, in US$ bn

Fixed-line and mobile services revenue, in US$ bn

Developing countries growing faster than developed ones

Mobile markets growing faster than fixed-line markets

Source: ITU Internet Reports 2005: The Internet of Things
…leads to a rapidly changing market landscape

New players – new roles
Old players – new roles

Source: EITO
more about the ITU
today’s

International Telecommunication Union

• ITU is an international organization where governments and private sector coordinate global telecom networks and services

• “International Telecommunication Union” since 1934

• 190 Member States, 650 Sector Members, 75 Sector Associates
  – Only International Organization to have both private sector members, governments and civil society as members

• Headquarters Geneva, 11 regional offices, 790 staff / 83 nationalities

• Secretary-General: Yoshio Utsumi (Japan)
• Deputy Sec-General: Roberto Blois (Brazil)

• 2005 budget = CHF164m (USD 130m)
what is the mission of the ITU?

• To maintain and extend international cooperation for the development of telecommunications
• To provide technical and policy assistance to developing countries
• To harmonize actions of Member States and promote cooperation between Member States and Sector Members
• To promote at international level, the adoption of a broader approach to issues of telecommunications in the global information economy and society
  – WSIS originally proposed at ITU in 1998 and later endorsed by UN
• To extend the benefits of telecoms to all the world’s inhabitants
• In sum, to “Help the world communicate”
how the ITU is structured
international treaties

• Constitution and Convention of ITU
  ▪ Two complementary treaties, containing mainly housekeeping details but also some longstanding international commitments (e.g. common carrier tradition)

• International Telecommunication Regulations
  ▪ Thin (10 Articles) treaty concerning mainly accounting practices. Last update 1988 – under review since 1998

• Radio Regulations
  ▪ Thick (>10’000 pages) treaty governing use of radio spectrum. Updated every WRC
according to the International Telecommunication Constitution (Marrakesh, 2002), the role of ITU is:

- International cooperation in telecommunications
- Technical assistance to LDCs
- To promote technical development
- To extend the benefits of telecoms
- To promote telecoms for peaceful use
- To harmonize national policies
- To promote telecoms in cooperation with other national and regional bodies
in other words, ITU’s role is in the following areas:

- Spectrum allocation and registration
- Coordination of national spectrum planning
- International telecoms standardization
- Collaboration in international tariff-setting
- Cooperation in telecoms development assistance
- Measures for ensuring safety of life
- Extension of universal access
- Policy reviews, research and information exchange
policy research at the Strategy & Policy Unit (SPU)

- **ITU New Initiatives Programme**
  - Begun in 1999
  - Around 17 workshops held to date

- **Building Digital Bridges**
  - Begun in 2004
  - Development of “Digital Opportunity Index”

- **Main research/data publications**
  - ITU Internet Reports: 7 editions since 1997
  - Trends in Telecom Reform: Annual since 1998
  - WSIS Stocktaking Database (More than 3’000 ICT projects)
let’s talk mobile
mobile has made it impact not only in quantity but also in quality

- The mobile has become a portable daily necessity not unlike e.g. a pen or a piece of ID?
- It is typically no more than one metre away from users (day & night) – it’s used even when fixed line available
- 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)
- 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 giants in mobile

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Mobile Subscribers</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>335</td>
</tr>
<tr>
<td>United States</td>
<td>181</td>
</tr>
<tr>
<td>Japan</td>
<td>92</td>
</tr>
<tr>
<td>Russia</td>
<td>74</td>
</tr>
<tr>
<td>Germany</td>
<td>71</td>
</tr>
<tr>
<td>Brazil</td>
<td>66</td>
</tr>
<tr>
<td>Italy</td>
<td>63</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>61</td>
</tr>
<tr>
<td>India</td>
<td>47</td>
</tr>
<tr>
<td>France</td>
<td>47</td>
</tr>
<tr>
<td>Spain</td>
<td>39</td>
</tr>
<tr>
<td>Mexico</td>
<td>38</td>
</tr>
<tr>
<td>Korea (rep.)</td>
<td>37</td>
</tr>
<tr>
<td>Turkey</td>
<td>35</td>
</tr>
<tr>
<td>Philippines</td>
<td>33</td>
</tr>
</tbody>
</table>

Source: ITU
who leads in mobile density?

