International ICT and Broadband Development

Robert Pepper
Vice President Global Technology Policy

FCC Workshop
August 18, 2009

Agenda: Results from Three Studies

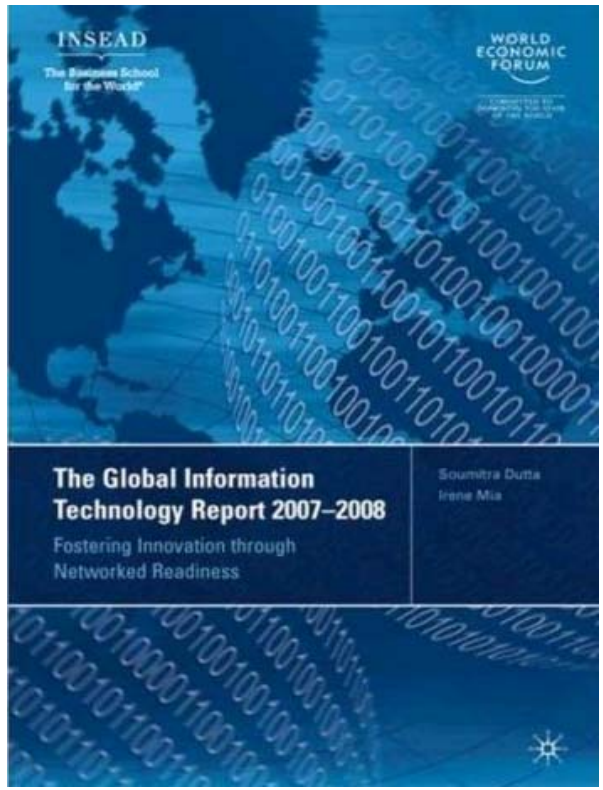
- Global Information Technology Report (2008)
- Global Information Technology Report (2009)
- Broadband Quality Score (2008)

2008 Global Information Technology Report
INSEAD and World Economic Forum

CHAPTER 1.2

The Emerging Nexus: Now is the Time to Plot a Balanced Course that Delivers on the Promise of ICT and Networks

ROBERT PEPPER, Cisco Systems, Inc.
ENRIQUE J. RUEDA-SABATER, Cisco Systems, Inc.
EWAN MORRISON, Cisco Systems, Inc.



Mapping ICT Ecosystem and Infrastructure

Ecosystem

ICT Policy-Regulation

- Laws relating to ICT (WEF)
- Burden of government regulation (WEF)

Market and Competition

- Quality of Competition in the ISP sector (WEF)
- Intensity of local competition (WEF)
- Capacity of innovation (WEF)

Business Climate

- Procedures to start a business (WEF from WB)
- Procedures to enforce a contract (WEF from WB)
- Efficiency of legal framework (WEF)

Infrastructure

Skills for ICT

- Availability of scientists and engineers (WEF)
- Availability of specialized training services (WEF)
- Quality of math and science education (WEF)

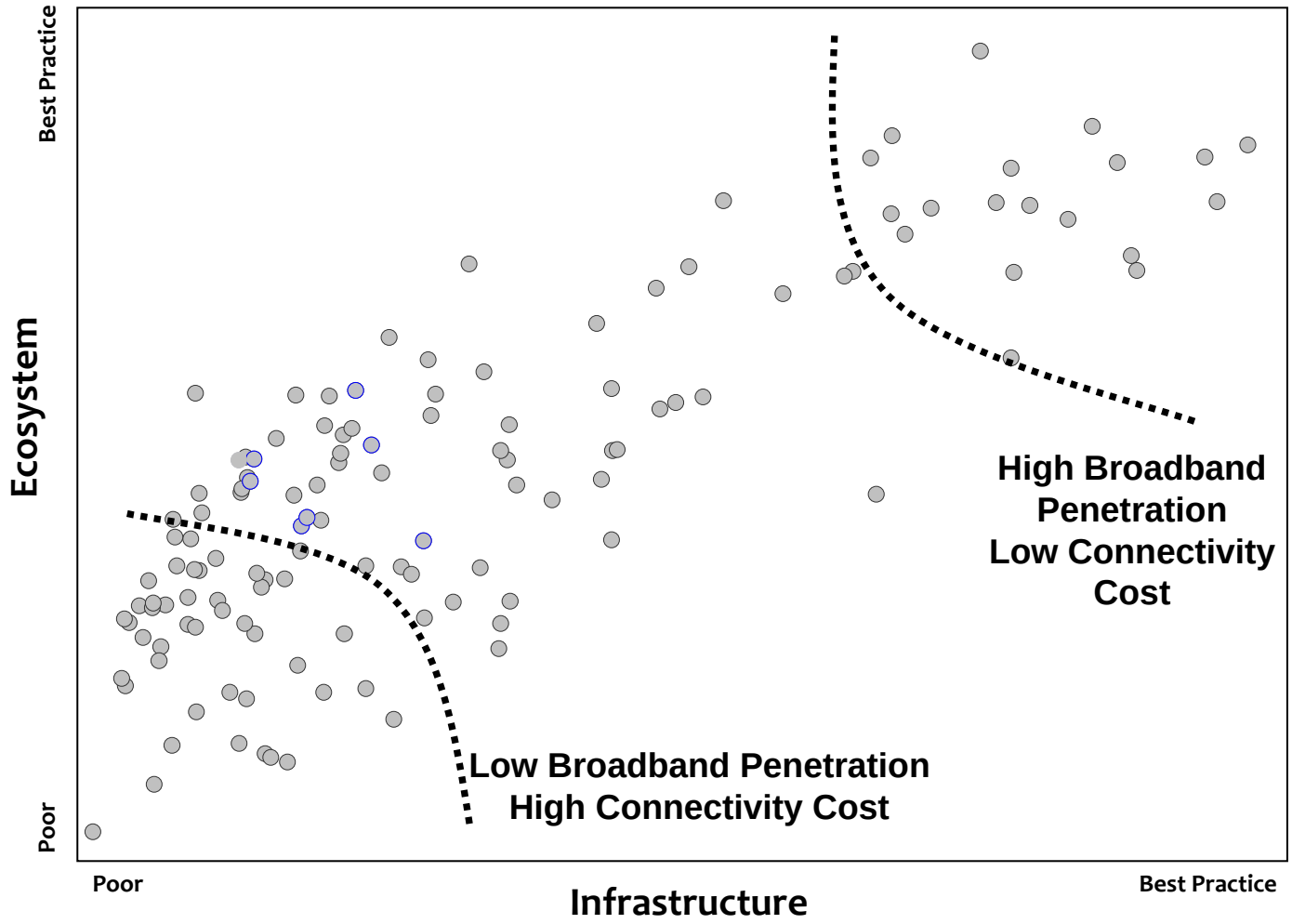
Domestic Networks

- Personal computers (WEF from ITU)
- Internet hosts (WEF from ITU)
- Mobile telephones (WEF from ITU)
- Telephone lines (WEF from ITU)
- Electricity production (WEF from WB)

