the mobility and ubiquity of ICTs

ICT Trends and Challenges in a Global Era
MSU/INT/BSL Programme (4 July 2005)

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introduction

"what hath God wrought"…

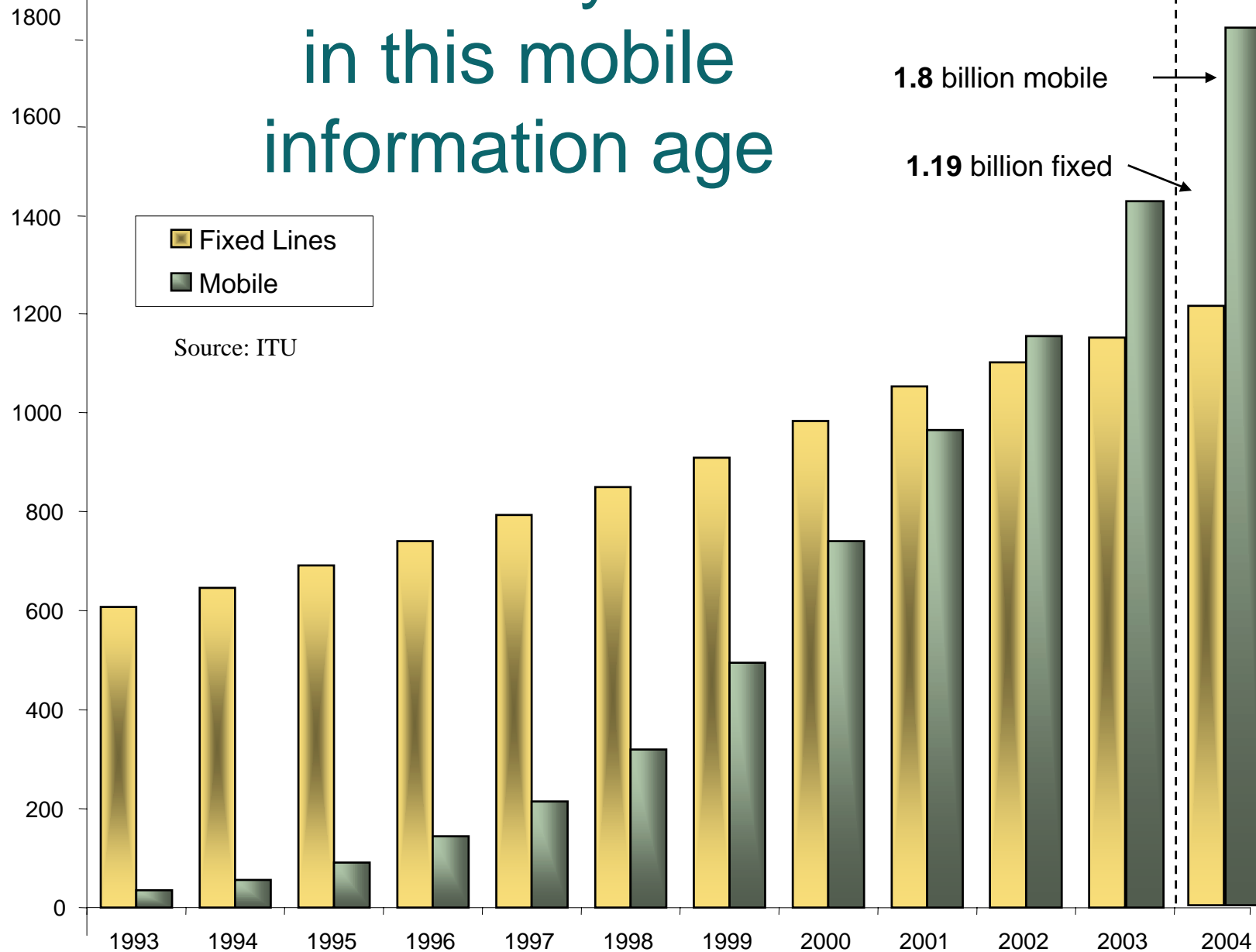…in 1844 - the first interurban telegraphic communication from Washington to Baltimore, 'morsed' by Samuel

the dawn of the information age…

- the creation of a World Wide Web of information, a revolution in itself

- growth of high-speed broadband infrastructure

- global proliferation of small mobile devices

- an emphasis on "always-on" communications and information access

- advances in computing to render ICT even more "ubiquitous"

- advances in networking to render access even more ubiquitous (e.g. NGN, ubiquitous or ambient networks)

…and a number "transitional" shifts and challenges

- from relatively static market environments to dynamic fast-paced innovation

- from heavy-handed regulation to increasing forbearance

- from low-speed to high-speed

- from sometimes-on to always-on

- from local to global

- from fixed to mobile

mobile certainly dominates in this mobile information age

est.

