Broadband for all –
the end of universal service?

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Governments across the world have developed policies to ensure that all citizens have access to broadband. Given these policies is the concept of universal service still relevant? If so, how should universal service be redefined? And what is the most cost-effective way to deliver universal broadband access?

What are the main problems?

Governments across the world have developed policies which aim to ensure that all citizens have broadband access at home for internet use. In most countries such policy is primarily concerned with increasing broadband availability, speeds, and download capacity so as to promote economic and social development. To date it has focussed on the bulk of end-users rather than on the poorest or most remote communities. But, as broadband use grows, two key issues become important:

- What resources should a government devote to measures which stimulate regular and universal *use* of the broadband internet among those who are not yet internet users, rather than simply ensuring universal *supply* of broadband?

- How can a government ensure that broadband is affordable and available to all of its citizens?

How far should governments stimulate demand for broadband?

High take-up does not guarantee the regular use required to generate social and economic value from broadband – especially among older and less educated people. The figure opposite illustrates this point. While take-up of fixed broadband is three times higher in South Korea than in Czech Republic, regular use of the internet among middle-aged people is virtually identical.
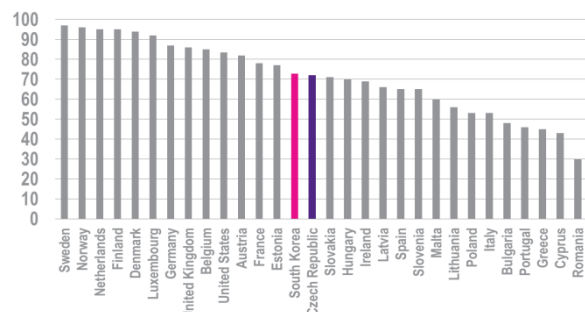
So government measures to stimulate use are an important part of broadband policy. But often governments focus resources on supply-side measures or put them into inefficient, poorly targeted and/or unevaluated demand-side measures.[1]

Fixed broadband take-up
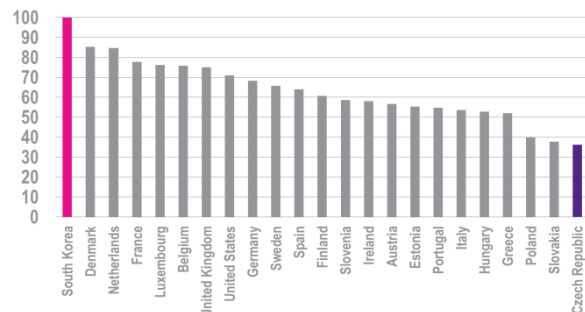
Source: Plum Consulting, OECD

Regular use of broadband (45-54 year olds)

Source: Plum Consulting, Eurostat

How can governments ensure affordable broadband for all?

A necessary condition for ensuring regular and universal use of the broadband internet is to make basic broadband affordable to all citizens. As penetration grows, broadband is becoming an essential service,[2] without which households are socially excluded.[3] This suggests that the universal service

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[1] For a discussion of these issues see *Demand-side measures to stimulate internet and broadband take-up*, Plum for Vodafone, February 2010, http://www.plumconsulting.co.uk/pdfs/Plum_March10_Demand-side_measures_to_stimulate_Internet_and_broadband_take-up.pdf

[2] The Joseph Rowntree Foundation surveys the UK's general public each year to determine what goods and services are considered essential for every household. Broadband connectivity entered this basket of goods and services for the first time in 2010.

[3] We note that a universal service requirement is just one-way to promote affordability. Price discounts through the VAT exemptions (eg on food) are another

concept, in which certain services are provided to everyone because they are socially necessary, applies to broadband. But there may be a need to implement universal broadband service in a way which is radically different from the traditional approach to ensuring universal telephony service.[4] At the core of any policy change are two questions – how to make broadband available in high-cost rural areas and how to make it affordable to low income households?

Over the past few years many governments have recognised the need to make broadband universally available. In high-income countries like the US and EU member states, there are now target dates, and associated minimum speeds, for making broadband available to all. And in the developing world the UN's Broadband Commission has set targets for broadband availability and affordability.[5] But so far there has been relatively little consideration of the most effective way to change universal service policy so as to include broadband. In this note we examine the main dimensions of this problem, while taking account of the fact that:

- Telecommunications services are steadily migrating from fixed to mobile networks. In Finland for example less than 10% voice calls now originate from the fixed network, whilst in China mobile is now the main form of broadband access[6]

- Telecommunications services are moving from narrowband to broadband connections. In particular voice services are becoming an application running over broadband.

Government institutions in both the UK and US have raised such concerns recently.[7]

When is broadband affordable?

An essential characteristic of universal broadband service is that it is affordable. Yet there is relatively little discussion of what is affordable broadband. The UN's Broadband Commission has suggested that *"entry-level broadband services should… [consume]…less than 5% of average monthly incomes".* In a 2010 study for Vodafone[8] Plum offers a more comprehensive definition, designed for application in high-income countries.