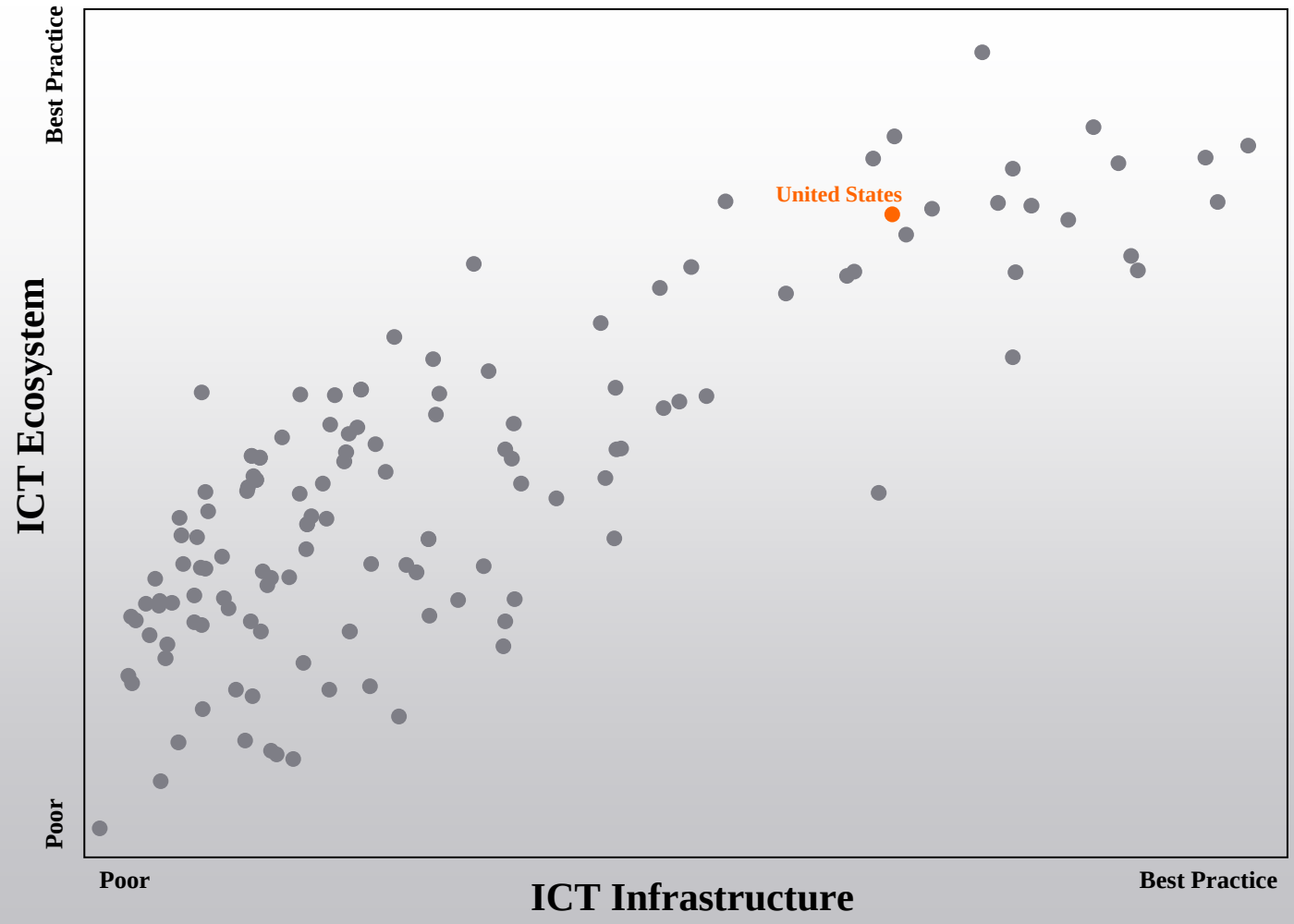
International Access

- Internet bandwidth (WEF from ITU)

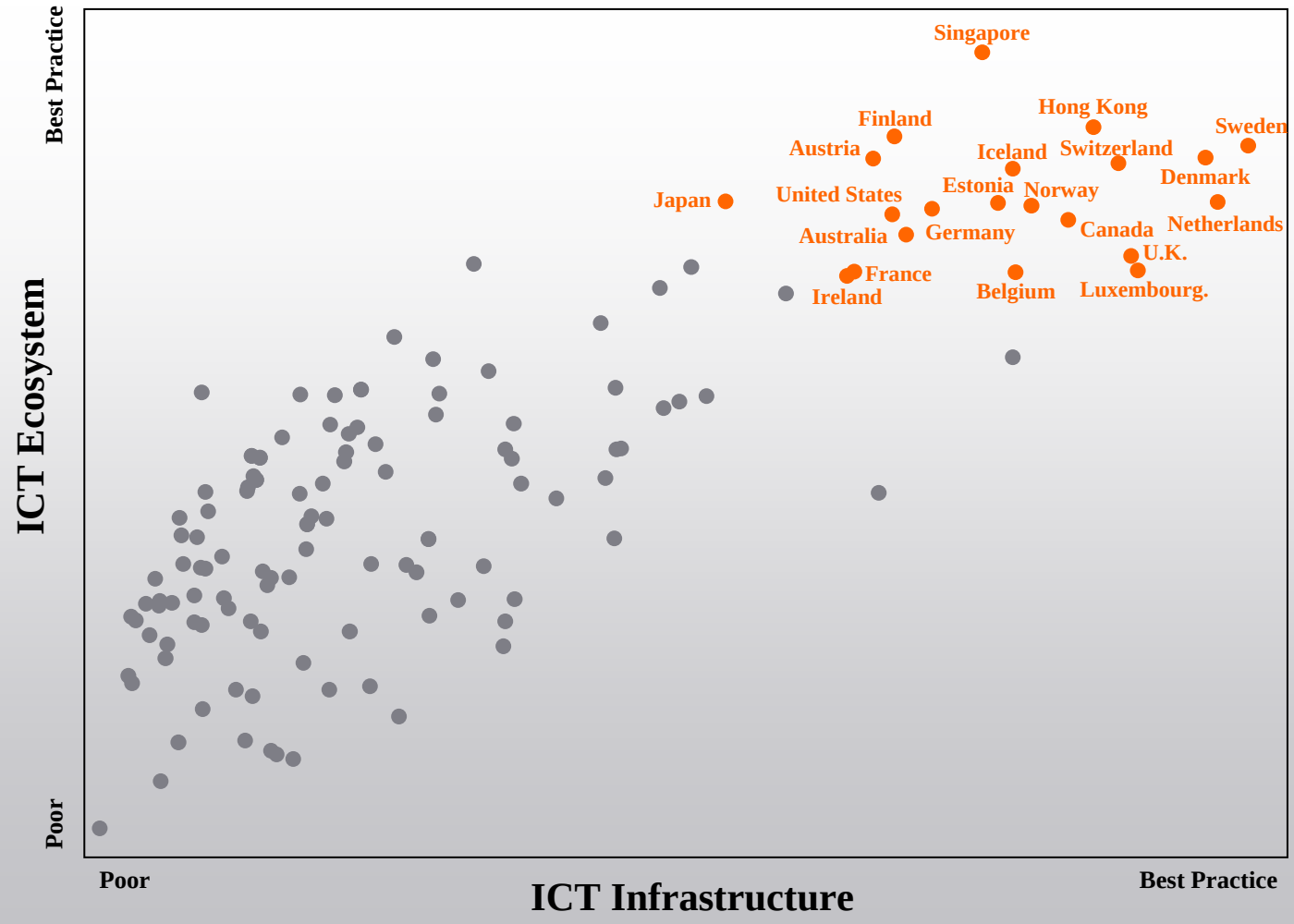
Mapping ICT Ecosystem and Infrastructure Implications for Broadband



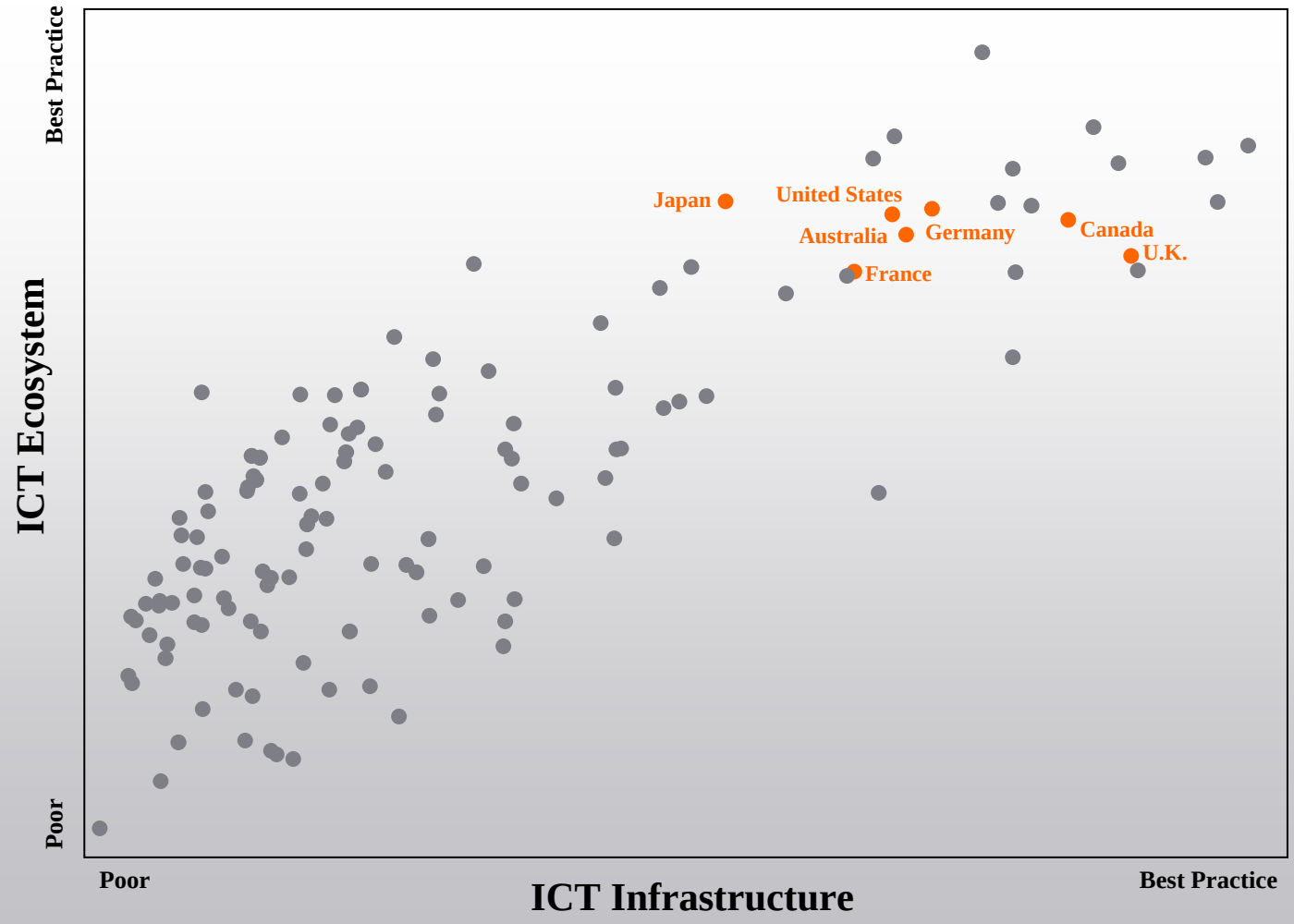
ICT Development Map: U.S.



