Arthur D Little

Telecommunication, Information,
Media & Electronics

National Fibre Strategies

National economic imperative or just another private industry task?

Content

Introduction

The socioeconomic benefits of advanced telecommunications infrastructure and services are intuitive, as well as definitive. Global studies by Arthur D. Little on the socioeconomic benefits of broadband have demonstrated the links between advanced telecommunications and the diversity and strength of economies.

While the telecommunications industry has continued over the years to invest vast sums in automation, digitalization and higher-speed fixed and mobile access, the industry has now come to a unique point in its history. Until now, it has been possible to modernize and upgrade the fundamental copper-based network, which was inherited in most cases prior to liberalization of the industry. Now the time has come for the industry to move decisively to fibre. Further upgrades to copper are possible only for short network segments close to the customers' premises. Whole fibre or mainly fibre networks are now needed not only for the very fastest fixed access services, but also to underpin the micro layer of the latest mobile backhaul networks.

The industry has spent almost 10 years debating which network architecture best fits the complicated puzzle of return on investments, technological soundness and competitive position. The challenge now is how to attain the clear national economic benefits of the latest fibre infrastructure while managing the considerable investment required. The best approach to meet this challenge remains unclear in many countries.

This paper identifies five National Fibre strategic models that have been implemented by countries around the globe, and assesses which of these models are most likely to fulfill National Fibre goals to the benefit of all stakeholders, including governments, regulators and policy makers. These models lever a number of key success factors, which can be adopted by industry, government and regulators, and which require more sophisticated public and private coordination and graded policy frameworks.

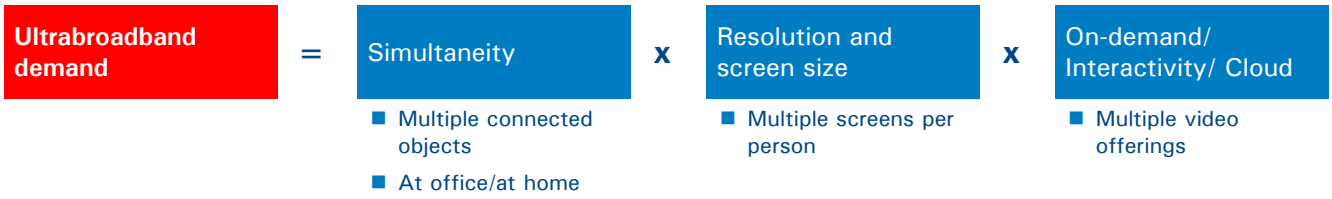
Broadband is a Key Lever for Economic Growth

Advanced high-speed telecommunication networks have long been considered a key underpinning of healthy economies. Now, with the explosion of internet-based business transactions and an increasing reliance on e-mail, file transfer, social network marketing, Cloud IT and real-time remote collaboration, the digital economy has become fundamental and mission critical to economic growth in every country.

Technological scenarios enabled by ultra-broadband are extraordinary and exciting. No longer is the need for 100 Mbps per line being questioned, and a combination of factors indicates the further development of ultra-broadband demand in the future (Figure 1).