<table>
<thead>
<tr>
<th>Country</th>
<th>Mobile subscribers per 100 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hong Kong, China</td>
<td>115</td>
</tr>
<tr>
<td>Italy</td>
<td>109</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>107</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>105</td>
</tr>
<tr>
<td>Israel</td>
<td>105</td>
</tr>
<tr>
<td>Sweden</td>
<td>103</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>103</td>
</tr>
<tr>
<td>Portugal</td>
<td>102</td>
</tr>
<tr>
<td>Greece</td>
<td>101</td>
</tr>
<tr>
<td>Taiwan, China</td>
<td>100</td>
</tr>
<tr>
<td>Iceland</td>
<td>99</td>
</tr>
<tr>
<td>Lithuania</td>
<td>99</td>
</tr>
<tr>
<td>Austria</td>
<td>98</td>
</tr>
<tr>
<td>Denmark</td>
<td>96</td>
</tr>
<tr>
<td>Estonia</td>
<td>96</td>
</tr>
</tbody>
</table>

Italy & UK also in Top 15 for TOTAL subs
mobiles for extending access…

- Developing countries have seen the greatest impact of mobile communications on access to basic telecommunication services
- Cellular networks can be built faster than fixed-lines networks and can cover geographically challenging areas
- Mobile services have served to boost competition, and prepaid models have opened access to mobile cellular for those who would otherwise not qualify for telephone subscription plans
...and diversifying access, through networks like IMT-2000/3G

Growth of IMT-2000 worldwide (in millions of users, year-end)

Number of countries with 3G/IMT-2000 services

Users (millions) and penetration per 100 pop.

Source: ITU
with higher speeds, mobile multimedia begins to take off!

• mobile TV
• news & information alerts
• information/internet browsing
• downloading of wallpapers and ringtones
• digital audio and video
• ticketing and transaction services
• gaming
• gambling
converging objectives: towards ubiquitous broadband connectivity

Key question: how to make effective use of spectrum to achieve this objective?
manufacturers continue to aim for more personalization …

- **fashion phones**: e.g. chocolate-like phones such as Nokia’s 7380, LG’s slim KG800 & Motorola RAZR, athletes’ sport smartphones
- **security phones**: e.g. fingerprints, or Pantech’s finger-writing PG-2800
- **mood phones**: e.g. Ornet’s biorhythm for windows-based smartphones
- **smelly phones**: e.g. Samsung’s patent application for perfume-spraying mobile phone functionality
- **slow phones**: e.g. NTT DoCoMo’s handset which slows down talking speeds

*Source: Nokia*
…while operators scramble to push multimedia services

- Large proportion of content still stems from personalization services (e.g. ringtones, wallpapers)
  - driven by events or brands unrelated to the mobile industry, e.g. popular TV series. Will this change in the future?

- Analysts predict that content will diversify over the next years, first to more audio & video services (e.g. mobile TV, with share of personalization services decreasing

- Total mobile entertainment revenues set to rise from 15.8 to 42.8 bn USD by 2010

- (How) will traditional mobile players re-position themselves?

Source: Informa
challenges of a high-speed highly-mobile world
untapped market opportunities? need for new business models?

High mobility
- Mobile
- Under development ??

Low mobility
- PAN
- WLAN/FWA
affordability a key problem

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

Average cost of ICT usage worldwide, in US$, 2003-2005

- Mobile basket: 23%
- 20 hours' Internet access: 25%
- Broadband ($/100 kbps): 40%

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

Average price of an SMS, in US$, 2005

- Americas: 0.06
- Asia: 0.07
- Africa: 0.10
- Europe: 0.14
- Oceania: 0.16

Source: ITU World Information Society Report
example: mobile roaming

- roaming =15% of global mobile revenues in 2004 (US$78.6 billion)
- EC first looked into issue in 2000, but to not much avail
- In 2005, a tariff comparison website was set-up

Informa estimates each fan at the FIFA World Cup will spend €36.50 on roaming charges!