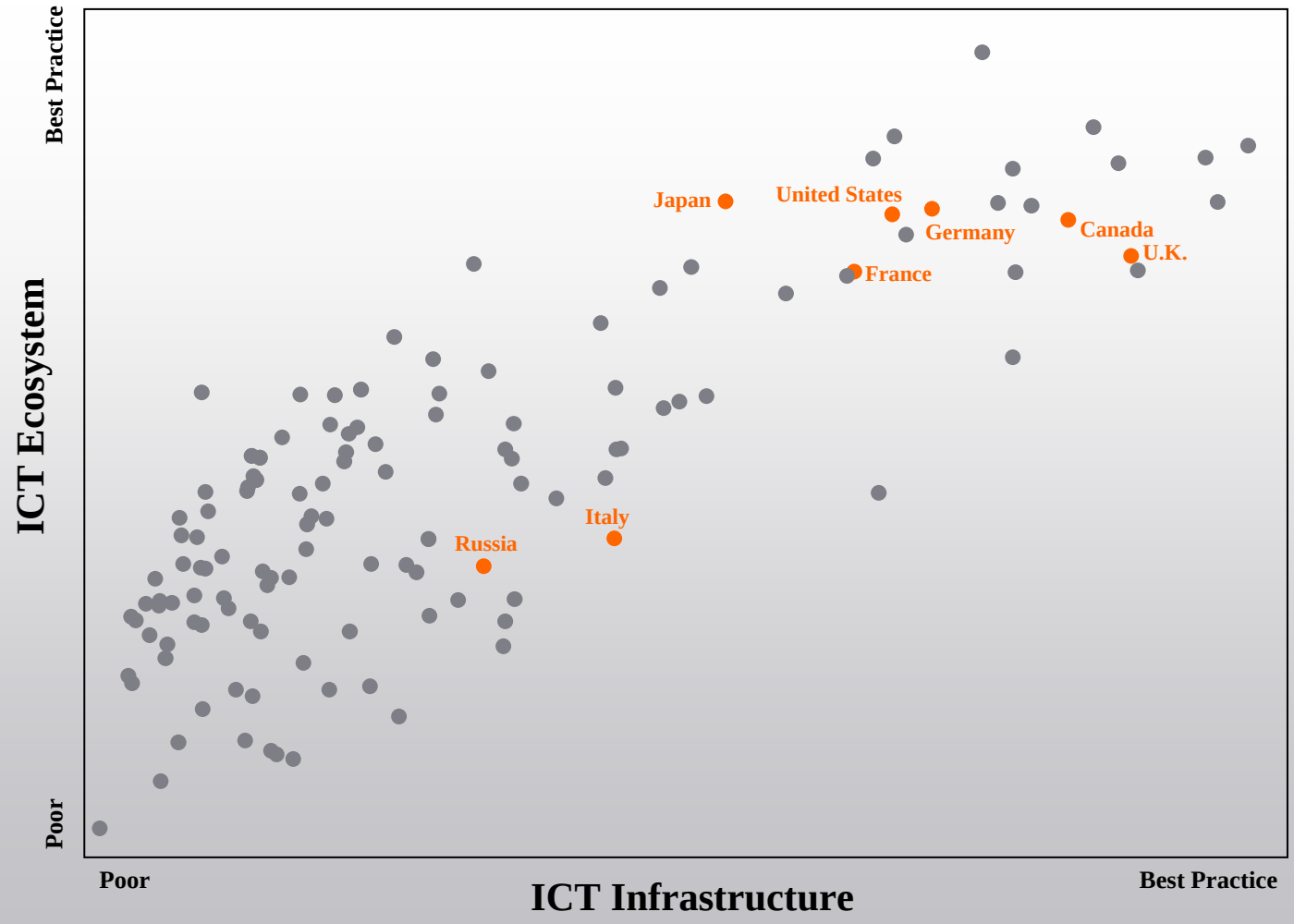
ICT Map: U.S. + Best Practice Countries



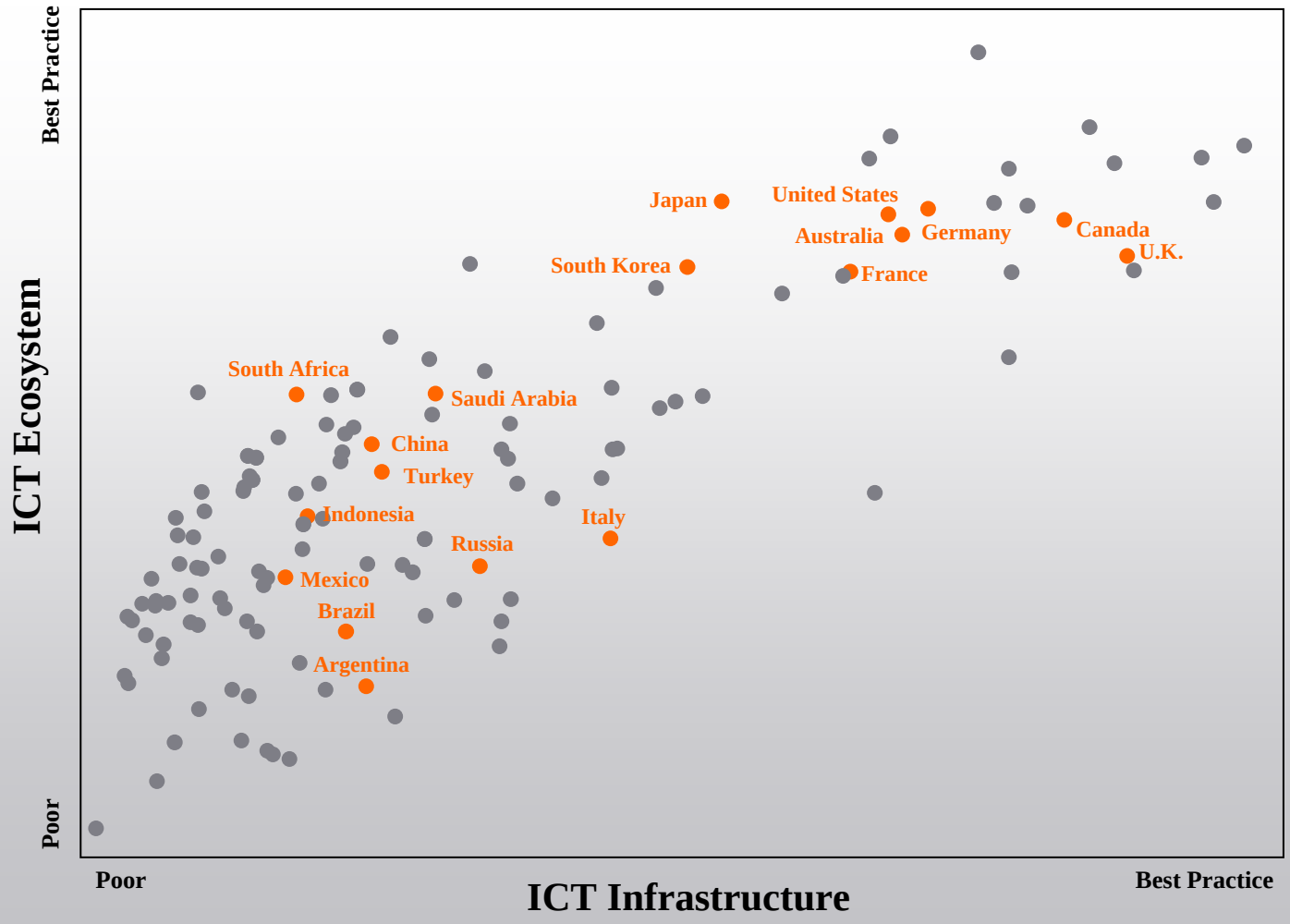
ICT Map: U.S. + Best Practice Countries



ICT Map: U.S. + Other G8 Countries



ICT Map: U.S. + Other G20 Countries



2009 Global Information Technology Report
INSEAD and World Economic Forum

CHAPTER 1.3

From Mobility to Ubiquity: Ensuring the Power and Promise of Internet Connectivity… for Anyone, Anywhere, Anytime