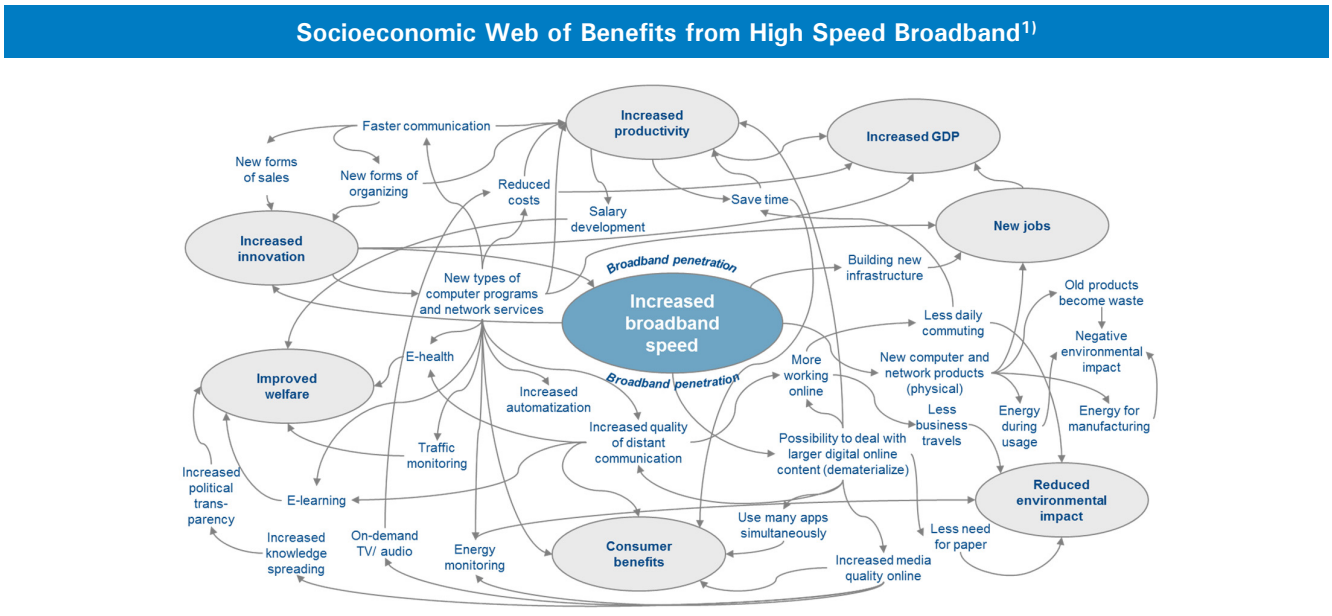
Arthur D. Little has conducted studies to explore the links between broadband services and economic growth in OECD countries. While not yet delving into causality, these studies identified the complex relationship between productivity and innovation, which ultimately drives economic growth (Figure 2).

Figure 1: Ultra-broadband demand drivers



Source: Arthur D. Little

Figure 2: Broadband networks in a web of socio-economic value creation



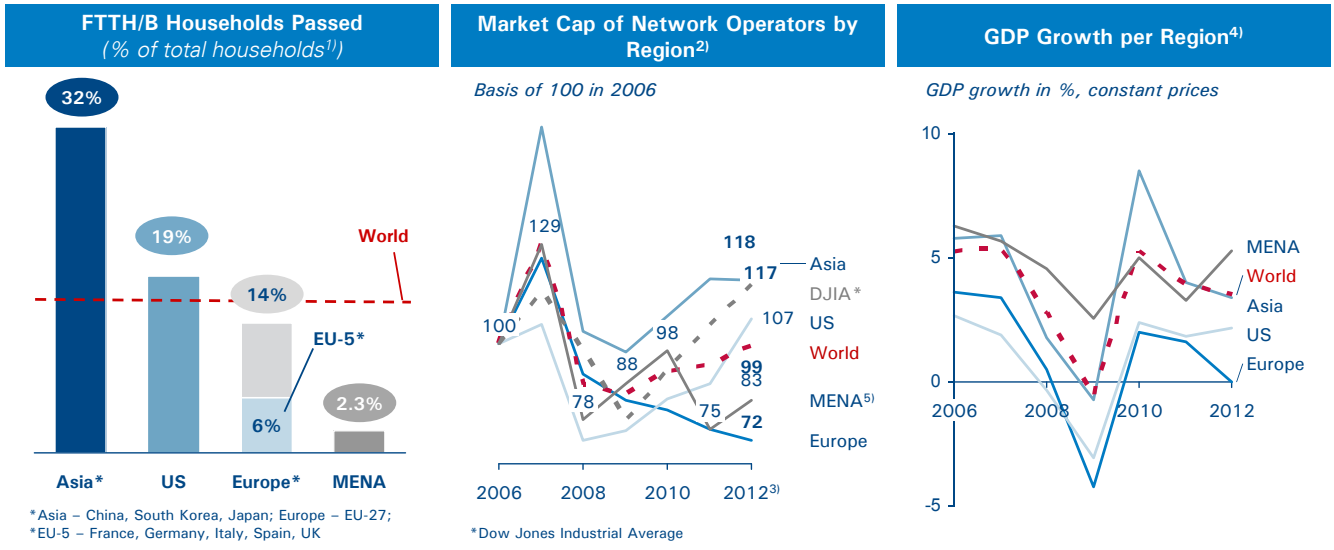
Note: This map is a simplification – in reality there are even more factors and linkages
1) Arthur D. Little study in cooperation with Chalmers University of Technology and Ericsson. Based on advanced econometric analysis of 33 OECD countries with speed intervals of 2 to 20 Mbps

While the broadband web of value evolves differently in each economy, the headlines are consistently stark and easily identified. Increasing broadband speed permanently boosts GDP and jobs are created.

