



Saïd Business School
UNIVERSITY OF OXFORD



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Broadband Quality Score

A global study of broadband quality
September 2009

Sponsored by  CISCO

Background information

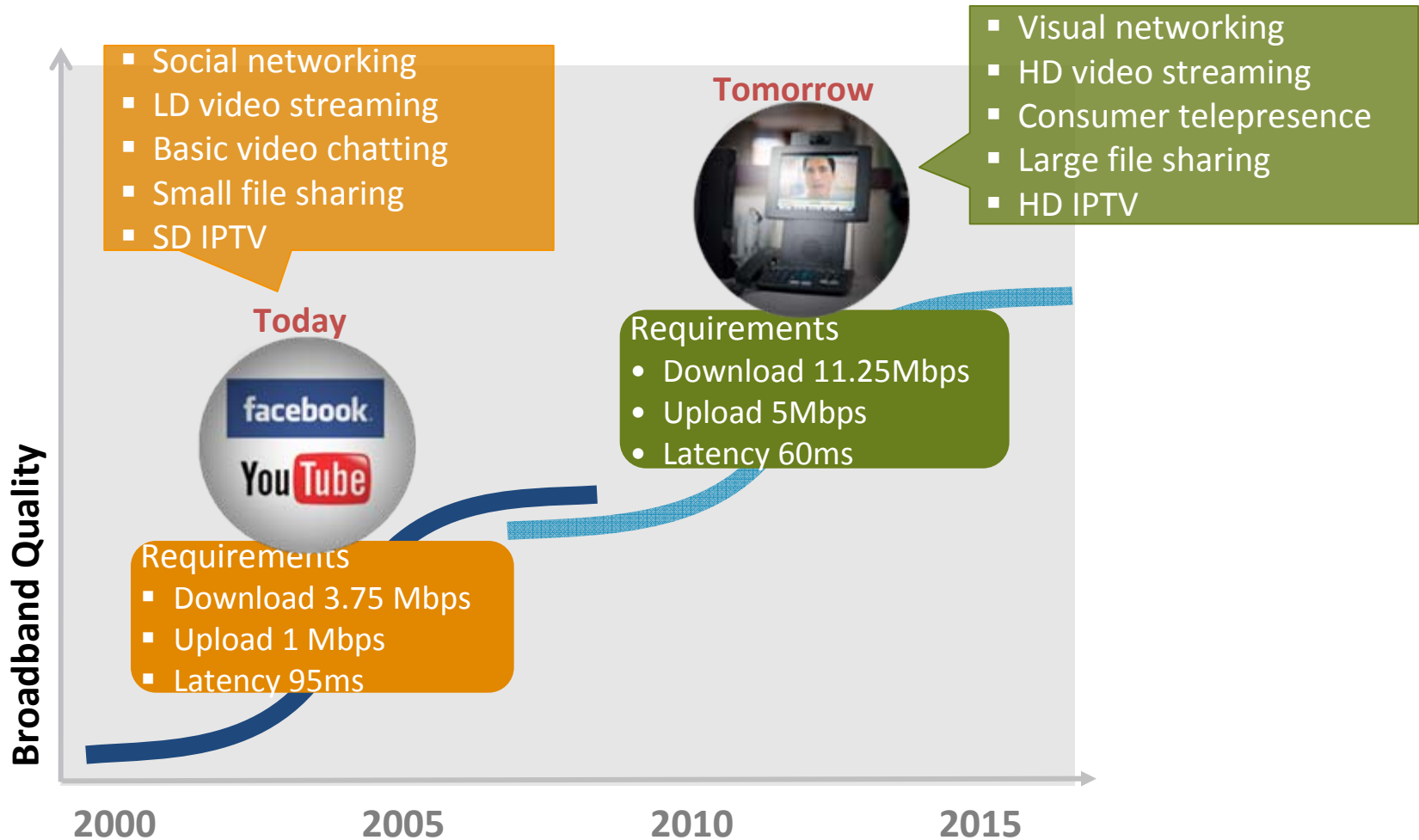
- Only a few years ago, the analysis of broadband diffusion focused on who had an Internet connection and who did not.
- As bandwidth intensive applications, such as video, became pervasive, the broadband gap is being redefined as a quality divide.
- Last year, Cisco sponsored the development of the Broadband Quality Score —an index that combines key performance parameters to measure the quality of a broadband connection.
- The research team found that broadband quality is linked to social and economic benefits and that countries with high broadband quality have broadband on their national agenda.
- Investments in fibre and cable upgrades improve broadband quality.
- In 2009, we analysed approximately 24 million records sourced from actual broadband speed tests from Speedtest.net (Ookla) for 66 countries during May 2008 and May to July 2009
- Additional analysis in 2009 includes segmentation based on stage of economic development; BQS for cities and the Broadband Quality Divide



What the study established in 2008

Changing quality requirements

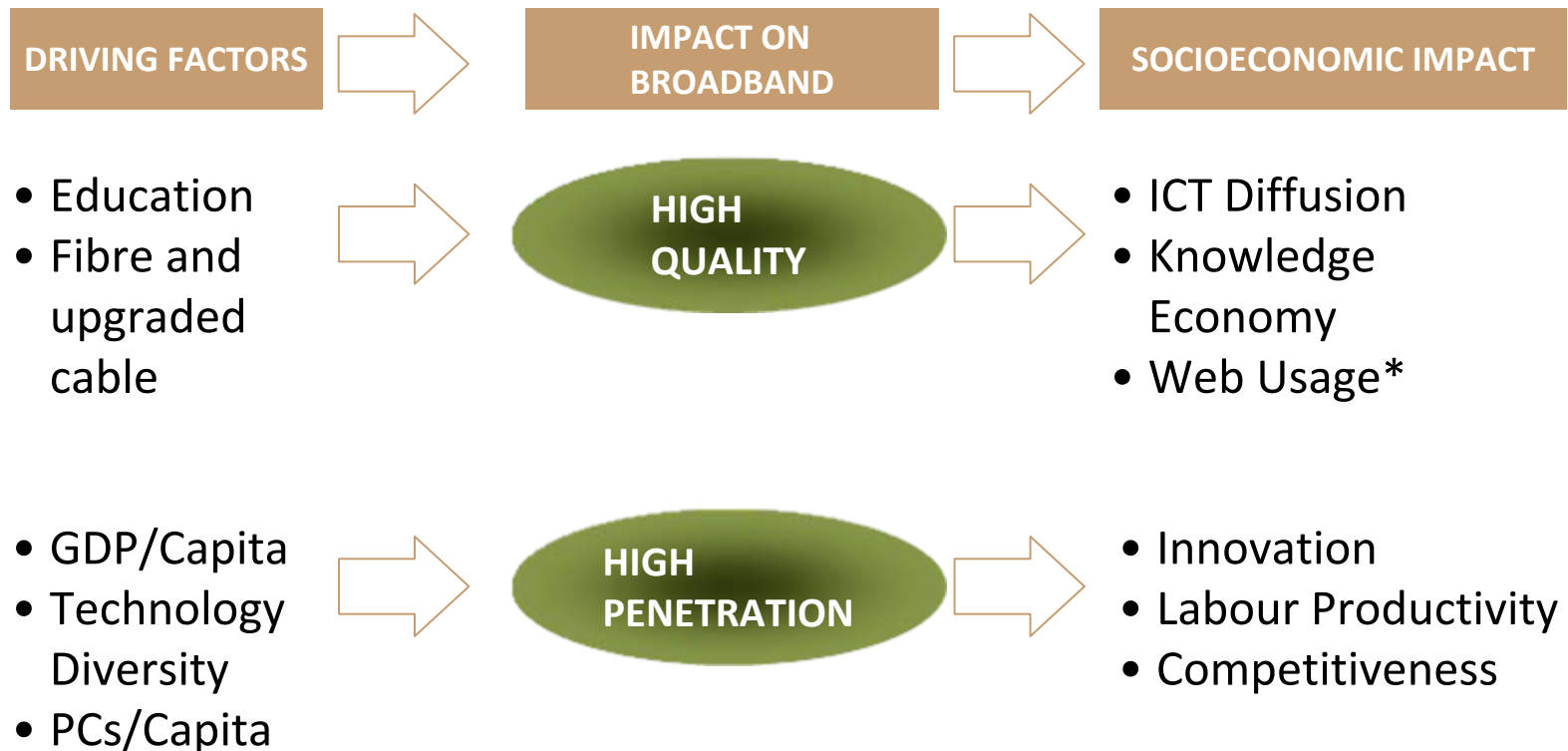
TWO WAVES OF BROADBAND SERVICES



What the study established in 2008

Impact of Quality and Penetration

MAIN FACTORS ASSOCIATED WITH BROADBAND QUALITY AND PENETRATION



* based on limited sample of ComScore data



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



Broadband Quality Score (BQS)