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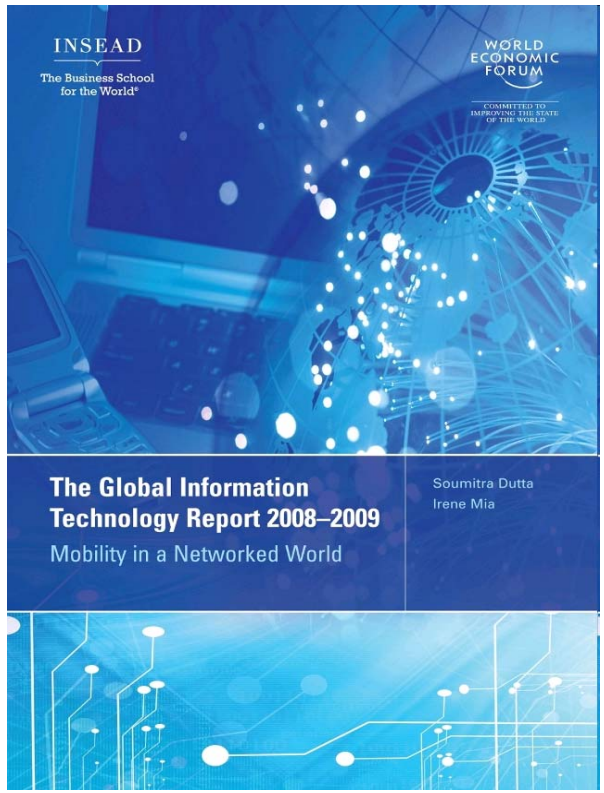
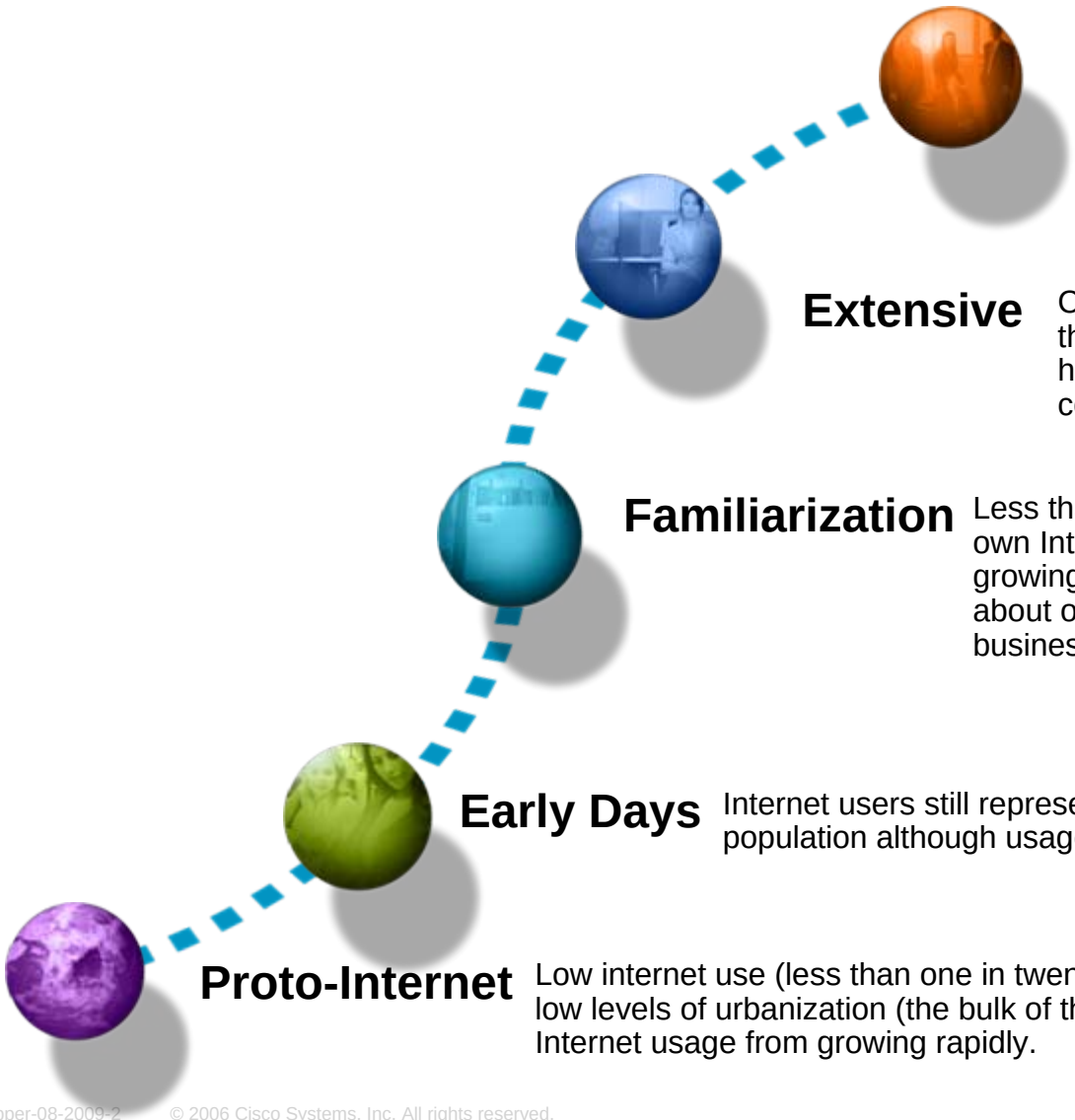


http://www.insead.edu/v1/gitr/wef/main/home.cfm

Internet Stages Worldwide



Intensive Over half of households and virtually all business have broadband connections; most people use Internet

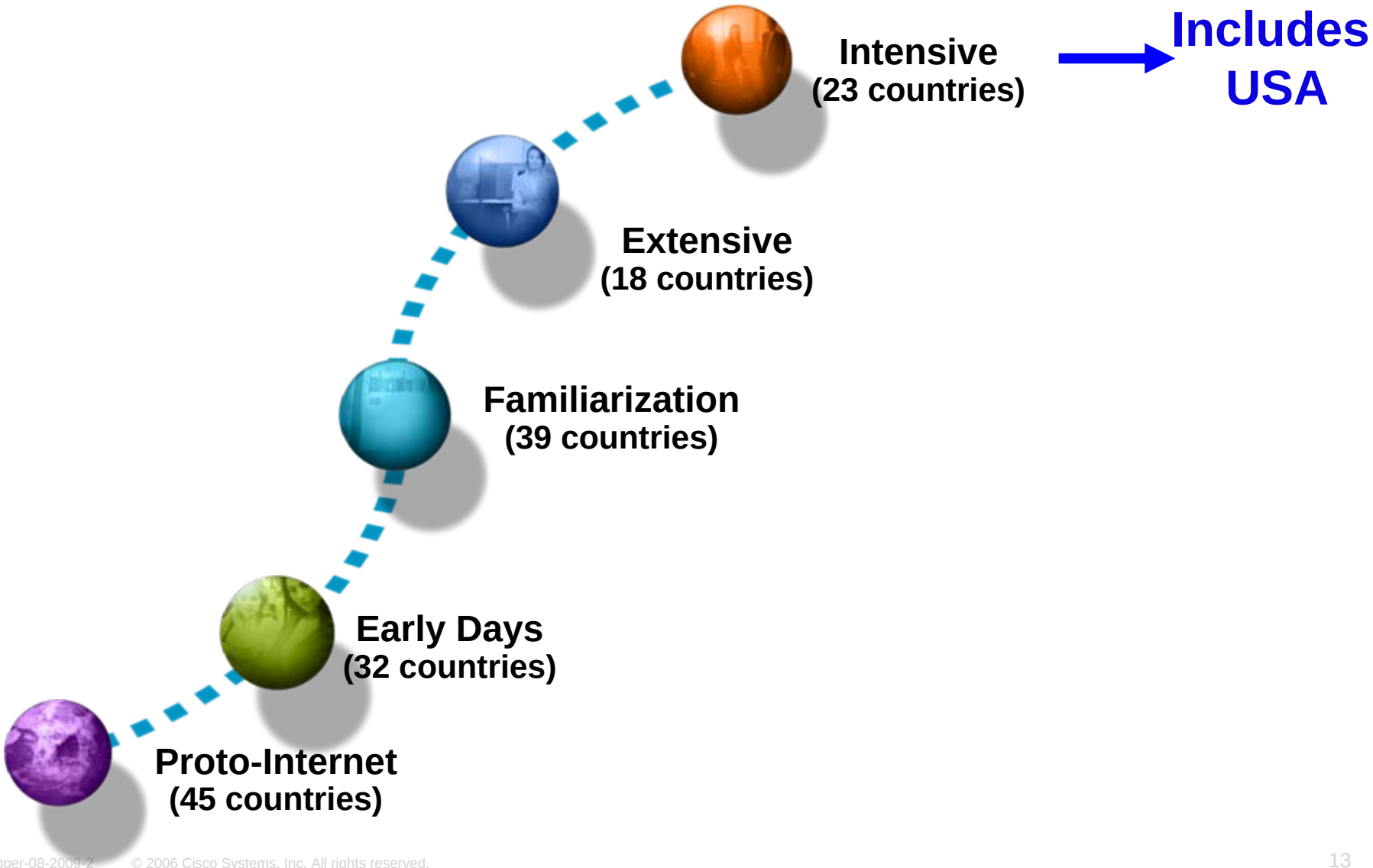
Extensive Close to half of the people are already using the Internet but only about one-third of households, on average, have their own connections