1.8 billion mobile →

1.19 billion fixed →

Source: ITU

Legend:
- ☐ Fixed Lines
- ☐ Mobile

Bar chart showing Fixed Lines and Mobile subscribers (in millions) from 1993 to 2004, with y-axis from 0 to 1800.

towards ubiquity: mobility and speed

Mapping mobility and speed:

high-mobility

low-speed

high-speed

low-mobility

- 2G and 2.5G
- early 3G

?
Mobile-Fi?
WiMax ?
3G +

New group of portable Internet technologies?

?
- BANs/PANs
- RFID
- Zigbee

- xDSL
- FTTH
- WLAN
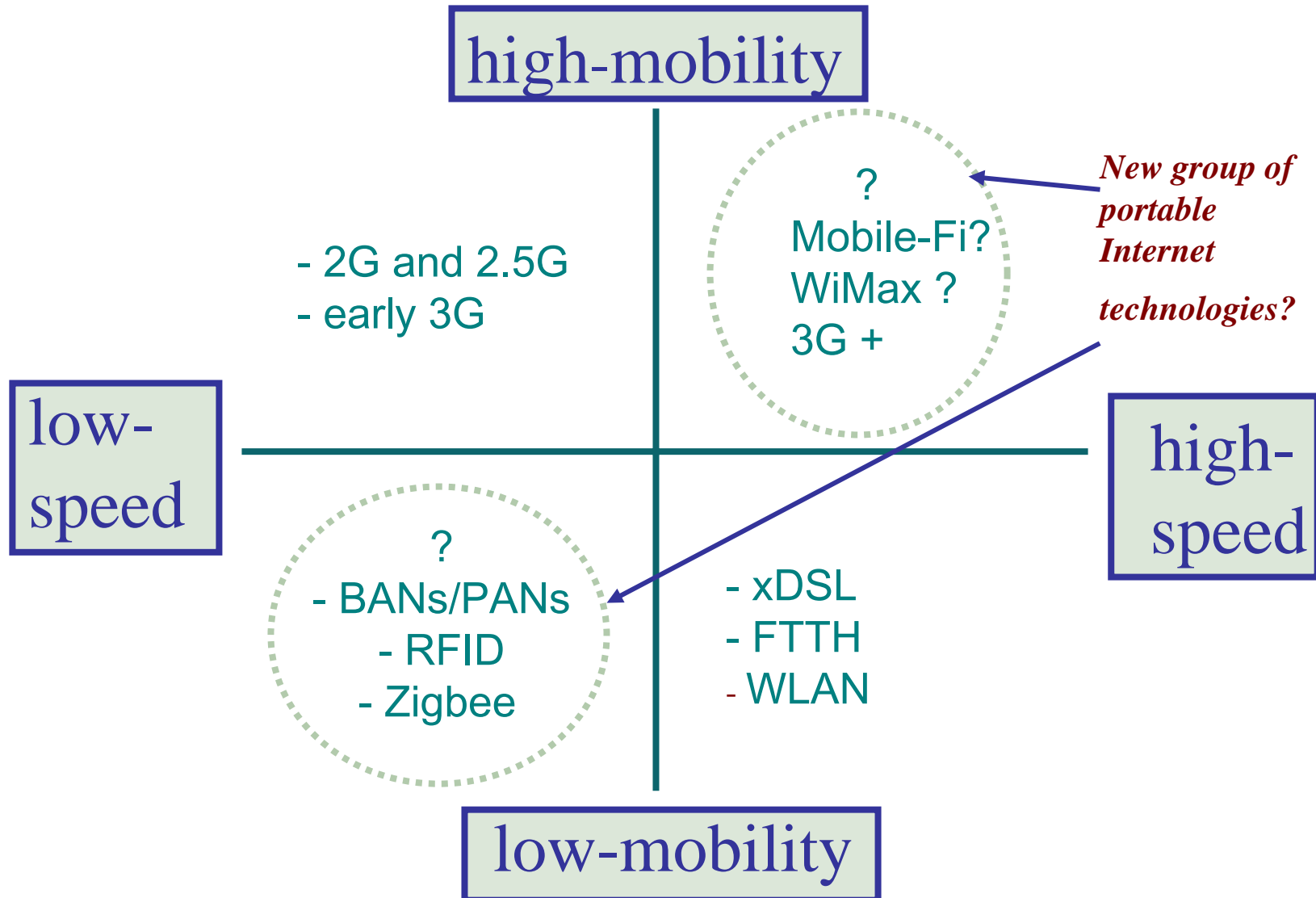
higher mobility, lower speed