BQS THRESHOLD CALCULATION

- BQS is calculated based on normalized values of:
 - Download and Upload throughput, and Latency
- 24 million records sourced from actual tests from Speedtest.net (Ookla) during May 2008 and May - July 2009
- 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: 30

- Download 3.75 Mbps
- Upload 1 Mbps
- Latency 95ms

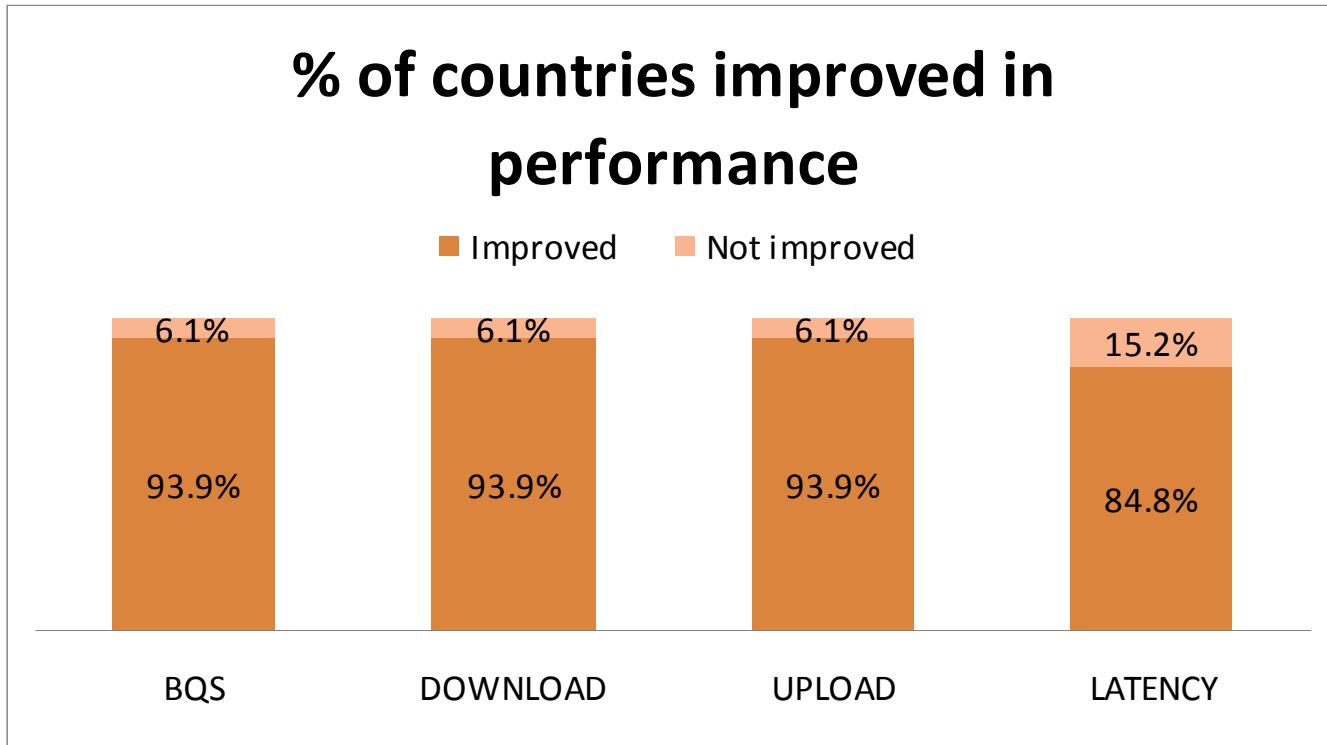
BQS (tmrw) = 45% Download + 32% Upload + 23%Latency

BQS threshold: 50

- Download 11.25Mbps
- Upload 5Mbps
- Latency 60ms



Global overview for 2009



	BQS	Download	Upload	Latency
2008	26	3185	773	215
2009	31	4754	1308	170
Delta	17%	49%	69%	-21%