Familiarization Less than one-quarter of households have their own Internet connections but Internet use is growing and already has been experienced by about one-third of people; virtually all urban businesses are connected

Early Days Internet users still represent less than one-sixth of the population although usage is growing fast

Proto-Internet Low internet use (less than one in twenty people had experienced it by 2007); low levels of urbanization (the bulk of the population is still rural) preventing Internet usage from growing rapidly.

Internet Stages Worldwide



Broadband Quality Score

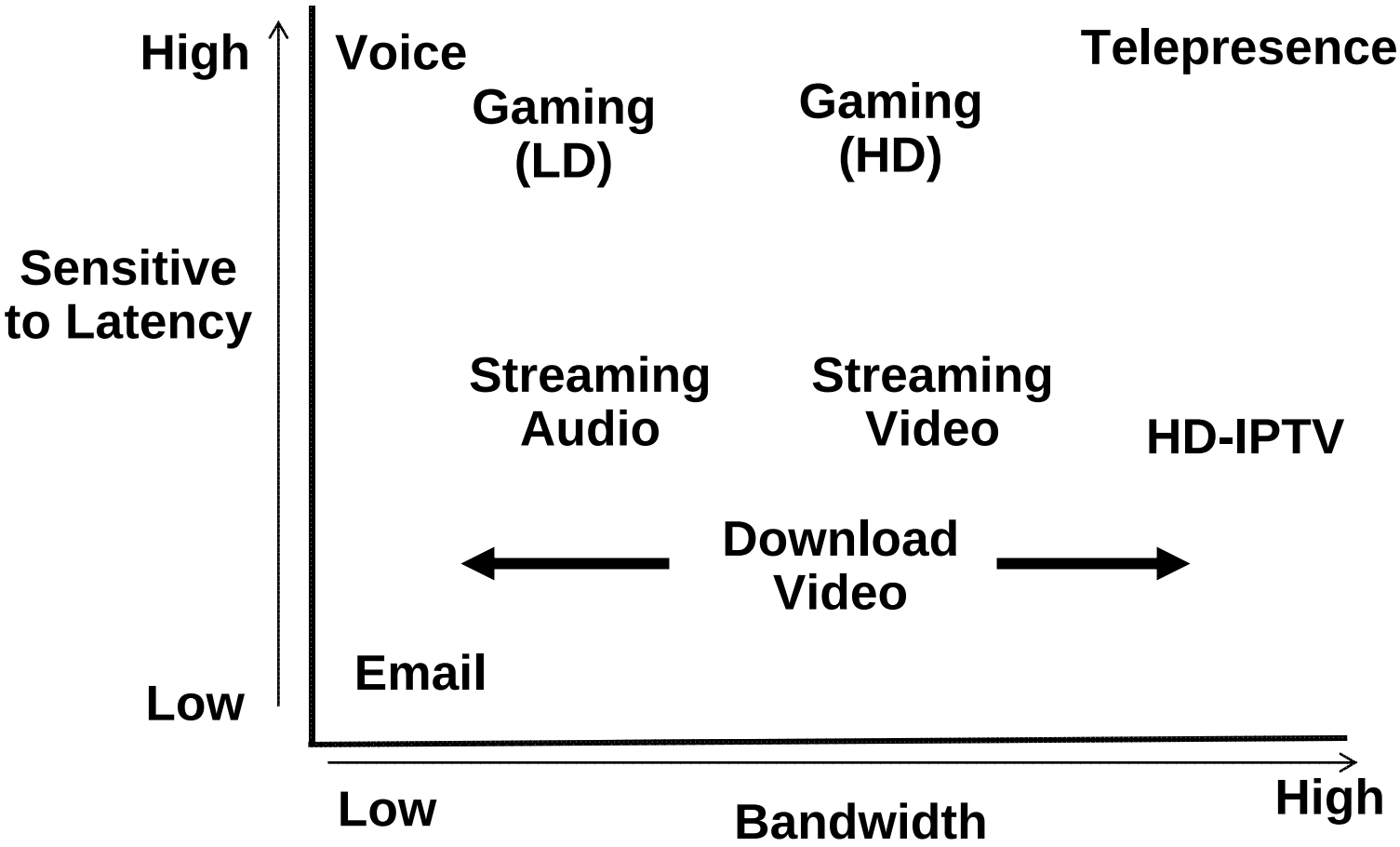
A global study of broadband quality
September 2008

Sponsored by 

Dimensions of Broadband

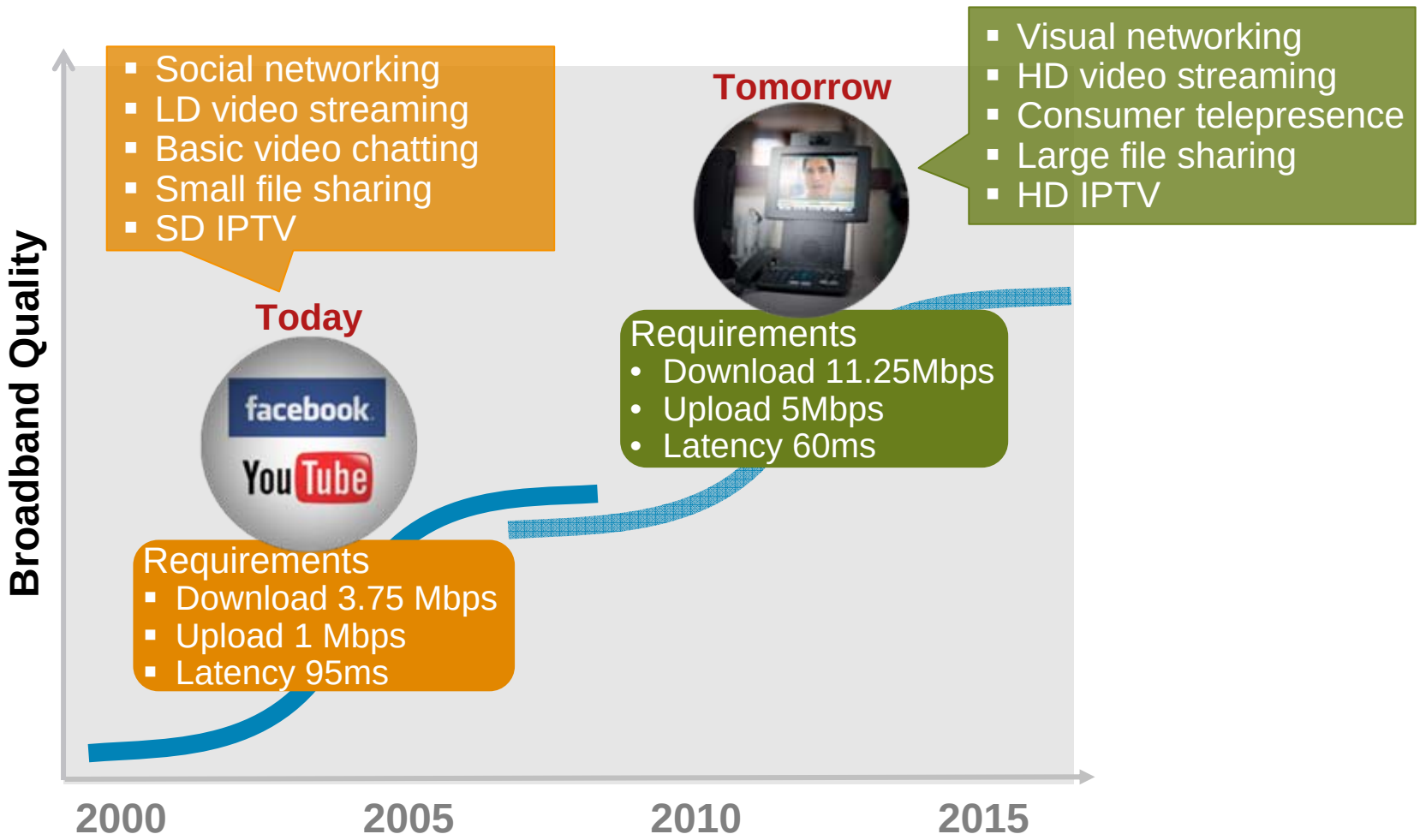
- Bandwidth—”speed”
- Latency
- Jitter
- Symmetry
- Bursting
- Other…