- Early 2G
  - dominated by GSM
  - characterized by fragmented market
  - some mobility of internet, but limited in most markets
- 2G -> 2.5G -> early 3G
  - messaging goes mobile and multimedia
  - increased accessibility, through e.g. services like Vodafone live!
  - still limited in take-up

higher speed, lower mobility

- Most popular is currently 802.11b (IEEE standard) or Wi-Fi (Wireless Fidelity)
  - Range is limited (100m) but speed is high (up to 11 Mbit/s). Mostly for stationary environments
  - Advantages:
    - unlicensed spectrum
    - easy to deploy
  - Disadvantages: no dedicated bandwidth, security concerns, high power consumption
- Estimated (mid-2004): 115 million users worldwide

higher speed, higher mobility: underlying the "portable" Internet?

- Enhanced 3G
  - HSPDA
  - CDMA 2000 1x EV-DV, EV-DO
- 802.16 or WiMax
  - Worldwide Interoperability for Microwave access
  - Capacity: max 70 Mbit/s over 50 km
  - Type of WMAN
- 802.20 also known as "Mobile-Fi"
  - Optimized for high-mobility environments

<u>low speed, low mobility</u>: enablers of "portable Internet"?

- often used at the edges of the network, e.g. as wire replacements
- take the next step in "always-on" connections anywhere and anytime…
  - to anyone and "anything"
- enable a 'ubiquitous communication environment'
- Key example:
  - RFID

challenges (1): spectrum

approaches to spectrum

- command and control
  - still exists for some areas ,
    e.g. military, radio astronomy
- market-oriented mechanisms
  - licensing, depending on regulation, liberalization
- new methods of spectrum sharing and trading
- open access spectrum
  - Open to all users, either 1) co-existence for low-power transmissions, 2) spectrum use in bands allocated for license-exempt use, e.g. ISM)
- common spectrum/spectrum commons
  - Does not assign exclusive rights to individual users, but to group of users

license-free open access

- for example, WLAN services
- eliminates requirement for administrative licensing
- lowers barriers to market entry and spurs competition
- significant concerns remain, however, as to long term viability:
  - over time, increasingly diverse and intense use of such bands might increase congestion affecting QoS

managing spectrum
to enable ubiquitous networks

- "**open spectrum**" approaches are seen by many as one of the key solutions to (perceived) spectrum scarcity

- "open spectrum" is a collection of new radio technologies, which can serve to dynamically manage spectrum access and assist in spectrum sharing
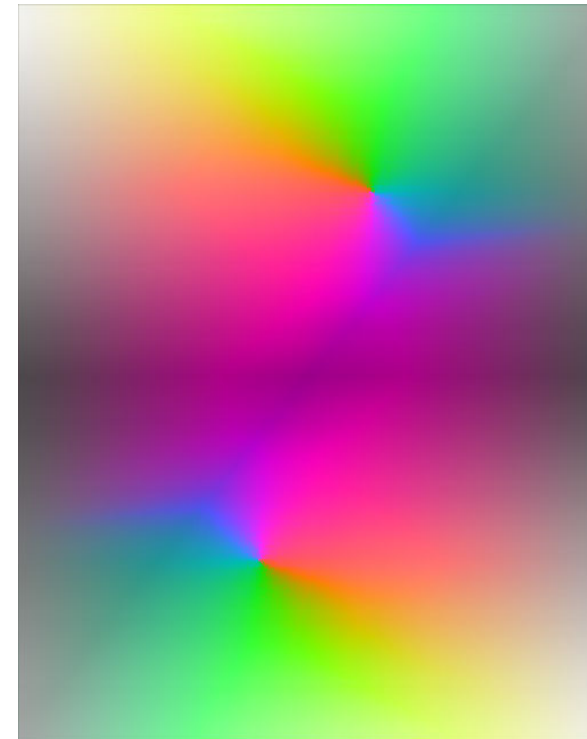
e.g. "defining radio"

