

Fibre investment – what, when, where?

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Network operators around the world are investing in, or considering investing in, the extension of residential and small business fibre networks. In contemplating what, when and where to invest both threats and opportunities need to be assessed. These include platform competition and customer retention, demand for different service levels, regulation and potential government subsidy. We examine the investment decision alongside these issues drawing on our policy and investment modelling experience.

What, when and where?

Fibre investment may take different forms depending on the circumstances. In some cases fibre to the premise may be preferred; in others fibre to the cabinet with VDSL may offer a lower cost solution, faster rollout, and performance which is good enough. However, in some countries the cost of VDSL deployment relative to fibre to the premise may be higher. For example fibre to the premise could be deployed on existing infrastructure (ducted or overhead) or the cost of air conditioning VDSL cabinets may be prohibitive in some hot countries. Choices must also be made over the fibre to the premise technology to deploy – should it be point-to-point, GPON or a mix?

Making these choices involves a consideration of deployment costs, product capability and regulation. The best solution may be a mix of technologies, while remaining mindful of the option to change and adapt as investment proceeds.

Where and when to invest will depend on: how costs vary by location; on human resource and capital constraints on deployment by the investor; and on the value of customers in each area. In particular what is the *incremental* demand for higher speed compared to what end users get now? Critically important is what happens if an operator does not invest or invests too little. To answer that question platform competitors must be considered.

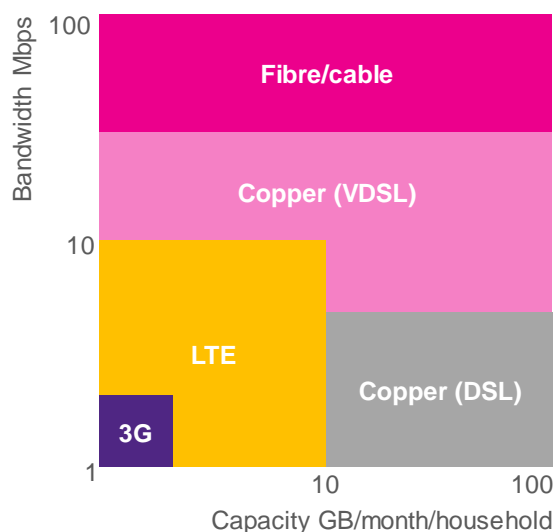
How intense will platform competition be?

For an established copper network operator a key potential source of competition may be cable, in particular a cable network upgraded to DOCSIS 3.0. However, the extent of cable deployment varies widely - within Europe from 0% in Italy to almost 100% in the Netherlands.

Wireless may also be an important competitor (as it is now in, for example, Austria and Bahrain), or may become one in future. It will also be near universal. Whilst wireless is

unlikely to satisfy all customers it may be good enough for many current ADSL users once LTE is deployed.

However, capacity at reasonable cost is also important alongside speed, as the figure below illustrates.¹ Demand for both capacity and speed therefore improve the business case for fibre versus wireless.

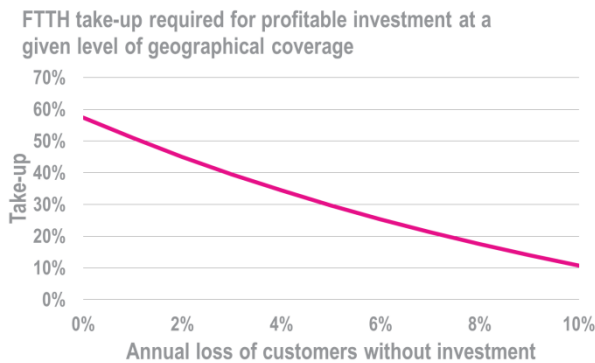


Competition may also arise from government initiatives to support fibre investment. Government funding may therefore create both threats and opportunities.

¹ Brian Williamson. 2011. Nomadicity and the evolution of applications, networks and policy. *Telecoms Journal of Australia*. http://www.plumconsulting.co.uk/pdfs/Plum_TJA_Nomadcity_Nov_2010.pdf

What impact does platform competition have on incentives to invest?

If there is little platform competition to consider then the incremental revenues from fibre investment are simply the premium which the investor can charge for higher speeds (the fibre premium). But if a rival platform is attracting existing or prospective customers then the incremental revenue at stake without fibre investment is not just the fibre premium, but the whole customer ARPU. This provides a strong incentive to invest, particularly if the anticipated loss of customers is expected to be substantial without investment.² The following graph shows that if the annual loss of customers is low a high level of fibre take-up is needed to justify investment. If the annual loss of customers is high, the incremental revenues from a fibre customer are higher and therefore a lower level of overall take-up is needed to break even.



Source: Plum Consulting NOMAD

What will people be willing to pay for higher speeds?

Over time access speeds have increased at around 50% per annum following Neilsen's law. However, extending fibre closer to the premise is costly, and willingness to pay for speed increments above those available to many today is uncertain. Further advances in compression can also be anticipated with a new standard (HEVC or H.265) expected to roughly halve the data requirement for video of a given quality, this is anticipated in draft final form by 2013.