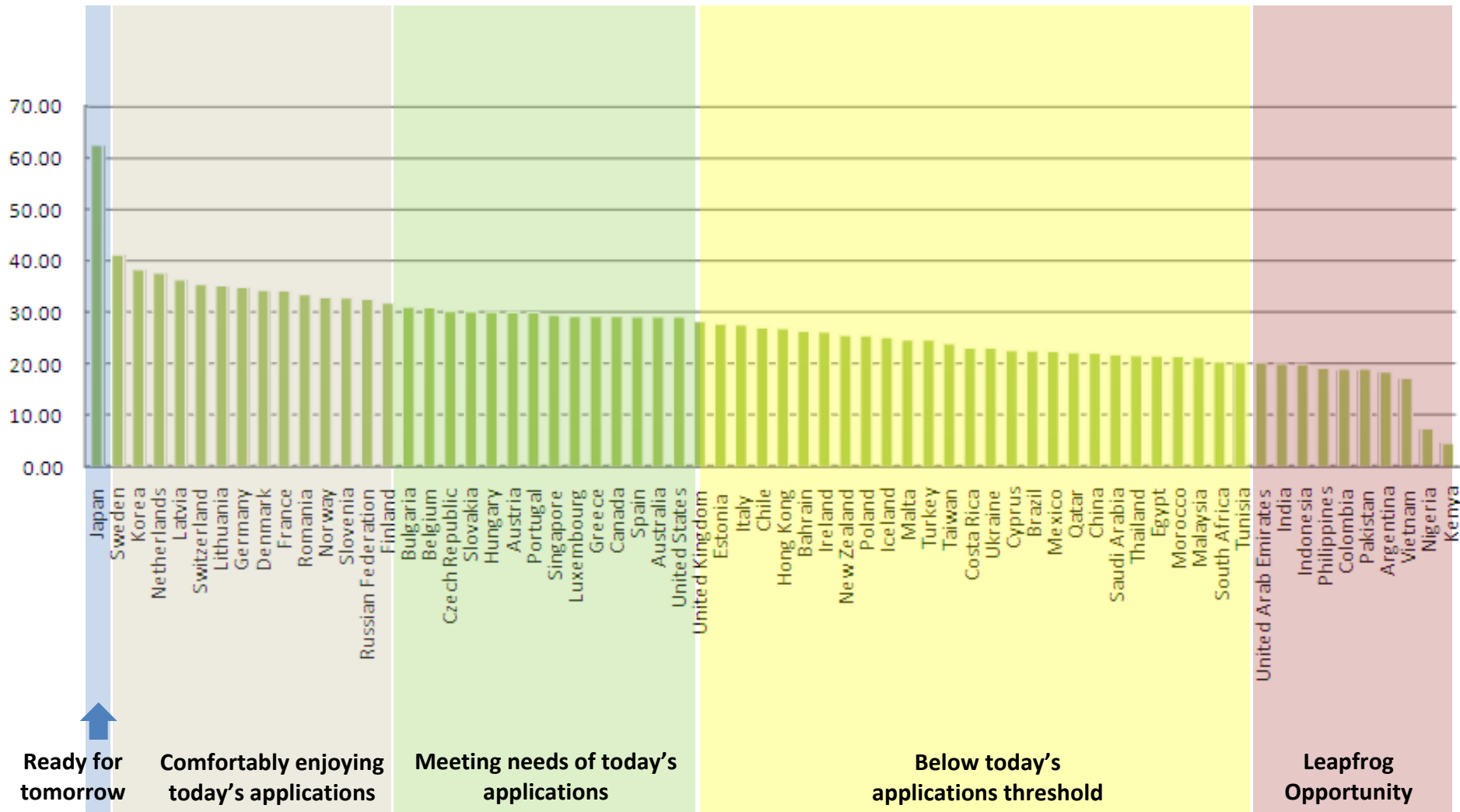


Regional improvement of BQS

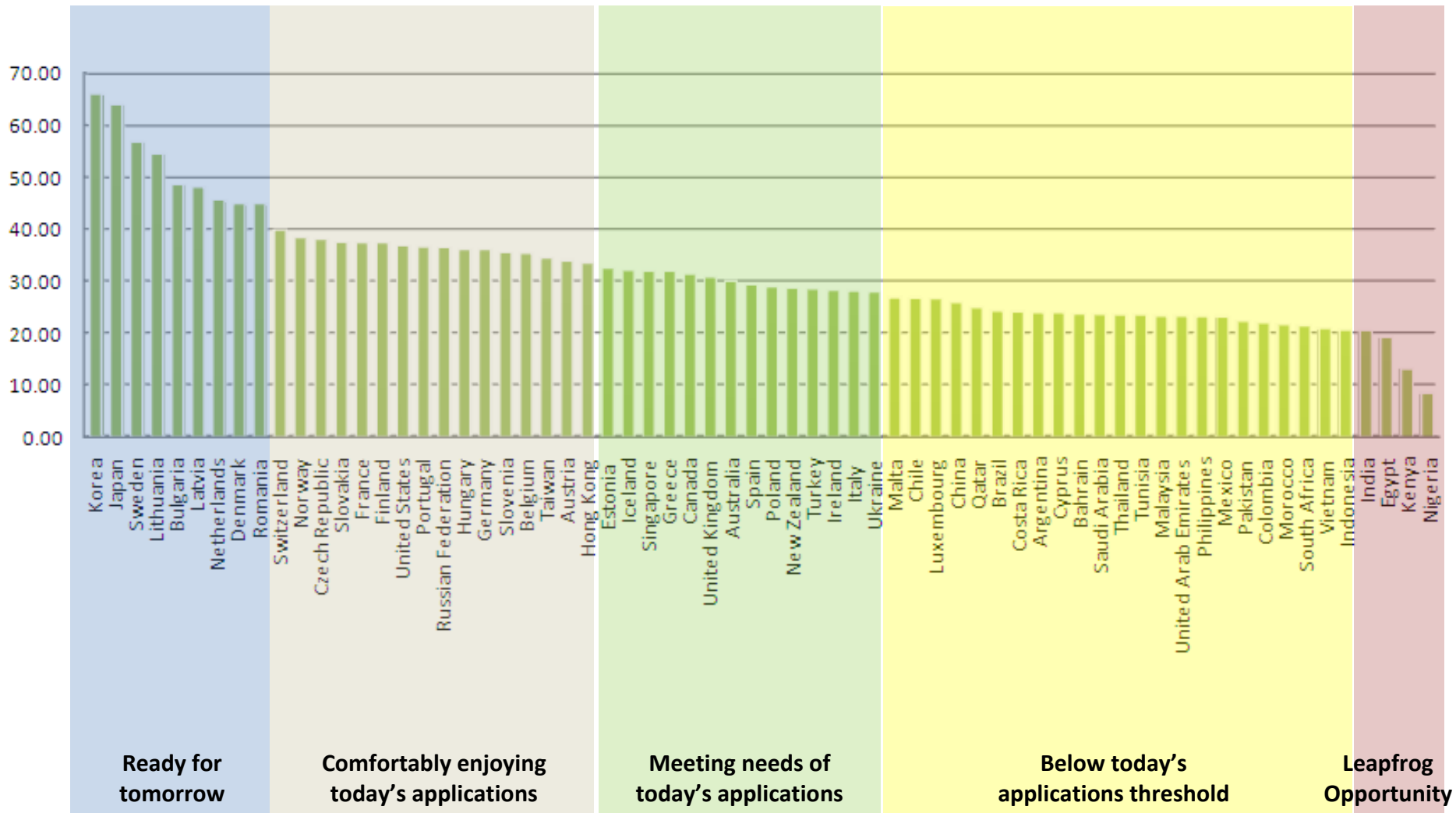
Region	Number of countries	Avg 2008 BQS	Avg 2009 BQS	% of improvement
Central & Eastern Europe	13	30.2	38.2	26.7%
W. Europe	20	30.7	35.0	13.8%
North America	2	29.1	34.1	16.9%
Asia Pacific	15	26.4	31.2	18.3%
Latin America	6	22.1	24.0	8.5%
ME & Africa	10	18.6	20.2	8.8%



BQS by countries 2008



BQS by countries 2009



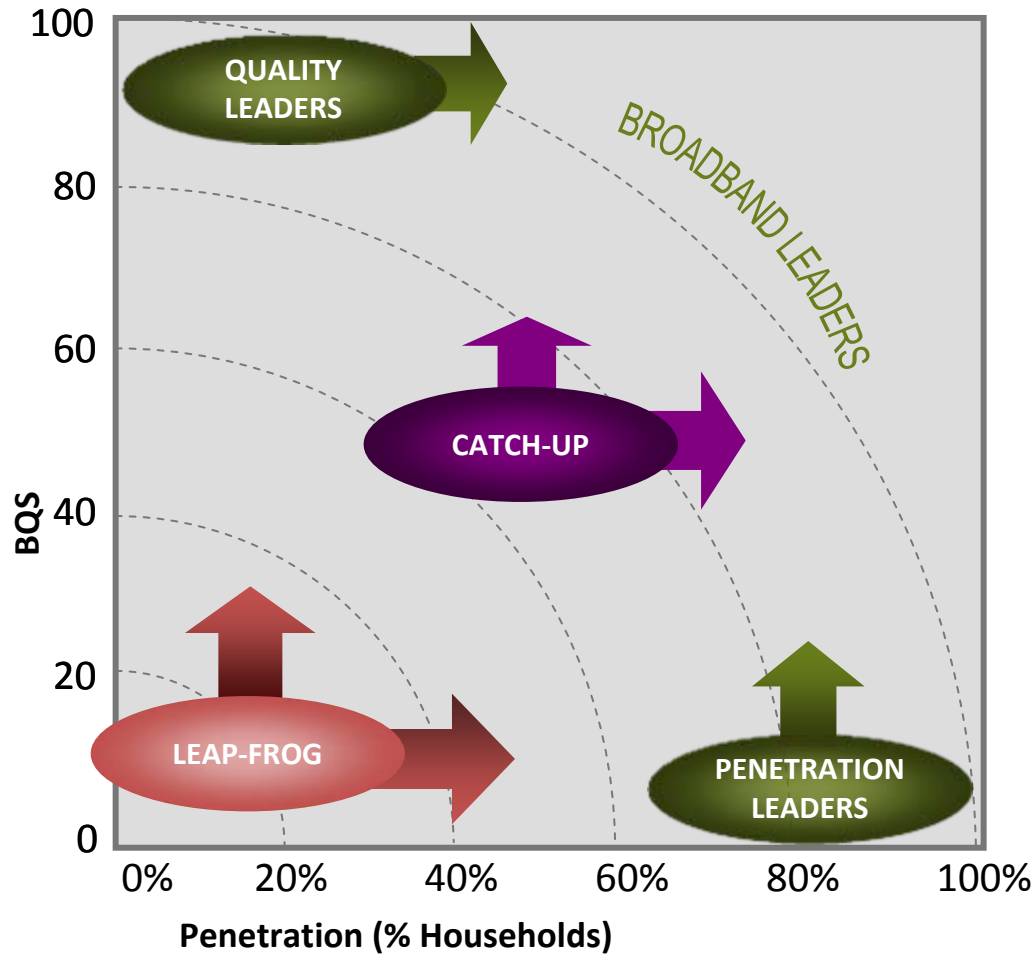
Top changes in BQS (2009-2008)