An affordable broadband package is one in which the average household in the lowest income decile…

- …can download up to 1 GB of data per month (socially necessary use)…

- …for less than 6% of net household income (sustainable expenditure)…

- …and where the minimum monthly commitment is small

The final characteristic is important. Low income households need to be able to reduce broadband spend if their income falls or expenditure rises unexpectedly in a particular month so that they can balance the household budget.[9] The size of the minimum monthly commitment affects their ability to do this. Such a definition, while there is debate about how to set the value of the parameters used, encompasses the essential components of a definition of affordable broadband.

What role can mobile networks play in delivering affordable broadband?

When measured against this definition mobile operators are in a significantly better position to offer affordable broadband on a commercial basis, without the need for state or industry subsidy, than fixed operators. This is because of the different cost structures of fixed and mobile operators in supplying broadband services. The figure below illustrates this.

Incremental costs of broadband
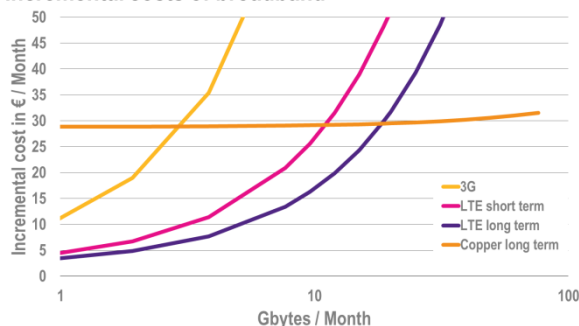
Source: Plum cost modelling, Analysys Mason, European Commission

It shows that:

- The incremental cost of providing broadband on a fixed network is largely constant. Once the costs of providing and maintaining a broadband connection are met, there is relatively little additional cost in carrying additional traffic

- By contrast the incremental cost of providing broadband over a mobile network is very traffic sensitive. At low traffic volumes, the cost per customer is much smaller than for a fixed network. But, as the volume of traffic generated grows, the cost of serving the customer grows and becomes bigger

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[4] Until recently the main universal service was voice telephony at a fixed location. The obligation to provide this service normally falls on the incumbent fixed operator, which may or may not be funded by the rest of the industry for the net cost of meeting this obligation.

[5] *Broadband targets for 2015*, UN Broadband Commission, Undated

[6] http://www.bbc.co.uk/news/technology-18900778

[7] See for example http://www.parliament.uk/business/committees/committees-a-z/lords-select/communications-committee/news/governments-broadband-strategy-risks-leaving-communities-behind/ and http://www.fcc.gov/blog/connect-america-fund-kicks-rural-california-and-nevada-frontier-communications

[8] *Are telecommunications services universally affordable across the EU?*, Plum for Vodafone, October 2010
http://www.plumconsulting.co.uk/pdfs/Plum_Nov2010_Affordability_of_telecommunications_services.pdf

[9] See for example *Portfolios of the poor*, Collins, Morduch, Rutherford, and Ruthven, 2009, Princeton University Press

than the costs of serving the customer using fixed broadband

- The cross over point where this happens depends upon the technology used. For example the crossover traffic volume is significantly greater for LTE technologies than for current 3G technologies.

These cost curves suggest that mobile operators can serve low-volume broadband customers profitably at significantly lower prices than fixed operators. This conclusion is supported by empirical evidence. Plum's 2010 study to look at whether low income households across the EU can afford broadband concluded that:

- Provided usage is restricted to socially necessary use, broadband services delivered over mobile prepaid commercial packages are already affordable by the poorest households, even in the poorer countries of the EU such as Romania and Poland

- At socially necessary levels of use, mobile prepaid packages are more affordable than fixed network services, even when a (subsidised) social tariff is available on the fixed network. Both the overall price paid in the average month and the minimum monthly commitment required is significantly lower than for fixed broadband services.

This analysis suggests that commercial prepaid broadband services have the potential to deliver affordable broadband to low income households without the need for any subsidy in areas where 2G coverage is already available. This conclusion has profound implications for universal service policy. It implies that, to be effective in a broadband era, universal service policy should:

- Move away from requiring fixed network operators to supply services and towards seeking delivery from mobile networks

- Move away from subsidy of universal service providers and towards commercial supply of universal service

- Move away from on-going subsidy of unprofitable fixed lines and towards targeted one-off subsidy to expand mobile coverage to unserved areas.

What are the main barriers to universal take-up of broadband based on mobile networks?

Even if broadband is made affordable, there are a number of additional challenges which need to be met before a government can be confident that a universal service policy based around commercial mobile deployment will work effectively to prevent social exclusion.