A continuation of Neilsen's law in the near term should not therefore be taken for granted. Whilst this may not bring into question a move from ADSL to VDSL, it does raise a question over whether fibre to the premise is the best solution in many circumstances.

Is commercial viability dependent on offering applications?

Fibre access *per se* is not valued by consumers; rather it is what consumers can do over high speed access that they will value. However, it does not necessarily follow that the fibre investor need provide all applications and content for the investment to be a success. Third party applications, including over-the-top applications, will also drive demand for higher-speed, higher-capacity, broadband connectivity.

Should a fibre investor offer open access to others? Third party retailers may help grow the overall market and may involve only limited foregone margin, particularly if over-the-top applications are eroding the margin on the access provider's own value added services (such as IPTV). However, the upside in relation to open access is likely to depend on the opportunity for commercial pricing freedom at the wholesale level. This is discussed below.

What impact does technology and market uncertainty have on investment?

Investment uncertainty is not confined to market demand and competition. Deployment costs will initially also be subject to a degree of uncertainty.

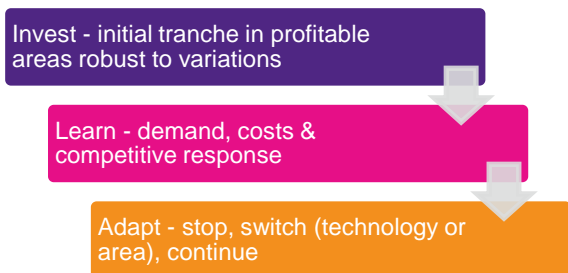
Whilst there is some emerging evidence in relation to the potential fibre price premium and rates of adoption, considerable uncertainty remains. In particular there is very limited evidence in terms of demand for fibre to the premise where VDSL speeds are available. New applications may increase bandwidth demand. However, advances in technology may increase the speed available over copper (VDSL with vectoring)³ or decrease the speed required for a given application (improved compression).

These uncertainties suggest an approach which keeps options open and which does not over-commit in terms of the initial tranche of investment (including any publicly supported investment) may offer higher returns than an upfront commitment to invest in all areas that appear profitable today.

In other words whilst modelling offers a tool that can help determine how robust an initial tranche of investment is to differing assumptions it cannot determine the best overall investment strategy. An approach which involves investment, learning and adaptation, as illustrated below, is likely to yield the greatest commercial and social return.

² Plum. December 2011. "Copper pricing and the fibre transition - escaping a cul-de-sac." http://www.plumconsulting.co.uk/pdfs/Plum_Dec2011_Copper_pricing_and_the_fibre_transition_-_escaping_a_cul-de-sac.pdf

³ Alcatel Lucent. 2011. "Get to fast, faster – accelerating the existing copper plant with VDSL2 vectoring and bonding" <http://www.alcatel-lucent.com/vdsl2-vectoring/>

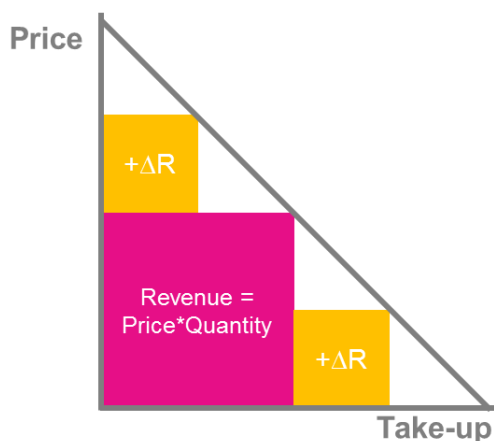


This analysis suggests that the investor should put in place a capability for information gathering, learning and adaption alongside the initial investment tranche.

What form of regulation is anticipated?

The anticipated regulation of the fibre investment will impact on the investment decision. The form of regulation will affect costs, the ability to earn incremental revenue and the ability to respond to competition.

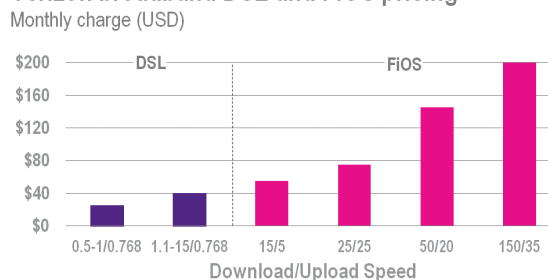
Price controls, particularly if a single “cost oriented” price is imposed, may limit investment upside, whilst leaving the investor exposed to demand risk. Demand risk is also greater if price flexibility is reduced. The investor cannot then segment the market and capture additional revenue from those with both low and high willingness to pay (as shown below by the regions marked $+\Delta R$).