Rank	Countries	2008 BQS	2009 BQS	Delta BQS
1	Korea	38.25	65.99	27.7
2	Lithuania	35.15	54	19.3
3	Bulgaria	31.01	49	17.5
4	Sweden	41.15	57	15.6
5	Latvia	36.29	48	11.8
6	Romania	33.43	44.89	11.5
7	Denmark	34.30	44.89	10.6
8	Taiwan	23.93	34.43	10.5
9	Kenya	4.57	13	8.5
10	Netherlands	37.62	45.59	8.0
11	Czech Republic	30.20	38	7.8
12	United States	29.11	37	7.7
13	Slovakia	30.10	37	7.3
14	Iceland	25.14	32	7.0
15	Hong Kong	26.81	33	6.6



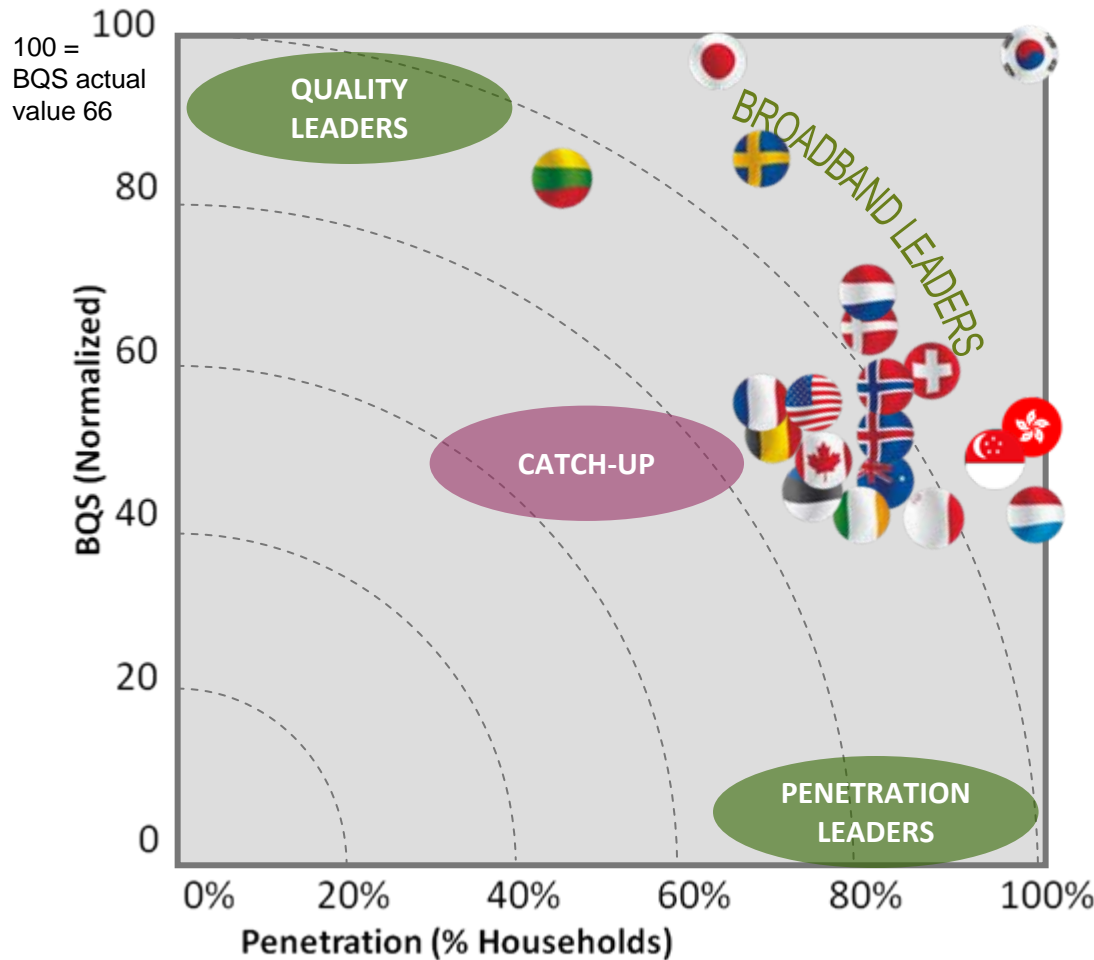
Broadband Leadership - Redefined

BROADBAND LEADERSHIP MATRIX



Broadband Leadership Top 20

BROADBAND LEADERSHIP MATRIX (TOP-20)



1. 🇰🇷 S Korea
2. 🇯🇵 Japan
3. 🇭🇰 Hong Kong
4. 🇸🇪 Sweden
5. 🇨🇭 Switzerland
6. 🇳🇱 Netherlands
7. 🇸🇬 Singapore
8. 🇱🇺 Luxembourg
9. 🇩🇰 Denmark
10. 🇳🇴 Norway
11. 🇲🇹 Malta
12. 🇮🇸 Iceland
13. 🇦🇺 Australia
14. 🇱🇹 Lithuania
15. 🇺🇸 United States
16. 🇮🇪 Ireland
17. 🇨🇦 Canada
18. 🇫🇷 France
19. 🇪🇪 Estonia
20. 🇧🇪 Belgium

N.B. All BQS values have been normalised to a scale of 0 – 100 with 66 = 100



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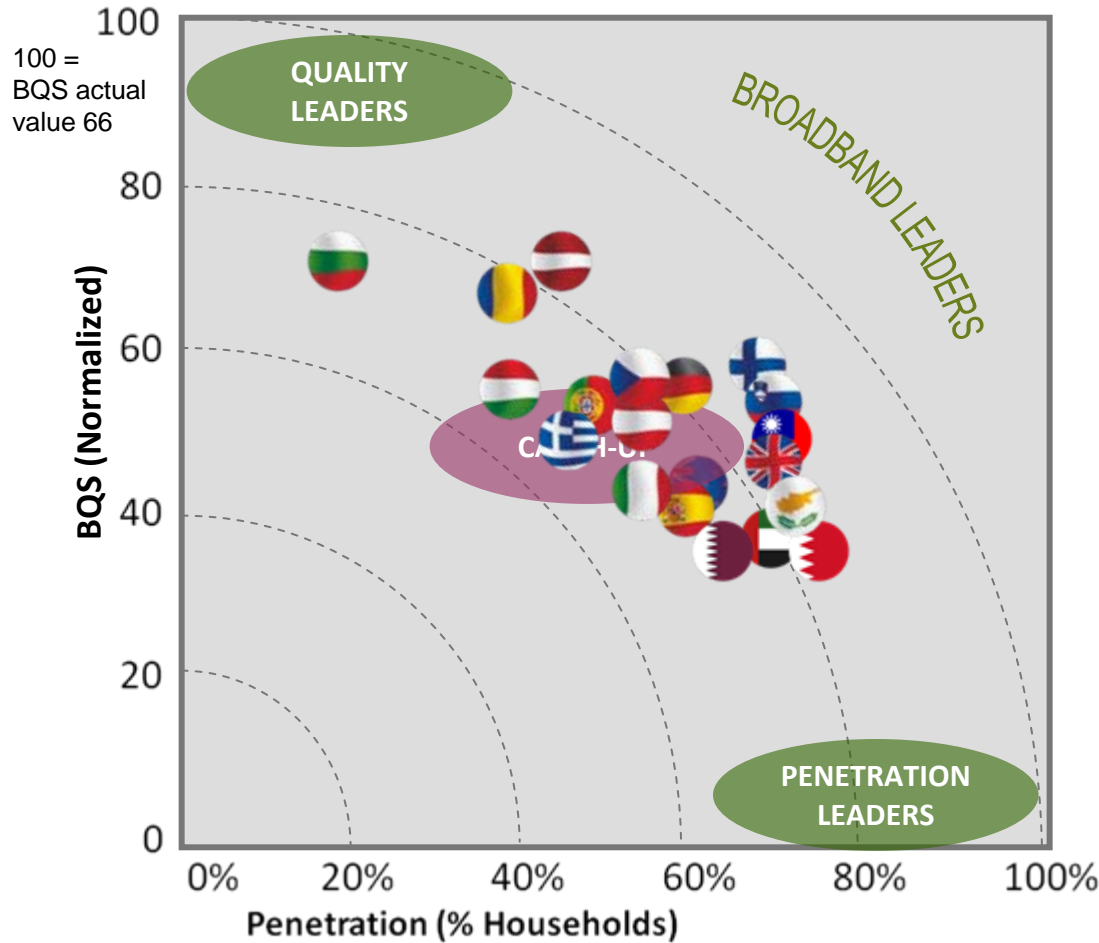