Matching Broadband to Applications
Not All Bits Are Created Equal



Changing Quality Requirements

TWO WAVES OF BROADBAND SERVICES



Source: California Broadband Task Force, Jan 2008; Expert interviews; Oxford Team analysis, Aug 2008

Main Broadband Quality Factors

KEY FACTORS IN DETERMINING BROADBAND EXPERIENCE

Factor	Description	Example
Download Throughput	Net bit rate of downstream data that transverse the network and the broadband connection	Critical for streaming high quality video, sharing large files such as pictures or video
Upload Throughput	Net bit rate of upstream data that transverse the network and the broadband connection	Increasingly relevant for two-way high-quality video communications, uploading/sharing pictures and videos
Latency	Time taken for a packet of data to reach from source to destination	Very important for real-time applications such as VoIP communications and gaming
Other	Network oversubscription, packet loss, jitter, service continuity. Typically embedded in throughput factors	Critical for video broadcast distribution and overall end-to-end experience

Source: Expert interviews; Oxford Team analysis, Aug 2008

Broadband Quality Score (BQS)

BQS CALCULATION

- **BQS is calculated based on normalized values of:**

  Download and Upload throughput, and Latency

- **About 8million records sourced from actual tests from Speedtest.net (Ookla) during May 2008**

- **Weights assigned to each factor for *today's* and *tomorrow*'s (3 to 5 years) applications.**

BQS (today) = 55% Download + 23% Upload + 22%Latency

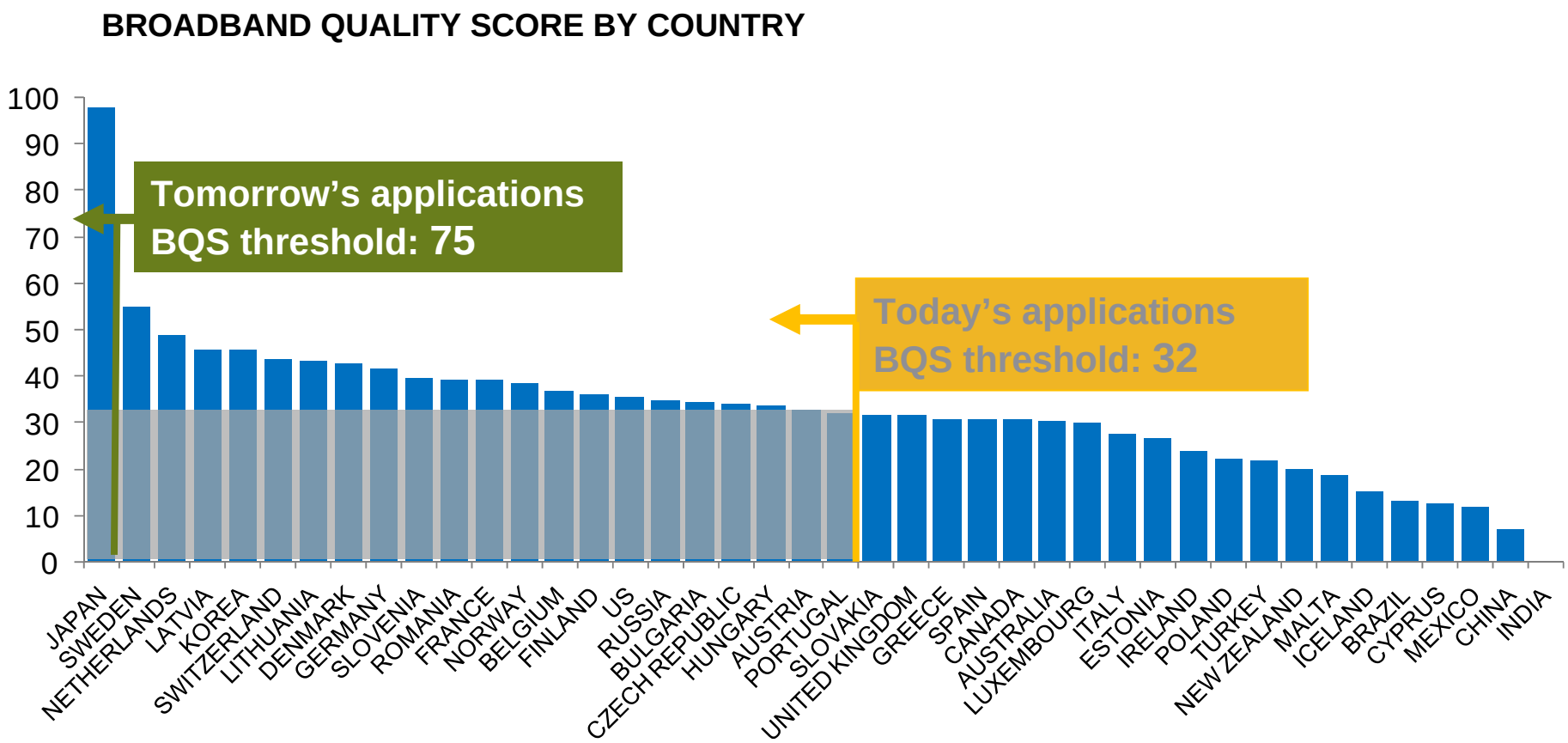
BQS threshold: 32
- Download 3.75 Mbps
- Upload 1 Mbps
- Latency 95ms