- Roaming charges vary widely, with the highest rate found by EC to be 13 euros a minute (Maltese calling home from Latvia)
- EC now proposing a regulation (consultation period ended in May 2006) which will be put into effect no earlier than summer 2007
ensuring a level playing-field remains an important challenge

• ICT regulatory trends in Europe:
  – from *ex ante* to *ex post*
  – roll back of sector-specific regulation as markets become more competitive in favour of competition law

• mobile has traditionally been less regulated than fixed
  – many of the larger mobile markets remain relatively concentrated in Europe

• In the broadband world, concerns over access to incumbent’s networks persist in many areas
regarding SMS: it’s SOS!

• by some estimates, the total SMS revenues in 2005 were about 75 billion USD. Compare this to:
  – Global box office: 25-30 billion
  – Global music industry revenues: 35 billion
  – Videogaming, consoles & all software: 40 billion

• though SMS interconnection costs are very low, retail costs remain high

• this does not bode well for future mobile data and multimedia pricing

• though little has been done thus far, some regulators are imposing price caps on SMS termination (e.g. ARCEP).

• but some argue that intervention at retail level (rather than wholesale) may be required
and content rules...?

• Specific forms of content
  – the 3Gs
  – regulating specific forms of content
  – increasing use of camera phones
    and user-generated content
  – protection of minors

• advertising
  – advertising rights & responsibilities
  – the problem of spam

• copyright and DRM
  – prevention of piracy & payment of appropriate royalties
  – rewarding content creation without limiting distribution
  – use of universal principles for DRM

• regulation of mobile transactions, mobile payments
addressing content & convergence

- traditional separation of broadcasting and telecommunications giving way to increasing convergence: both in terms of media & regulation

- Europe’s TWF Directive now being amended as Audiovisual Media Services Directive (AMS)
  - to cover (scheduled and on-demand) media services over internet, mobile, telecom, broadcasting and over “any other electronic network whose principal purpose is the provision of moving images to the general public”
  - regardless of technology used, multimedia services will be subject to a minimum standard of protection relating to e.g. advertising, discrimination, incitement to hatred

- Thus the directive will extend regulation to control audio-visual media services that have, until now, been untouched by specific regulatory intervention, and left to MS’s general laws (and self-regulation has been the norm)
from the mobile, to the portable, to the ubiquitous...
increasingly pervasive wireless communication environment

- Growth of high-speed and high-mobility networks
  - 802.16, 802.20 etc…

- Importance of new short-range wireless techs and applications
  - Zigbee
  - RFID

- From connecting people and PCs (devices) to connecting “things”
connecting things - a new dimension

Any TIME connection

- On the move
- Outdoors and indoors
  - Night
  - Daytime
- On the move
- Outdoors
- Indoors (away from the PC)
- At the PC

Any PLACE connection

- Between PCs
  - Human to Human (H2H), not using a PC
  - Human to Thing (H2T), using generic equipment
- Thing to Thing (T2T)

Any THING connection

Source: Adapted from NRI (Japan)
the next internet: an Internet of things?

- Technologies like RFID have the potential to tag every item on the planet
- Combined w/ sensors, they can create context-aware applications, linking the real world to the virtual world
- Developments in “smart materials” and nanotech will further drive this revolution

[www.itu.int/internetofthings](http://www.itu.int/internetofthings)

- ITU Internet Report 2005: The Internet of Things
- ITU Internet Report 2006: digital.life
4 key technological enablers

- **Tagging Things:** **RFID**
  - enables real-time identification & tracking

- **Sensing Things:** **Sensor technologies**
  - enables detection of environmental status and sensory information

- **Thinking Things:** **Smart technologies**
  (e.g. those enabling smart homes, smart vehicles etc.)
  - build intelligence into the edges of the network

- **Shrinking Things:** **Nanotechnology**
  - makes possible the “networking” of smaller and smaller objects
a future of smart things

Source: ITU, Ubiquitous Network Societies, ITU, 2005
e.g evolution of RFID-enabled & 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)
from mobility to ubiquity

- the overwhelming use of mobile communications today is but a beginning
- we are witnessing the dawn of a new era of ubiquitous/ambient connectivity
- growth of technologies like wireless sensor networks and RFID mean that in the future, individual items or things may become networked, leading to an “internet of things”
- what issues can already be addressed in an always-on multimedia environment that might foster the growth of ubiquitous networking, and ensure its user-centric, healthy & safe development?