Figure 3 correlates fibre deployment with the market capitalization of network operators, and GDP of their home regions. This illustration suggests that the correlation between fibre deployments and economic growth is more than coincidence.

More crucially, high-speed networks strengthen and drive diversification of economies as Small and Medium Businesses (SMBs), essential for robust economies, are often the quickest to adopt and benefit the most from improved on-line business. For example, as Cloud computing is taking off around the globe, it is the SMBs that gain access to more software and other IT services to enhance their businesses, provided there are high-speed, low-latency and affordable networks available.

Figure 3: Fibre deployment, Telco market cap and regional GDP growth rates



Implementing the right national FTTH/B deployment fosters industry value generation and strengthens economic development

1) FTTH Council Presentation; Asia assumption: China - 63 mill. HHP as of June 2012 + 25 mill. HHP added for Dec 2012 figure (assumption: yearly 50 mill HHP); MENA figure as of Sep 2012; 2) In top 30 global operators, nationality according to HQ location; 3) As of Sept 28, 2012; 4) International Monetary Fund, October 2012 (Europe – EU-27, Asia – Newly industrialized Asian economies); 5) At end of 2012

Great Macroeconomics, but a Challenging Business Case

Given the socioeconomic advantages of fast networks and the undisputed capacity supremacy of fibre, why has the telecom industry been unsuccessful in developing a good business case for extensive fibre deployments? The answer is that the investment required to replace what is often over 100 years of infrastructure deployment is vast. The Fibre-To-The-Home (FTTH) Council estimates that re-wiring Europe on a similar reach and scale as the historic networks will cost a massive EUR 200 billion. Similarly, when evaluating the Google Fibre case, Goldman Sachs reported that at least USD 140 billion is required to partially cover the US. It can be further argued that these private initiatives can probably not be completed without extensive partnerships with municipal, regional or national governments.

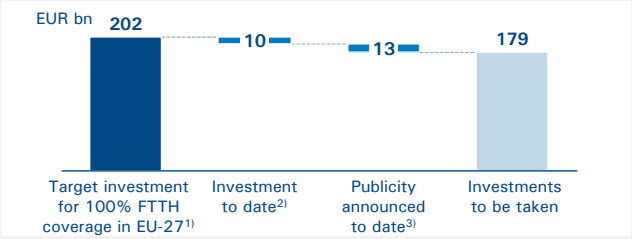
Comparing what has been invested in fibre in the region to date and what has been promised as future investment in Europe, we see there is still a long way to go (Figure 4).

The last time the industry took on national network deployments on this scale was before privatization, before network competition and when industry profitability was higher. In most countries, there are several parallel telecom infrastructures that further hamper industry economics. A typical developed country may have an incumbent fixed network, a challenger fixed network, four mobile networks, cable TV networks covering a large proportion of the country, and an electrical power or other utility company with a fibre network in several large cities. This could amount to five or six national telecom infrastructures, which no one would suggest for roads, railways, and water or electricity systems. This mosaic of infrastructures typically results in densely populated areas being served with multiple solutions of variable standards, and the rest of the nation being under-served. Hence the phrase "digital divide" was coined.

The situation presents regulators with an unfamiliar challenge. After 30 years or more of breaking national monopolies, there is now a growing opinion and sound argument that too much infrastructure competition is holding back fibre deployment, which in turn is hurting consumers and the wider economy (refer to Figure 2).