BQS (tmrw) = 45% Download + 32% Upload + 23%Latency

BQS threshold: 75
- Download 11.25Mbps
- Upload 5Mbps
- Latency 60ms

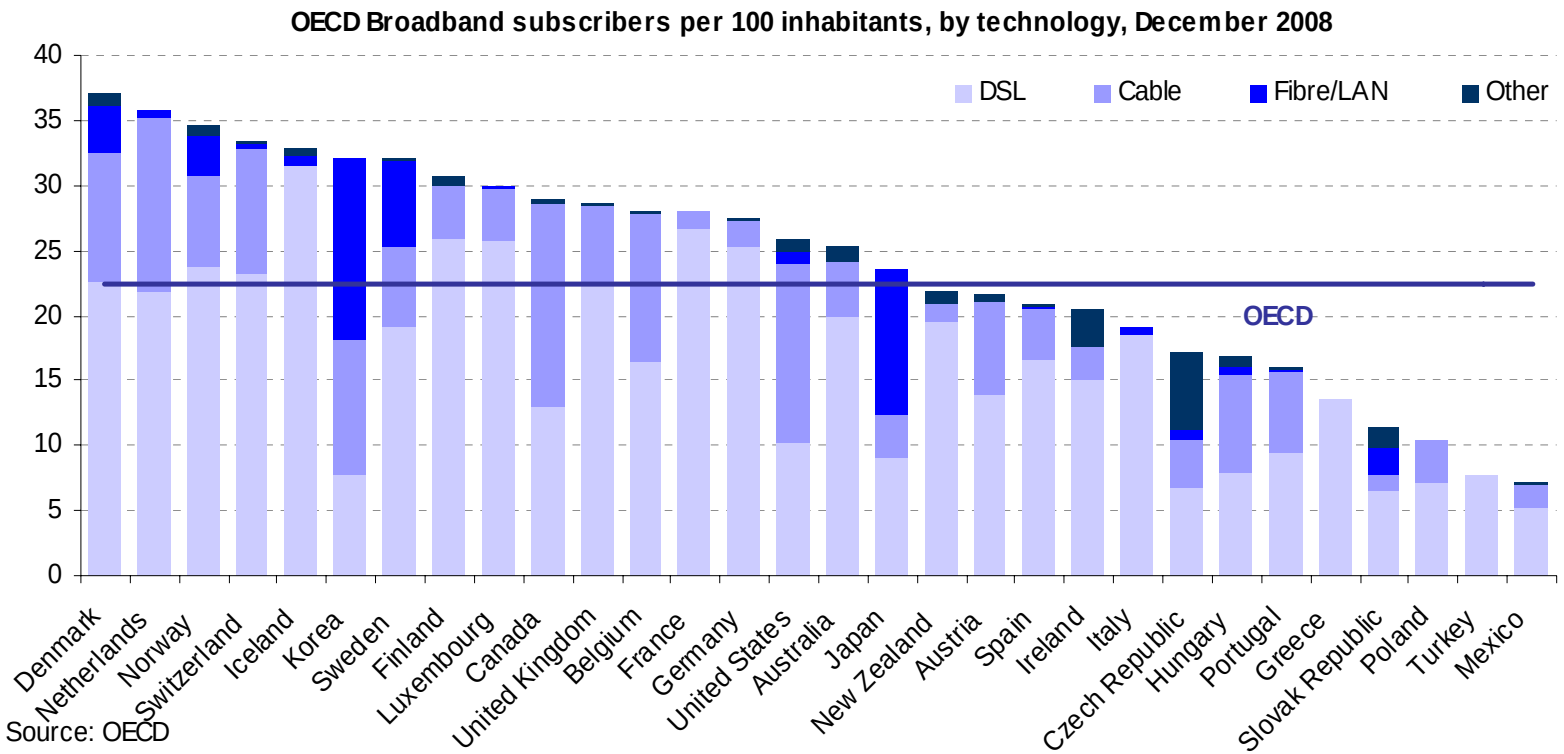
Source: University of Oviedo; Delphi interviews; Oxford University Team Analysis, Aug 2008

Country Broadband Quality Scores



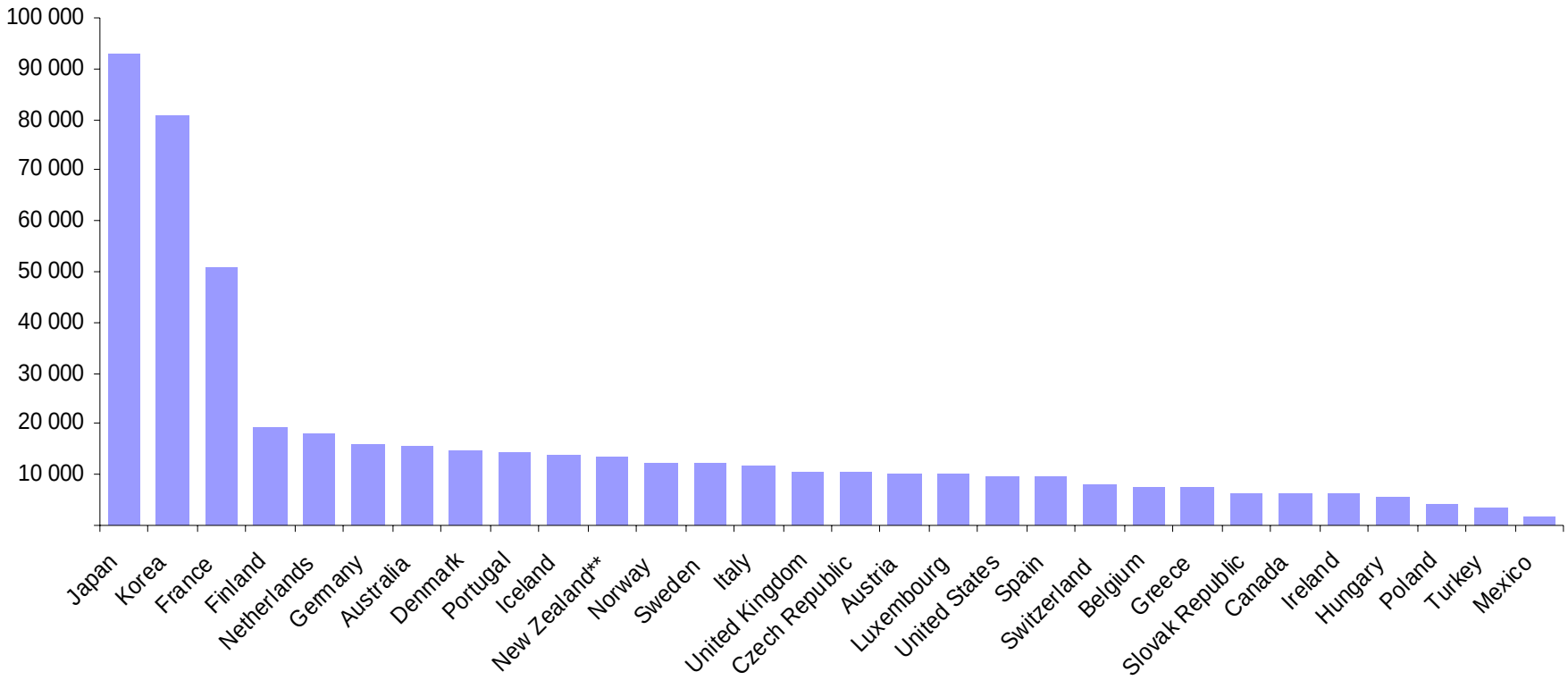
Source: Speed Test database, Expert Interviews, BQS Team Analysis, Aug 2008

Broadband Adoption (OECD)



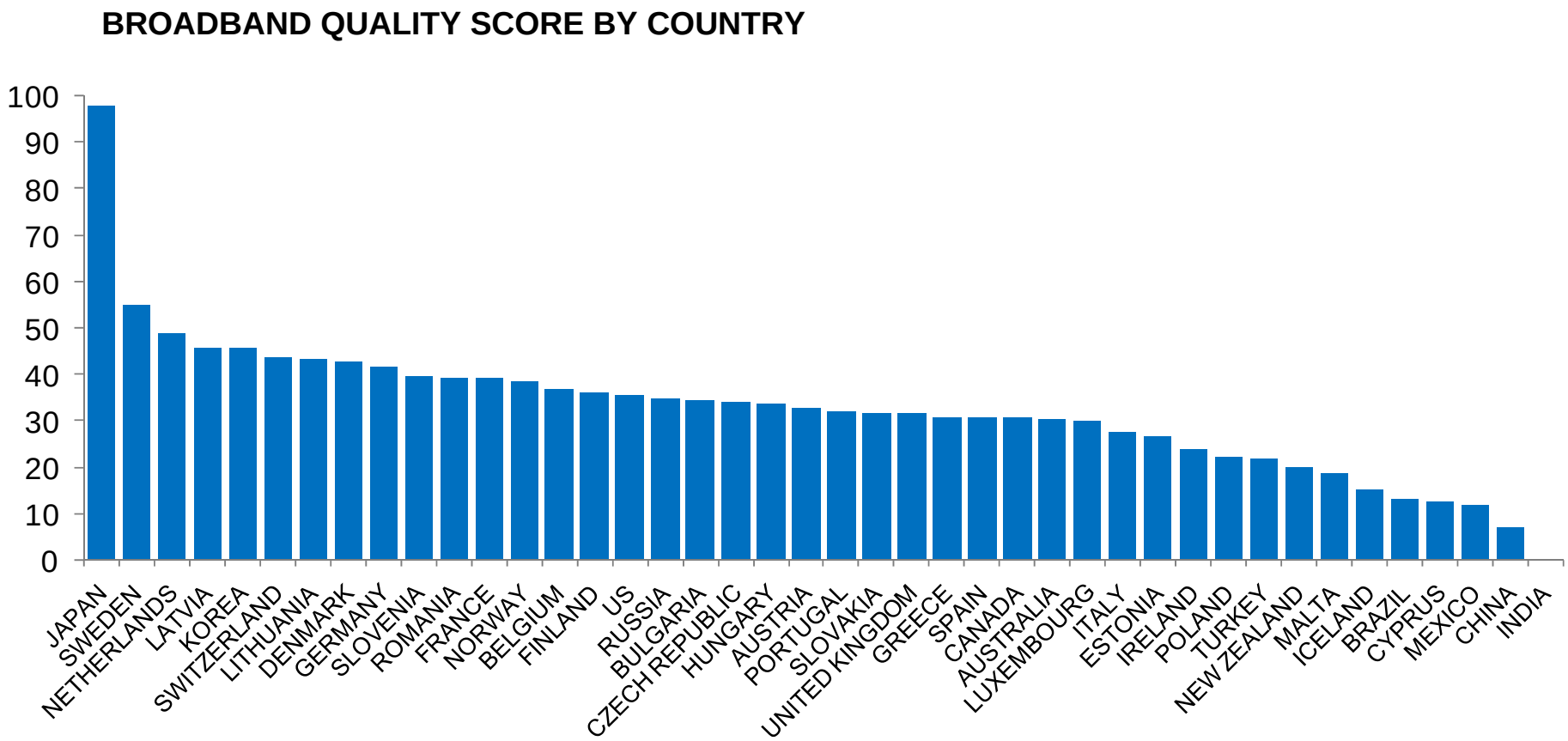
Advertised Average Download Speed (OECD)