We note that open access on an active bit-stream basis (Layer 2) differs from open access to dark fibre (Layer 1) since the latter does not support service-price differentiation at the wholesale level, say by bandwidth. Layer 1 access removes the opportunity to retail lower and higher price services, since arbitrage by competing entrants will tend to drive prices towards the single wholesale price plus a mark-up. Service-price differentiation at the wholesale level via Layer 2 products is necessary to sustain retail price differentiation. This in turn maximises overall demand and improves the business case for investment.

An example of price differentiation is the copper and fibre to the premise (“FiOS”) prices offered by Verizon in the US for different downstream and upstream bandwidths. The following figure shows price differentiation between copper (DSL) and fibre (FiOS) products and between fibre products by bandwidth.

Verizon broadband DSL and FiOS pricing



Source: Plum Consulting. Pricing for one-year contract with phone service.

Not only might regulation influence anticipated returns, but investment intentions may influence regulation. For example a government which is keen to see high levels of fibre investment may support wholesale pricing freedoms. We note that there is considerable variation between countries in the way fibre is regulated. For example Ofcom in the UK requires open access and equivalence but does not apply *ante* price controls on fibre. In contrast OPTA in the Netherlands has set cost oriented prices for unbundled fibre loops.

It is important that, as part of the business case analysis, regulatory alternatives and their impact on expected returns are assessed.

Government funding – a threat or an opportunity?

A number of governments, including those in the UK, Australia and New Zealand, provide public funding for fibre. This may create both threats and opportunities for a network operator contemplating commercial fibre investment. In terms of potential threats:

- Governments may favour fibre to the premise, even where VDSL or wireless would be a more cost effective option. Unless the case for an intelligent mix of technologies is made early a focus on fibre to the premise may become entrenched, as it has with Australia’s NBN.
- Public funding may attract entrants and crowd out otherwise commercially attractive investment.
- Developing a state funded investment scheme may delay investment. For example, in Australia NBN Co had 2315⁴

⁴ NBN Co. January 2012. “NBN Co marks year of progress as rollout moves up a gear in 2012.” <http://www.nbnco.com.au/news-and-events/news/nbn-hails-4000th-customer.html>

fibre customers at the end of 2011 – four years after the concept was proposed and two years after NBN Co was created.

- A state funded scheme may, once up and running, reduce the option value associated with learning and adapting since a specific investment programme is likely to be locked into a plan.
- Finally, a government may impose conditions or prioritise the least attractive areas, thereby reducing both commercial returns and the opportunity to respond to competition.

In Europe we note that “State Aid” rules may limit the scope for subsidy in commercially attractive areas, thereby limiting some of the risks attached to government funding.

In terms of potential opportunities:

- Engagement with government over policy and regulatory aspects may allow a win-win in terms of improved

prospects for commercial fibre investment and a reduced need for public funding.

- A government may also be willing to pay for complementary infrastructure or customer transition (as in Australia). Government funding also offers the prospect of locking in a long term contractual arrangement.
- Lastly funding itself may be valuable, though the combination of a likely focus on commercially unattractive areas and competitive procurement may leave little opportunity for profit.

Conclusion

Fibre investment is amongst the most important strategic decisions facing network access providers. Not only will it impact costs, margins and competitive success; but it will both shape and be shaped by the policy and regulatory stance of the government and the national regulator.

Plum Access Investment Model (AIM) – application to policy and commercial strategy decisions

AIM is built around a model of the fibre investment decision whereby investment opportunities are evaluated in terms of their incremental cost and revenue impacts. Areas are ranked by the Internal Rate of Return (IRR) and this determines the deployment order. Key considerations are incremental cost by location, the anticipated impact on customer retention, the associated revenue impact (including all relevant services), and the potential upsell opportunity presented by higher bandwidth.

AIM was first applied in assessing the impact of alternative forms of regulation on fibre to the premise and fibre to the cabinet investment assuming a cost function that increased smoothly with coverage. The model allows for the intensity of platform competition to be varied by changing the assumed rate of customer loss to competitors with or without fibre investment. For a given set of commercial assumptions an incremental break-even level of coverage can be calculated and the sensitivity of this level of coverage to regulation explored.

AIM has been extended and adapted to investment strategy evaluation at the national level with cost and revenue assumptions by location. The model allows a number of questions to be answered about what, where and when to invest; and to explore sensitivity of the investment programme to changes in assumptions. In practice we have found that circumstances do differ materially from country to country and location to location depending on factors such as extent of existing infrastructure (duct or overhead), the extent of cable and/or wireless competition and how much revenue is at stake. The feasibility of fibre to the premise versus fibre to the cabinet will also vary with the distribution of households and line lengths and, potentially, thermal constraints on use of VDSL cabinets in countries with hot climates.

The policy context will also differ depending on the level of commitment of the government to fibre investment and available public funding, anticipated regulation and limitations in relation to aerial or underground fibre deployment. These factors may change depending on the willingness to invest commercially. Modelling can illuminate these issues, but a wider strategic judgement, which draws on an understanding of the local environment, will be required.