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Broadband Leadership 21 - 40

BROADBAND LEADERSHIP MATRIX (TOP-21-40)



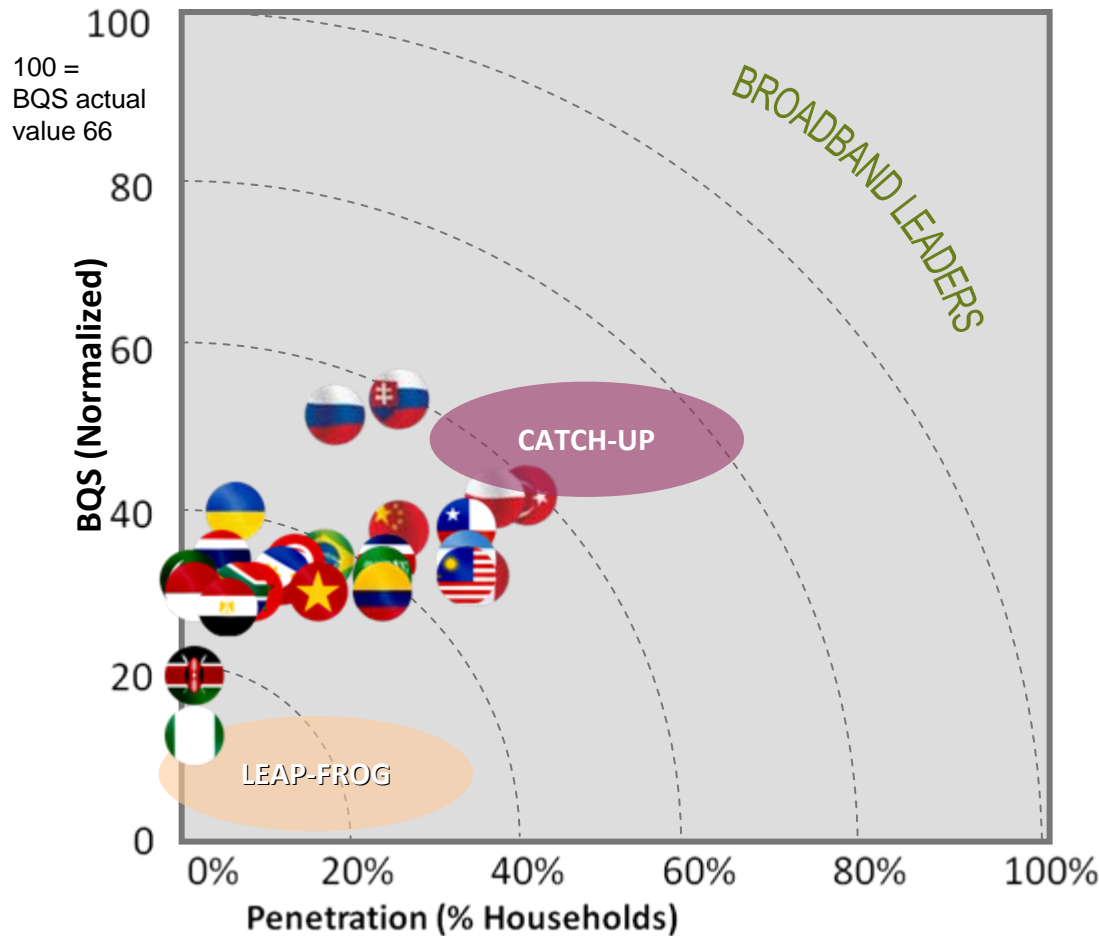
- 21. 🇫🇮 Finland
- 22. 🇸🇮 Slovenia
- 23. 🇹🇼 Taiwan
- 24. 🇱🇻 Latvia
- 25. 🇬🇧 United Kingdom
- 26. 🇧🇦 Bahrain
- 27. 🇩🇪 Germany
- 28. 🇨🇵 Cyprus
- 29. 🇨🇪 Czech Republic
- 30. 🇦🇪 UAE
- 31. 🇷🇴 Romania
- 32. 🇳🇿 New Zealand
- 33. 🇪🇸 Spain
- 34. 🇧🇬 Bulgaria
- 35. 🇶🇦 Qatar
- 36. 🇦🇹 Austria
- 37. 🇵🇹 Portugal
- 38. 🇮🇹 Italy
- 39. 🇬🇷 Greece
- 40. 🇭🇺 Hungary

N.B. All BQS values have been normalised to a scale of 0 – 100 with 66 = 100



Broadband Leadership 41 - 66

BROADBAND LEADERSHIP MATRIX (TOP-41-66)



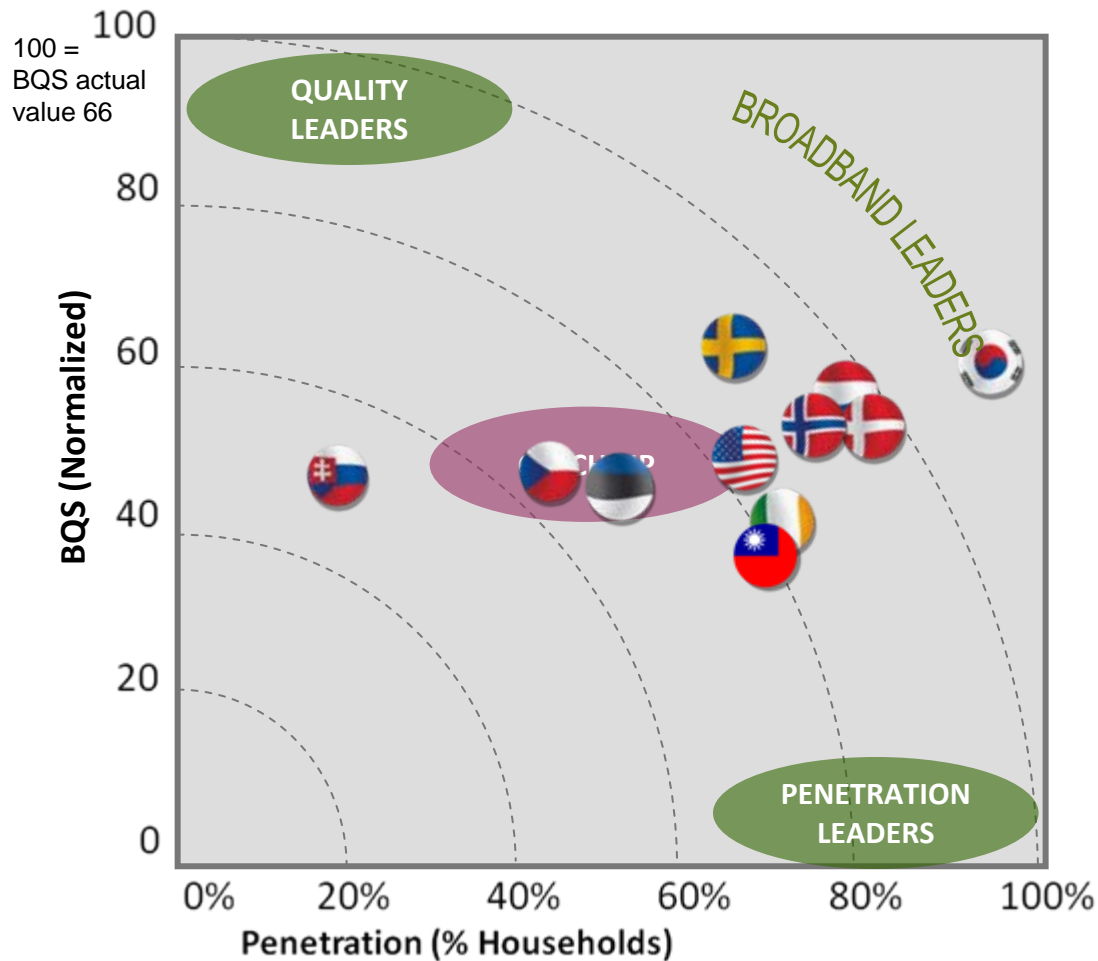
- 41. Slovakia
- 42. Turkey
- 43. Russian Federation
- 44. Poland
- 45. Chile
- 46. Mexico
- 47. Argentina
- 48. Malaysia
- 49. China
- 50. Costa Rica
- 51. Saudi Arabia
- 52. Ukraine
- 53. Brazil
- 54. Colombia
- 55. Tunisia
- 56. Philippines
- 57. Thailand
- 58. Vietnam
- 59. Morocco
- 60. Pakistan
- 61. South Africa
- 62. India
- 63. Indonesia
- 64. Egypt
- 65. Kenya
- 66. Nigeria