- software-defined, or cognitive or agile radio
- has embedded intelligence and RF technology allowing it to discern the kind of transmissions that are needed
- aware of rules of what spectrum is available for sharing, and can determine available chunks of spectrum
- SDR can transmit/receive customized RF modulation, which can be conventional, UWB or multi band
- can co-exist with legacy radio applications

challenges (2): privacy

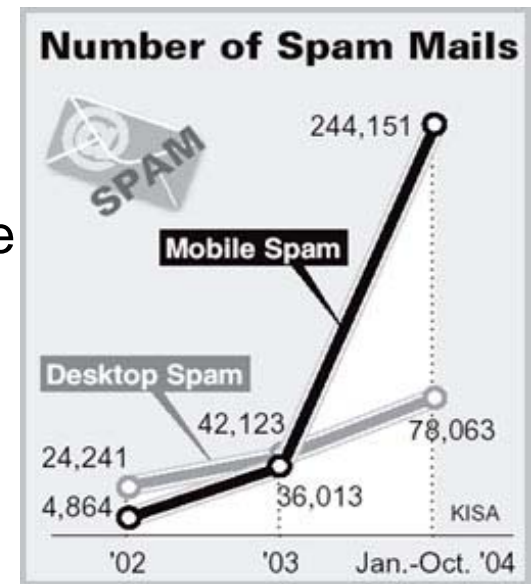# as mobility becomes ubiquitous, what happens to privacy rights?

- Right to protect private information

- At the *device end,* little use made of PIN; new developments are more hi-tech e.g. fingerprints, biometric sensors

- At the *network end*, privacy guidelines are not clearly defined

- Right to freedom from interference

- Unsolicited messaging over mobiles (mobile spam) is a growing concern

Right to freedom from interference: *mobile* spam

- unsolicited messages delivered to mobile handsets,which:
  - try to sell something to the user;
  - ask the user to call a phone number, which may be a premium-rate service
  - destroy or change handset settings
  - are simply messages of commercial nature that intrude upon a user's right to privacy and/or carry harmful content

Number of Spam Mails

SPAM

Mobile Spam — 244,151

Desktop Spam — 78,063

24,241 — 42,123

4,864 — 36,013

'02   '03   Jan.-Oct. '04   KISA

Source: KISA

- Legislative/regulatory measures and industry action are only beginning to address problem
- Call for international collaboration, e.g. WSIS

impact on the operator's brand

Negative brand perception for the mobile network operator

What do you think is the impact on the brand of your mobile operator, if it allows mobile spam to happen on its network?
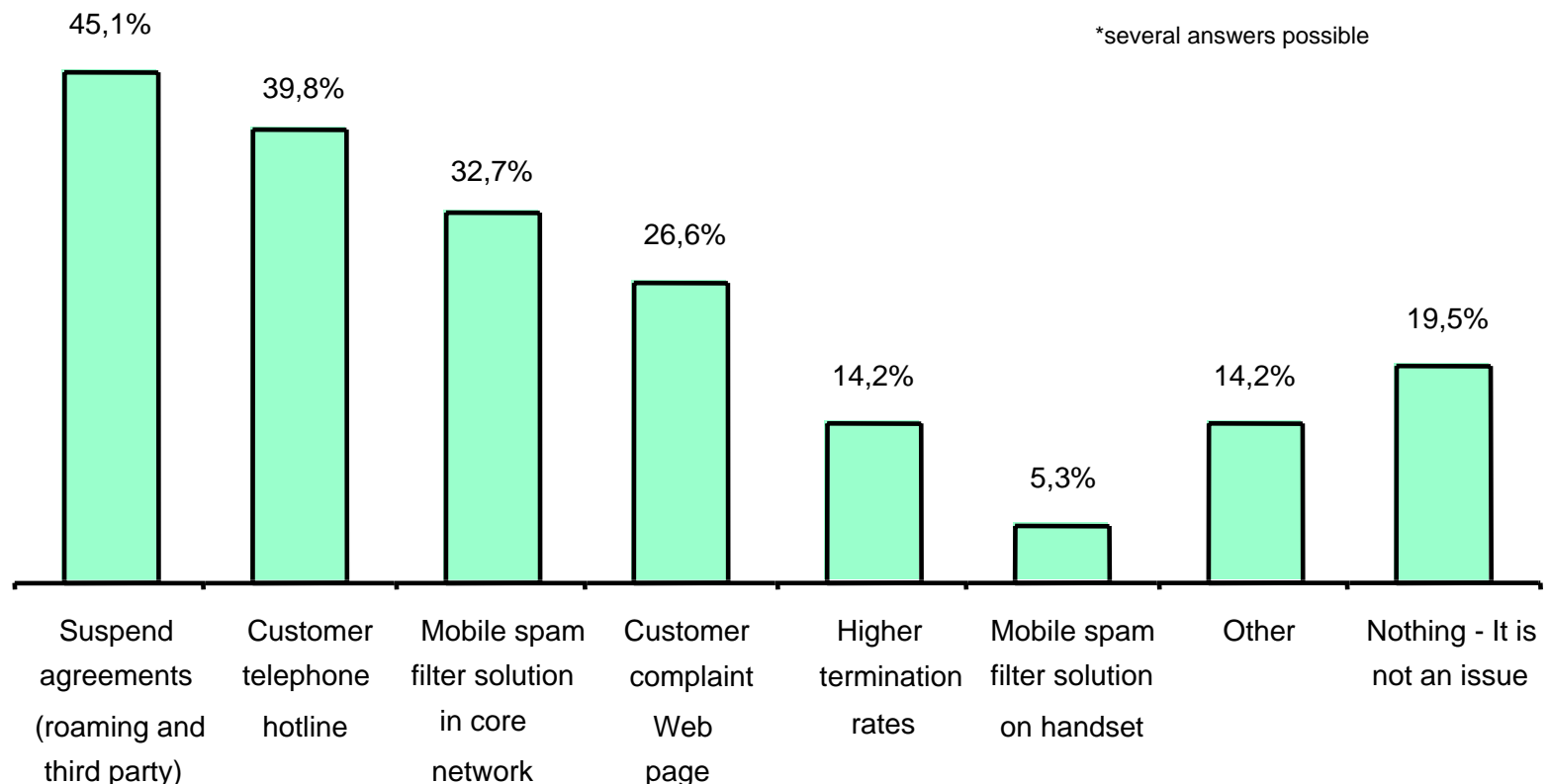
- 84.8% of Asian and 74.1% of European end-users (87.2% NA) believe that mobile spam has a negative impact on operator brand