Average advertised broadband download speed, by country, kbit/s, September 2008



Source: OECD

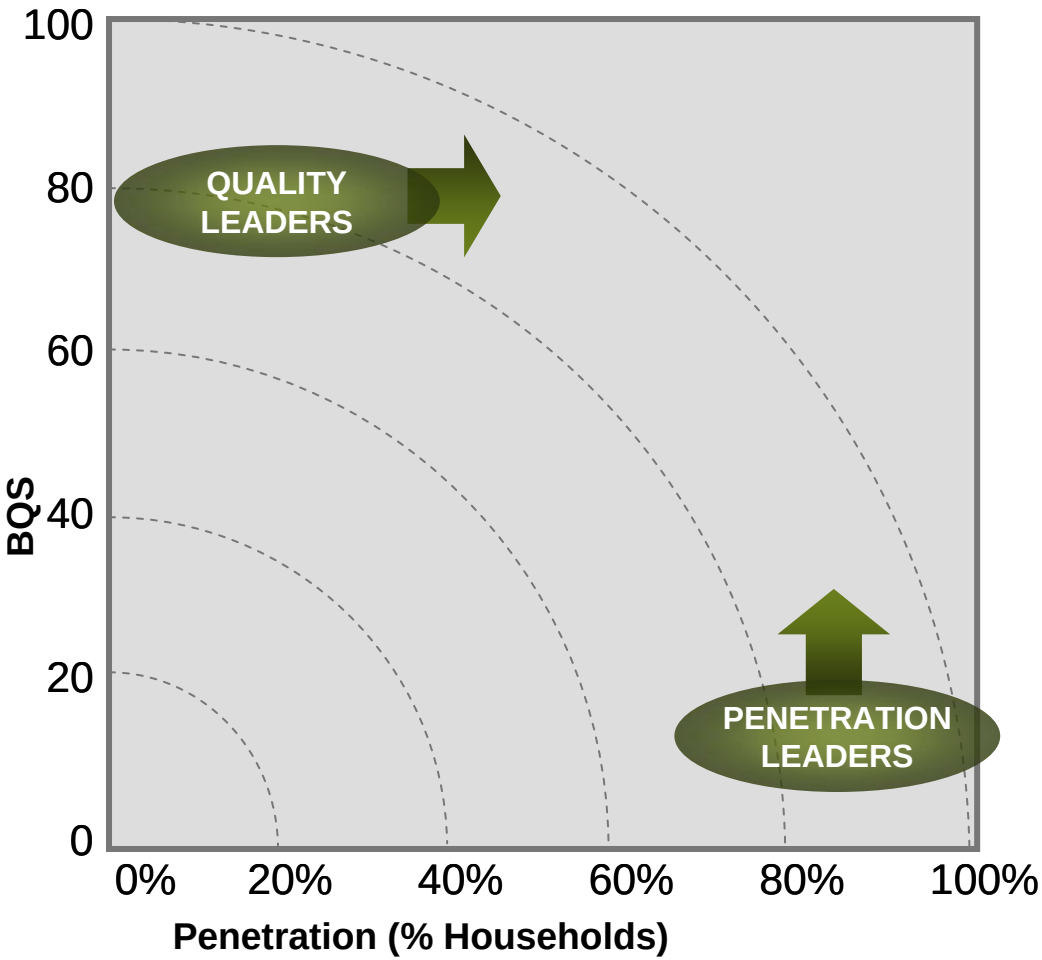
Country Broadband Quality Scores



Source: Speed Test database, Expert Interviews, BQS Team Analysis, Aug 2008

Broadband Penetration and Quality

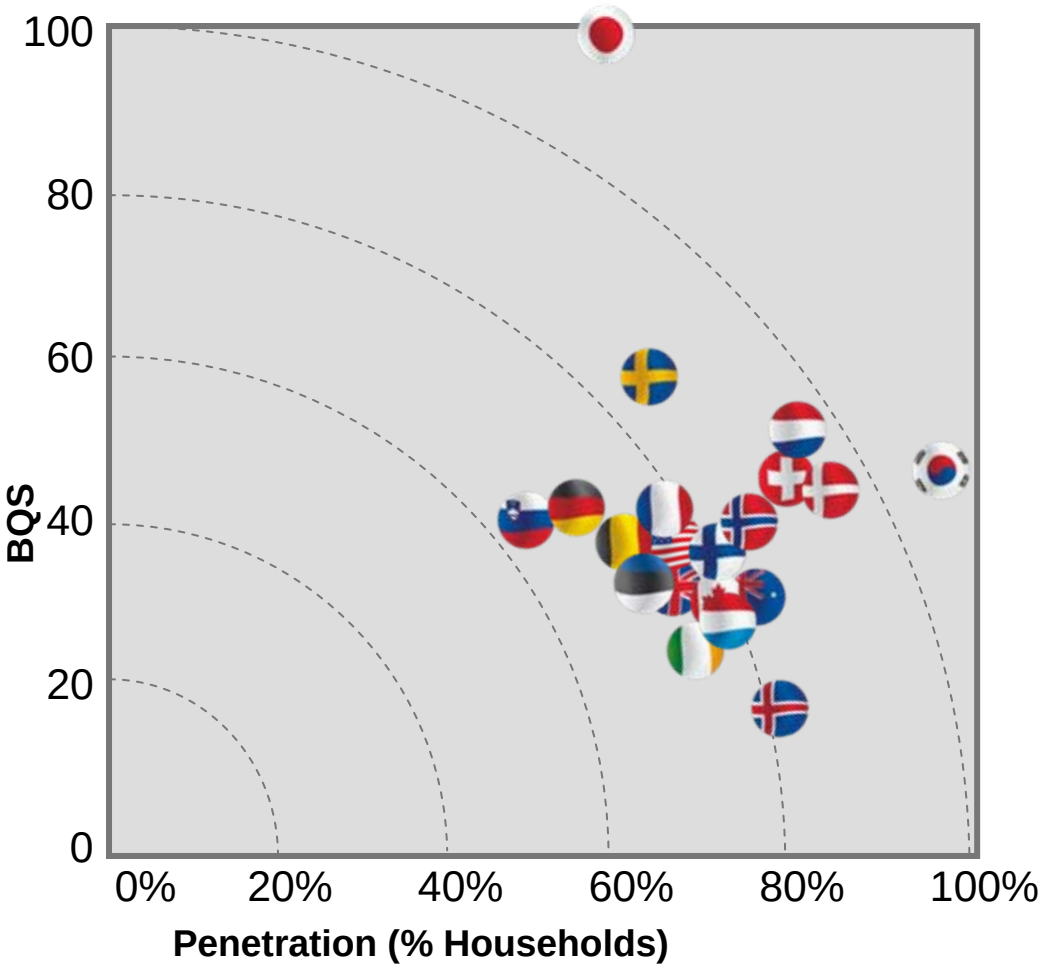
BROADBAND LEADERSHIP MATRIX



Source: Cisco IBSG, Aug 2008

Broadband Penetration and Quality

BROADBAND LEADERSHIP MATRIX (TOP-20)



1. Japan
2. South Korea
3. Netherlands
4. Denmark
5. Switzerland
6. Sweden
7. Norway
8. Australia
9. Iceland
10. Luxembourg
11. Canada
12. Finland
13. France
14. US
15. United Kingdom
16. Ireland
17. Belgium
18. Estonia
19. Germany
20. Slovenia

Source: Speed Test database; Point Topic, BQS Team Analysis, Cisco IBSG, Aug 2008

Lessons Learned

- ICT Ecosystem is more than broadband
- Multi-staged path to ubiquity (and benefits)
  - Availability/reach
  - Adoption
  - Utilization
- Broadband is multi-dimensional and non-static—quality matters