N.B. All BQS values have been normalised to a scale of 0 – 100 with 66 = 100



Broadband Leadership Movers 2008 – 2009

Innovation Economies



-  S Korea
-  Ireland
-  Sweden
-  Estonia
-  Netherlands
-  Slovakia
-  Denmark
-  Taiwan
-  Norway
-  Czech Rep
-  USA


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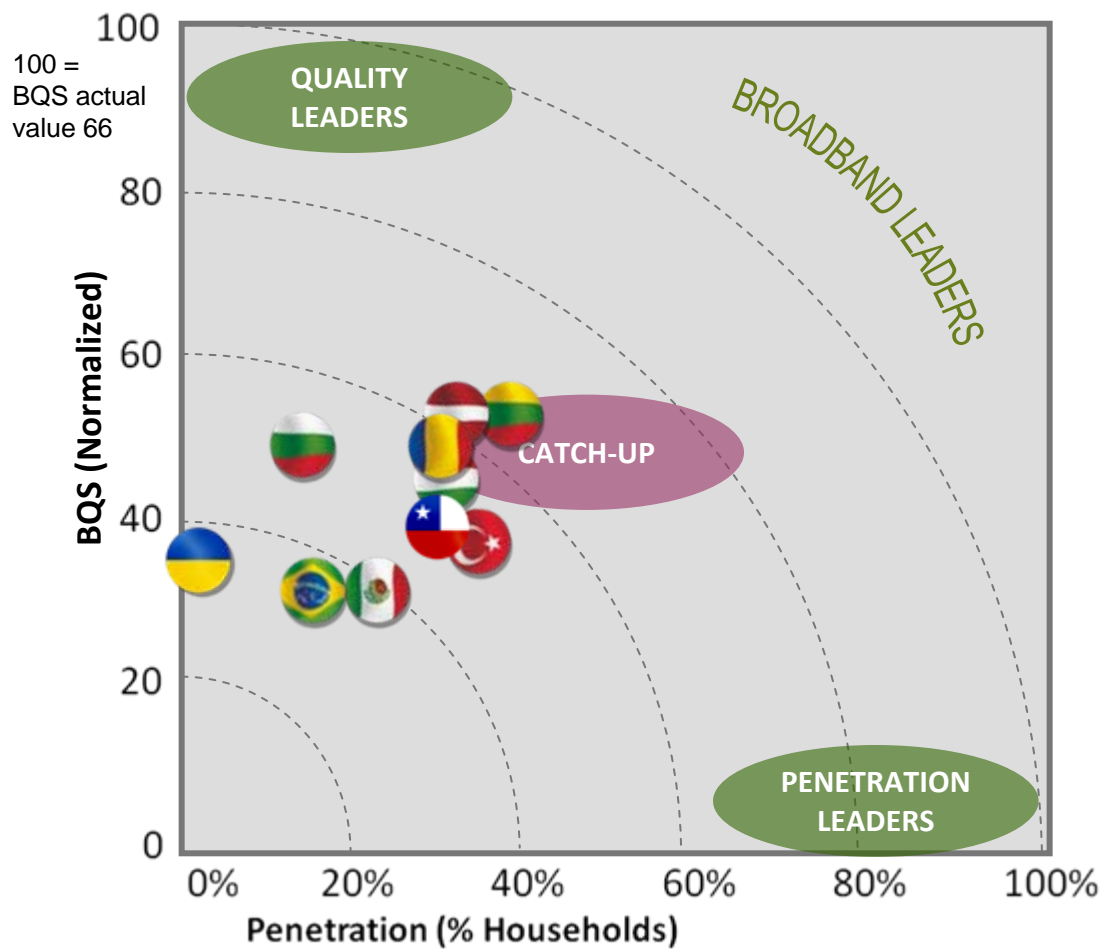


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Broadband Leadership Movers 2008 – 2009

Efficiency Economies



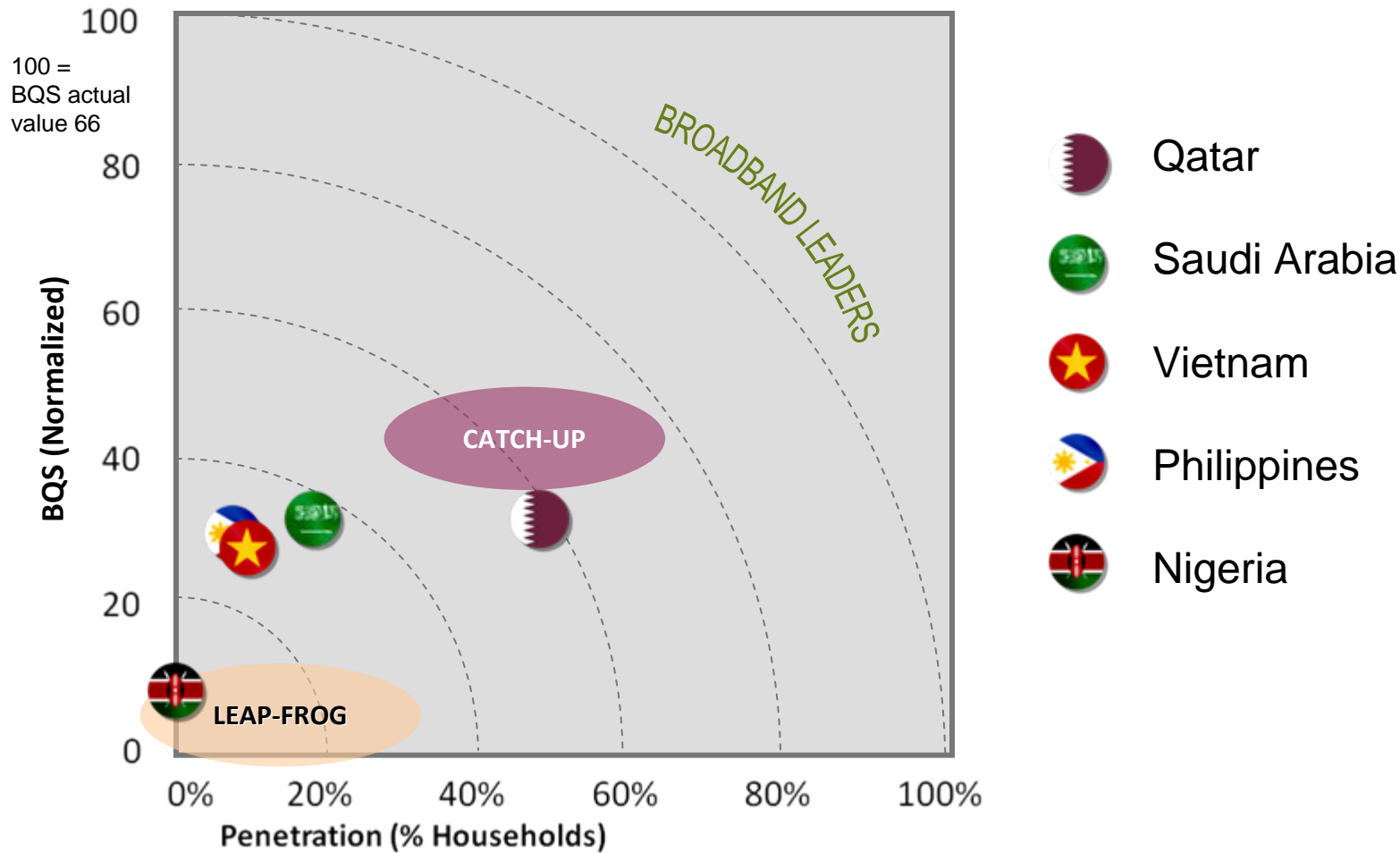
-  Lithuania
-  Bulgaria
-  Latvia
-  Chile
-  Romania
-  Mexico
-  Turkey
-  Brazil
-  Hungary
-  Ukraine