Figure 4: FTTH Council estimates of National Fibre deployment in EU27

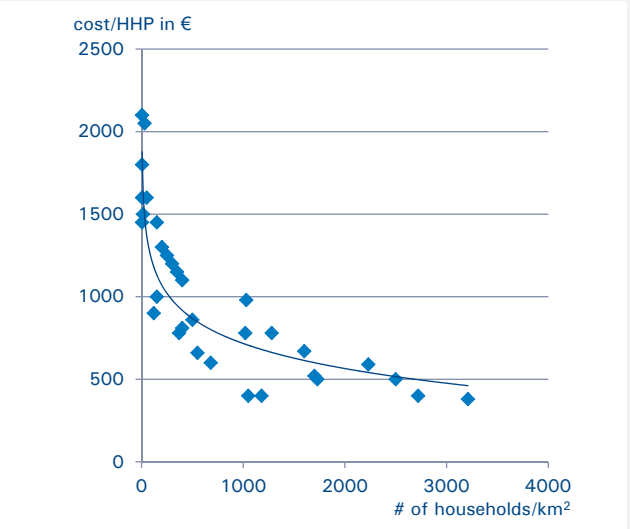
Fibre Investment Requirements EU 27



- The European Union set ambitious targets in the "Digital Agenda" – *at least 50% of the households in European Union will use broadband connections of 100 Mbps or more*
- Assuming a targeted 100% FTTH coverage of EU-27 countries, a total investment of approximately € 202 billion is needed[1]
- To date only approximately 11% of this investment has been made or announced, indicating a huge gap between needed and effected investments. This may be attributed to the unclear regulatory landscape and limited initiative by operators to collaborate together to invest in fibre

1) FTTH Council – "The Cost of Meeting Europe's Network Needs", July 2012;
2) FTTH Council – "Financing Stimulus for FTTH", July 2013;
3) Investments announced by Incumbents – Arthur D. Little – Exane BNP Paribas Report 2011 (€250mil. added for each EU country not included in report)

Cost per Household Passed in Relation to Household Density[1)]