- experts believe that a spam-free network can be communicated to customers as a competitive advantage

Positive 2.0%

100%

Neutral 13.2%

50%

Negative 84.8%

0%
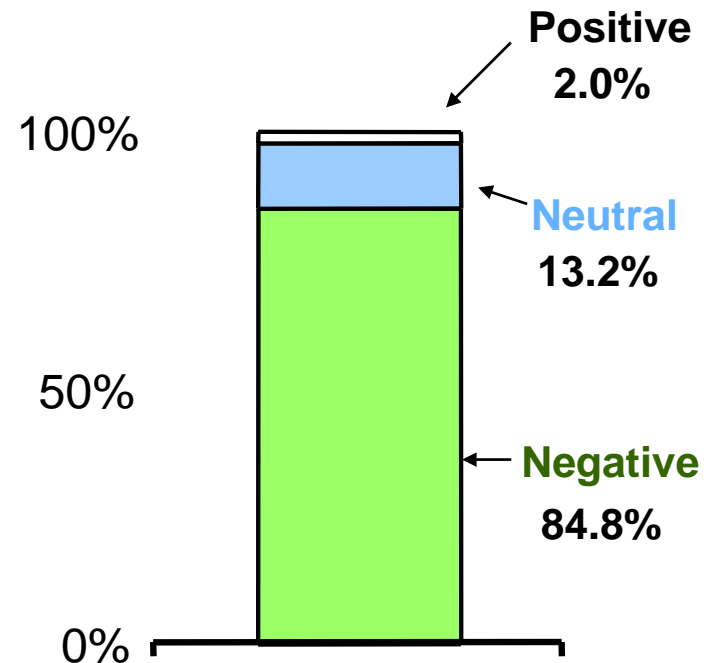
current measures by operators to reduce mobile spam

Operators are suspending roaming agreements to control mobile spam

What are operator's current measures against mobile spam?

*several answers possible

45,1% — Suspend agreements (roaming and third party)
39,8% — Customer telephone hotline
32,7% — Mobile spam filter solution in core network
26,6% — Customer complaint Web page
14,2% — Higher termination rates
5,3% — Mobile spam filter solution on handset
14,2% — Other
19,5% — Nothing - It is not an issue

Source: Insights into Mobile Spam Report 2005

RFID raises further concerns about protection of private info

- Based on uncertainty of status of tag information after purchase

  - strong opposition, e.g. by CASPIAN, EPIC, EFF
  - led to Benetton cancelling its RFID plans

- public sector organizations now becoming more aware of problem, e.g. EU Data Protection WP

- however, there are differing notions of privacy across cultures

a final thought on the challenges of transition

Change in all things is sweet

- Aristotle

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