N.B. All BQS values have been normalised to a scale of 0 – 100 with 66 = 100



Broadband Leadership Movers 2008 – 2009

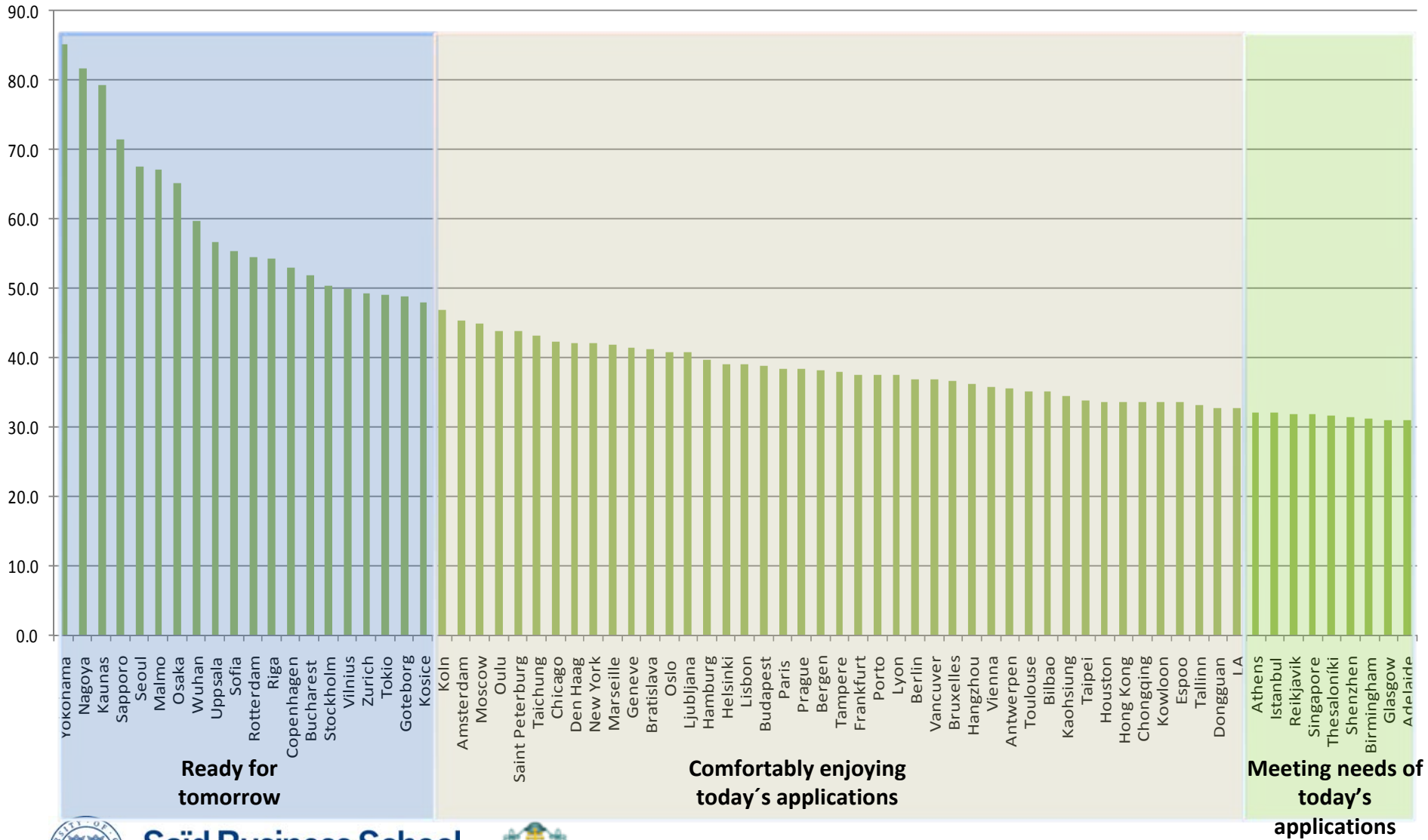
Factor Economies



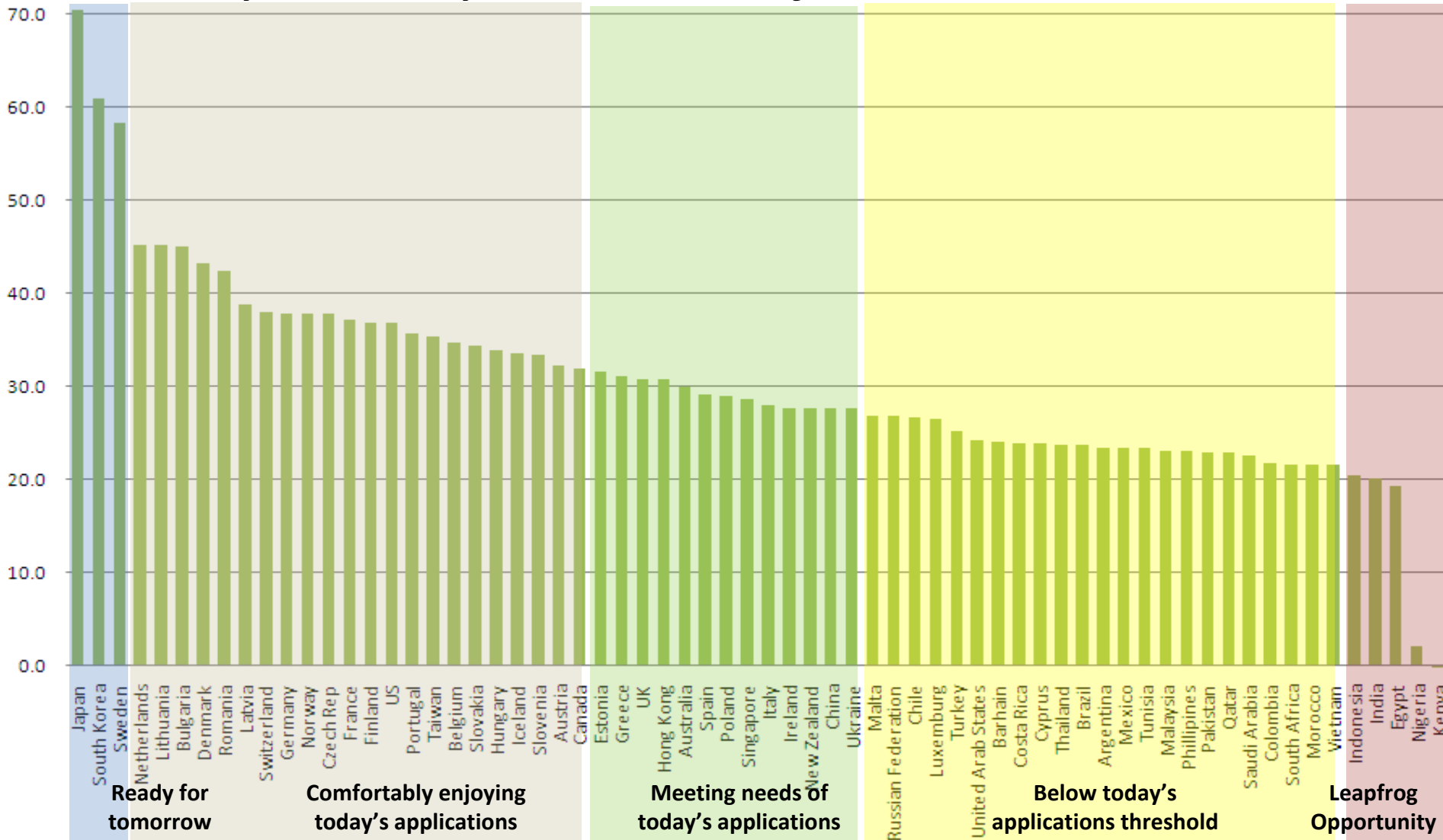
N.B. All BQS values have been normalised to a scale of 0 – 100 with 66 = 100