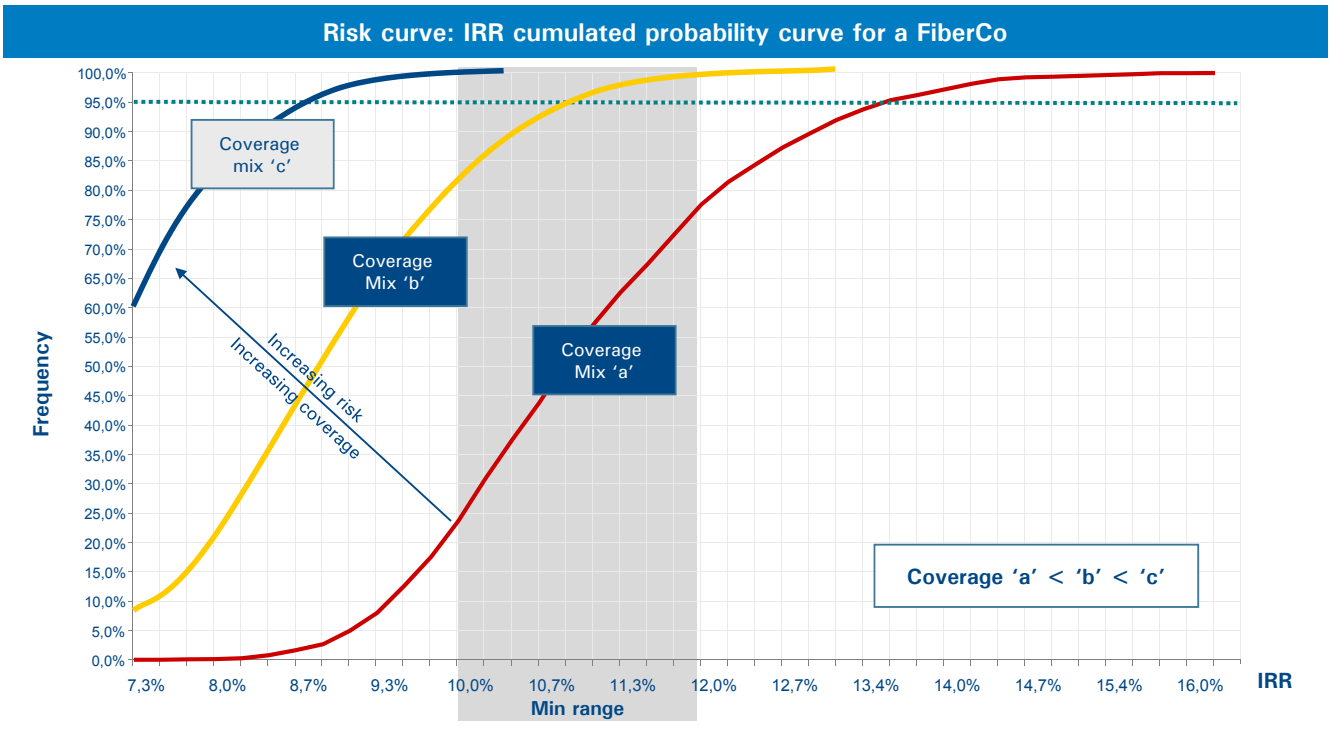


1) FTTH council – "The Cost of Meeting Europe's Network Needs", July 2012

Simply put, the best solution for National Fibre involves well-dug trenches that are maintainable, can be reconfigured and expanded, offers the latest technology and presents options to accommodate new technology in the future. This is not cheap and even in the favorable situation of dense cities, the business case typically heads for +15 year breakeven. More importantly, there is a significant risk associated with such a business case, as represented in our Monte Carlo simulations (Figure 5). This example represents only one fibre deployment; a competitive build would reduce both take-up and the business case.

This fibre investment opportunity often has to compete within telecom operators' portfolio of projects, including near-term return cases for new product launches and mid-term return cases for local-loop shortening projects, such as VDSL. The overall business environment is further complicated by regulatory uncertainty, such as the possibility of regulatory pressure to open up fibre access investments to competition at cost-oriented price levels. Taking all this into account, it is not surprising that, in the absence of some better industry coordination, fibre projects often do not get the highest priority.

Figure 5: Simulations with different coverage scenarios show that 'value at risk' increases with coverage

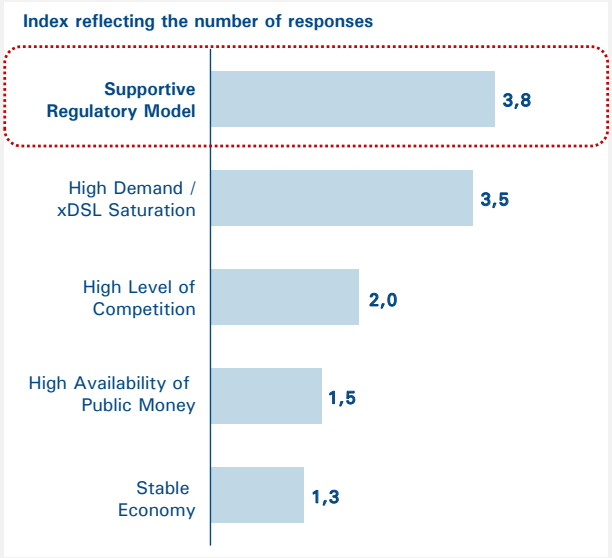


The take-up rate, defined as the number of houses passed converted to houses connected with fee-paying service, is key to business case performance. In an environment where take-up rates could be half or a third if other alternatives are laid, then competing companies are going to look for the cheapest solutions and deploy only in the most densely populated and high revenue areas.

As part of the Arthur D. Little - Exane BNP Paribas Report 2011, we surveyed over a hundred leaders in the European telecoms industry to get their opinions on what makes or breaks the move to fibre. Regulatory stance was at the top of the list (Figure 6 overleaf).