Source: Ubiquitous ID Centre
important emerging challenges

• **Standards-setting and interoperability**
  – Harmonization required particularly in the area of transmission protocols
  – Tag formats have *de facto* standard “EPC”

• **Governance of resources**
  – Who controls the unique identifiers?
  – More commercial value at stake than DNS…

• **Data protection and consumer privacy**
  – Information contained on tags should appropriately managed and controlled
the privacy problem

• Strong opposition to some of these technologies:
  – CASPIAN, EPIC, EFF

• Public sector is becoming more aware of problem, e.g. EU Data Protection WP

• Still, lack of clarity as to rules and guidelines for use of technologies like RFID, for instance, and no harmonised approach to digital identity management

• Risking a “privacy divide”?
individuality and surveillance

- **Growth of citizen journalism**
  - through use of camera phones and moblogging, all human activities susceptible of being recorded
  - climate of security threats and terrorism may mean that vigilantes become increasingly common

- **Lack of technical and economic incentives to delete any information about anyone**

- **Such an environment of surveillance (real of perceived) may lead to lack of individuality, self-expression and greater anxiety in decision-making (no matter how small)**

- **These elements are crucial to individual and societal development**
how to be future-proof?
… by ensuring a holistic approach

Example: Privacy and data protection

Socio-ethical principles

TECHNICAL
- Encryption
- ID management tools
- Mobile phone jammers
- Biometrics
- P3P/Privacy preferences
- DRM tools

MARKET-BASED
- BBB-type programmes
- Self-regulation
- Codes of conduct
- User education
- Privacy certification

POLICY/REGULATORY
- Legislation/guidelines
- Consumer advocacy
- Accountability
- Harmonization
- Public awareness
- User consent

Source: ITU
... through global dialogue

- development of harmonized approaches, e.g.:
  - spectrum management
  - licensing
  - global standards
- information exchange, e.g. on regulatory best practices
- development and interoperability of privacy-enhancing technologies (PETs)
- data protection schemes across borders and articulation of global digital identity management principles
- global efforts for increasing security in critical infrastructure
- international cooperation on digital rights management
- governance issues
more information

• …on ITU’s Strategy and Policy Unit (SPU) Activities:
  – www.itu.int/spu

• …about ITU’s New Initiatives Programme:
  – www.itu.int/ni

• … about the SPU’s publications
  – www.itu.int/spu/publications
The ITU Young Minds Programme

In 2005, the Strategy and Policy Unit (SPU) launched its first Young Minds in Telecoms competition. The competition is open to graduate students and recent graduates in economics, political science, law, literature, telecommunications, computer science, information systems and related fields. The objective of the ITU Young Minds Programme is to give young people valuable exposure to the international telecommunication environment and to work of the ITU. Information on the winners and runner-ups for the 2005 and 2006 competitions are available on this website. One of the main criteria for evaluation was the submission of a essay and those essays that were highly-ranked in the evaluation process have been made available on this site. The ITU Strategy and Policy Unit plans to announce its 2007 competition in December 2006, so watch this space!

Introducing the 2006 ITU Young Minds Competition Winners and Their Essays

Chin Yong Lu [Hong Kong SAR, People’s Republic of China]

Read Essay: Key opportunities and threats raised by the growing use of Services over IP such as VoIP and IP-TV

My name is Chin Yong Lu and I am a winner of the ITU Young Minds Competition 2006.

My background is a bit confusing as my family has moved around a lot. We moved to Hong Kong when I was 11 and I lived there for 4 years before moving to Singapore, where I studied in Raffles Junior College and completed OCE A levels.

After receiving a merit scholarship, I went to the International University Bremen (IUB) in

Lucy Yu [United Kingdom]

Read Essay: How can the interests of end users in the information society be balanced with the interests of business, in the UK?

I am Lucy Yu, one of the 2006 ITU Young Minds.

I am a graduate of Imperial College London, where I studied Chemistry and specialised in molecular electronics and electrochemical systems (MEMS).

After graduating, I joined the UK government’s Fast Stream programme, and have
- thanks -

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