BQS by city (top 100)



BQS by country outside major cities



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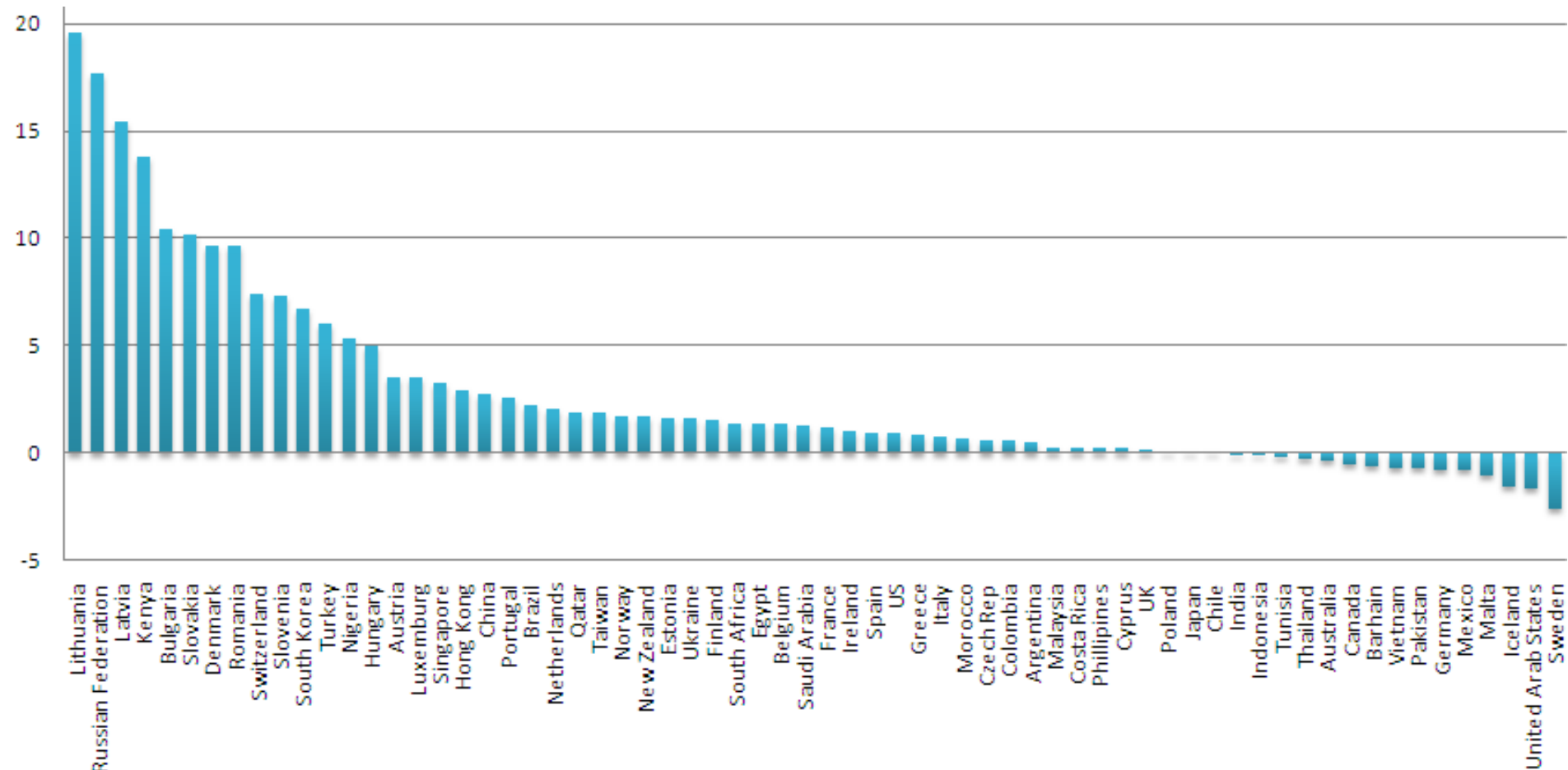


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Digital Broadband Quality Divide

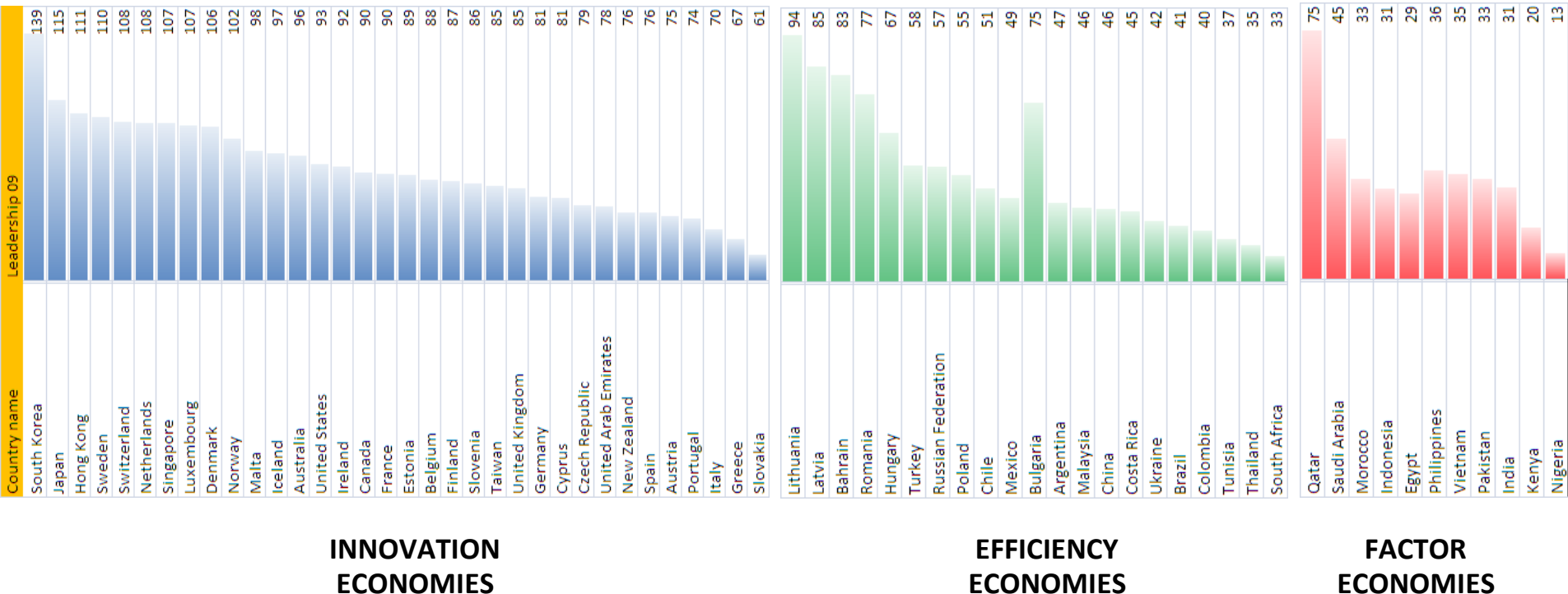


Mobile Broadband Quality Divide

Technology	Download	Upload	BQS
GPRS	43	41	-30
EDGE	244	116	-3
3G	753	180	5
HSDPA	1223	189	9
HSPA+	1984	198	11
Today's Threshold	1300	1300	26
WIFI	2814	779	22

Broadband Leadership

By stage of economic development



Broadband Stakeholders

HIGH-LEVEL RECOMMENDATIONS TO KEY STAKEHOLDERS

Government, policy makers and regulators

- Set national broadband agenda with goals for availability, penetration and quality. Encourage private investment

Content producers, aggregators, and over-the-top players

- Provide content and applications that are quality-aware to ensure a consistent customer experience

Service Providers

- Build a broadband business model based on quality as the key differentiator

Equipment and device vendors

- Focus on simplicity, usability and interoperability

Consumers

- Keep home and personal devices up to date and conduct regular speed tests