Figure 6: Industry survey as part of Arthur D. Little – Exane BNP Paribas report 2011 "Superfast broadband: Catch up if you can"

Potential Triggers for FTTH/B Roll-out



Opinion based on observations

- A supportive regulatory model is vital for a FTTH rollout and needs to balance the trade-off between infrastructure competition and investments
- It is key to develop the regulatory model in close collaboration with all relevant stakeholders to ensure an optimal model selection and deployment
- A sufficient demand for high speed broadband and the level of xDSL saturation is another logical factor triggering the FTTH/B rollout
- The current level of competition on the broadband market can be an important factor spurring investment into next generation networks (e.g. high cable competition forcing TelCos to invest in fibre networks), while in other areas over-competition in infrastructure stifles investment
- Public money is seen as a very important instrument to incentivize rollout activities, especially in unattractive areas for investment (low-density areas)

Source: Arthur D. Little -- Exane BNP Paribas 2011 Report, "Superfast Broadband: Catch up if you can"

European regulatory policy is now under discussion. Georg Serentschy, Chair of BEREC and CEO of RTR, the Austrian Regulatory Authority for Broadcasting and Telecommunications, recently stated:

Today, the focus of telecommunications regulation in Europe is to some extent on promoting static efficiency. Low prices for consumers are widely seen as the ultimate goal. However, there are a few drawbacks that arise from this approach. The main downside is that firms – especially incumbents – can hardly earn the profits needed for broad investment in new infrastructure. The entrants, on the other hand, have only few incentives to invest in their own infrastructure, because they can easily access the incumbent's networks (option value).

The 'ladder of investment' concept, which tried to combine static and dynamic efficiency, failed in this respect […]. It is worth noting that the concept of 'ladder of investment' was instrumental for opening the market. However, it became obsolete when it comes to fostering investments in a new infrastructure.

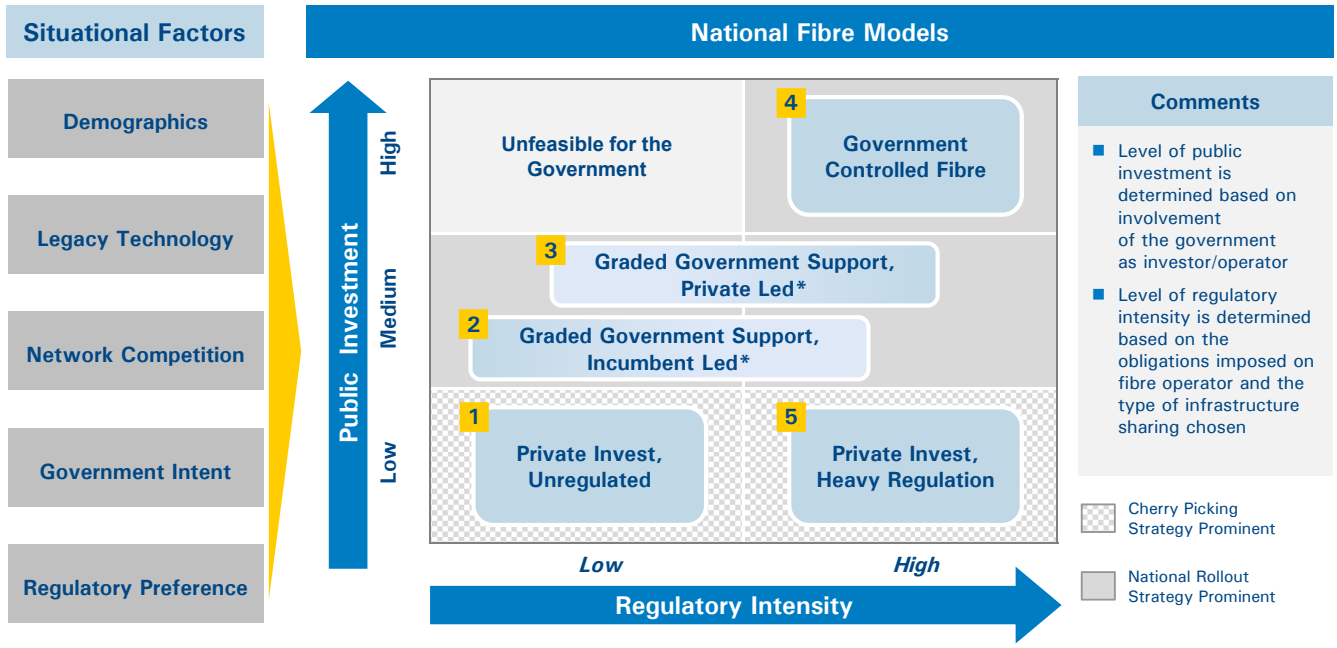
If governments want the macroeconomic advantages of fibre, then a degree of industry coordination and stimulation of demand need to be part of their policy-making.