Six challenges for policy makers

1. Will low income households use affordable broadband?
2. Is there enough spectrum?
3. Are existing broadband policies consistent with the aims of universal service policy?
4. How can universal broadband service reach the most remote areas?
5. Can mobile broadband continue to provide affordable broadband as the volume of socially necessary use grows?
6. How can the current geographic variability in mobile broadband service quality be reduced to give everyone adequate service?

Challenge 1: will low income households use affordable broadband? Providing affordable broadband using mobile networks is necessary but not sufficient to achieve universal service goals. There are other, demand side, barriers which include lack of digital literacy skills, security concerns, and a perception that the internet is irrelevant. Government policy has an important role to play here.

Challenge 2: is there enough spectrum? There is now general recognition of the need to expand the supply of spectrum allocated to mobile data services. But it will be especially important to release sub 1 GHz spectrum, which can be used to upgrade existing 2G networks with LTE technologies, if operators are to provide good basic broadband speeds at minimum incremental cost in rural areas. Upgrading an existing base station to use additional spectrum to provide more capacity is 5 to 10 times cheaper than building a new base station.

Challenge 3: are existing broadband policies consistent with the aims of universal service policy? Many governments have developed broadband policies in which they set minimum speed targets for all broadband services. Such targets may become important in a world where end users need higher download speeds each year for an acceptable experience. But targets need to be set with great care. For example the European Commission has set a target for everyone to have access to download speeds of at least 30 Mbps by 2020 across the EU. If implemented in full this target would:

- Significantly raise the costs of making broadband services universally available

- Increase substantially the proportion of households where the supply of mobile broadband services on a commercial basis is no longer viable

- Increase substantially requirements for subsidy. Generating this subsidy from the telecommunications industry would raise broadband prices overall; generating them from general government revenues could prove challenging for many countries over the next decade.

Challenge 4: how can universal broadband service reach the most remote areas? There are limits to the cost-effective

reach of mobile broadband. In both the US and Australia the Government plans to provide broadband to the last few per cent of households using satellite rather than terrestrial technologies. The cost of satellite broadband, which is largely a function of the traffic volume downloaded, has fallen significantly over the past five years and has now reached levels where socially necessary use is affordable to most remote households in many countries, once set up costs are met.

Challenge 5: can mobile broadband continue to provide affordable broadband as the volume of socially necessary use grows? The volume of fixed broadband traffic is predicted by Cisco to treble over the next five years, and it is reasonable to expect that socially necessary use will grow in the same way. On the supply side we might expect the marginal cost of provision to fall by a factor of two with the introduction of LTE, while the supply of additional spectrum should further reduce unit costs. This should allow socially necessary used to grow significantly without an increase in the incremental cost of supply.

Challenge 6: *how can the current geographic variability in mobile broadband service quality be reduced to give everyone adequate service?* Mobile broadband services are currently very variable in quality, even in high income countries, with good services in major cities, but unpredictable or no service

elsewhere. This variability should largely disappear over the next three to four years as:

- Digital dividend spectrum is deployed and 900 MHz spectrum is refarmed for mobile broadband use, so that anyone with current 2G coverage gets mobile broadband as well
- Suppliers deploy high gain fixed antennas to boost broadband speeds in rural homes where the signal strength is low. Verizon's LTE based Home Fusion product is a good example.

There is an important role here for regulators or other third parties - to provide information to end users on which networks offer good mobile data services in which areas.

Conclusion

None of these challenges are insuperable. But if broadband is to be affordable for all then the traditional ways of implementing universal service in the telecommunications sector will not suffice. Radically new thinking is required. The panel below lists key suggestions for policy makers to consider. Such considerations will, for example, be important when the European commission reviews its Digital Agenda targets at the end of 2012.

Proposals for policy makers

Separate universal service policy from broadband policy. Setting general targets for broadband provision does not deal with the problem of whether broadband is affordable for the poorest, or commercially viable to supply to those living in the most remote areas.

Focus on providing affordable broadband services. This requires an explicit definition of what is affordable and an understanding of the cost structures of the different network technologies.

Switch the focus of universal service provision from subsidised fixed to commercial mobile provision in most areas.

Focus any supply-side subsidy on expanding mobile coverage in high cost rural areas using capital expenditure grants.

Provide these subsidies from government revenues rather than from industry levies. Industry funding of universal service raises telecommunications costs and prices overall. Yet telecommunications remains a fundamental driver of economic growth across the globe.

Safeguard low-income consumers by requiring mobile operators to offer at least one prepay mobile broadband package in which credit upgrades are modest in size and credit expiry terms are 90 days or more.

Ensure that there is sufficient spectrum, especially sub 1 GHz spectrum, for mobile broadband use and LTE deployment. This helps lower the unit cost of supply.

Be careful that any minimum speed requirements of more general broadband policies do not jeopardise universal service goals for broadband.

Assess the needs for complementary measures in terms of digital literacy, relevant applications and affordability of terminals alongside universal service policy.