Five Models for National Fibre Strategies

Arthur D. Little has just concluded a global survey of National Fibre strategies in nearly 50 countries. From this study, we identified five models that governments around the globe have been following to reap the benefits from fibre (Figure 7).

This model usually results in service providers investing into fibre. Good quality services at competitive prices appear in major population centers, but little beyond those areas. The United States is a well-fitting example of this model.

Figure 7: Five National Fibre Models



Source: Arthur D. Little analysis *Regulatory intensity in these models can vary from low to high depending upon situational factors

Each model is a combination of (i) regulatory intensity ranging from low (freedom) to high (mandatory open access and regulated pricing) and (ii) degree of public investment ranging from zero to full public funding. With the level of public funding comes a related degree of policy and regulation of the usage of the assets. Underpinning the models are the specific national factors that play a significant role in which model is chosen or prevails, especially in terms of the level of network competition.

Model 1 – Private investment, unregulated

In this model, service providers are free to invest in fibre where they deem suitable. Little to no regulatory pressure to unbundle to competitors is applied, and regulated prices are not enforced.

Model 2 – Graded government support, incumbent led

In this model, the incumbent operator, usually still with a significant government investment stake or a high level of influence, is mandated to roll out an extensive National Fibre network. Public money is involved in the exercise either directly or indirectly, and some regulation on open access is applied to create a competitive environment. Quite often the second operator in the market will also establish a smaller position in selected regions or areas, and be in a position to offer an alternative national service via regulated open access. Smaller players in the market usually rely purely on a regulated open access policy.

This model usually results in a more extensive, higher penetration network than Model 1, but care is required to ensure that artificially-created competition resulting from public policy does not adversely impact service level competition. Otherwise, this model can lead to either uncompetitive prices or dull service offerings. Japan is a good example of this model.

Model 3 – Graded government support, private led

Similar to Model 2, Model 3 results in a more equally competitive multi-player market, where the government has distanced itself from the incumbent. Importantly, the government drives and partially funds a National Fibre agenda through all the players in the market. These models generally deliver high levels of fibre penetration and coverage, allowing free market forces to operate where they naturally would and public money to be focused efficiently on areas where free market forces would not deliver fibre. With public coordination, targeted public investment, and graded or lighter touch regulation, these models also foster healthy competition at the service level. France is a good example of this model.

Model 4 – Government-controlled fibre

In this model, the government takes a full hands-on approach to creating and, in some cases, operating a National Fibre network. With such models, the government agenda for a digital economy is in the foreground, and the objective of policy and regulation is to openly offer and possibly transfer the infrastructure to the communication service providers in the country for commercial service operation. These models will probably achieve high penetration and a highly uniform standard of infrastructure, and the associated national economics that come with it. However, current examples of this model indicate challenges in terms of speed and efficiency of construction. Australia is a well-fitting example of this model.

Model 5 – Private investment and heavy regulation

This model assumes that communication service provider (CSP) competition is strong, and CSPs believe that the fibre market is so attractive that project financing will be easy and fast. Further, this model then applies open access and regulated price controls so that other, usually smaller, CSPs can offer services without the burden of heavy infrastructure investment. The intended result is considerable infrastructure competition that drives low prices for highly specialized services. The overall European telecom regulatory stance is well-fitting of this model; however, individual countries within Europe often follow significantly different models in their local markets, depending on the specific mix of competition from cable operators, the quality of copper network and the peculiarities of the regulatory context.

In a global survey of National Fibre Strategies, there were leading and lagging examples for each macro model. Hence choosing a National Fibre strategy is not just a simple case of good model / bad model. Rather, it is a case of identifying the best model for a specific national market conditions and applying that model well.

National Fibre Models – Which to Choose?

An analysis of achieved penetration rates reveals the complexity of the National Fibre topic and indicates where national situational factors can swing to favor either FTTB/H or hybrid FTTCab models. A selection of results is shown in Figure 8 (a snapshot of performance as of December 2012) and Figure 9 overleaf (the same examples normalized by time in operation, based on a simple average penetration per year of operation). It is clear that it is already time for FTTB/H solutions in many countries.

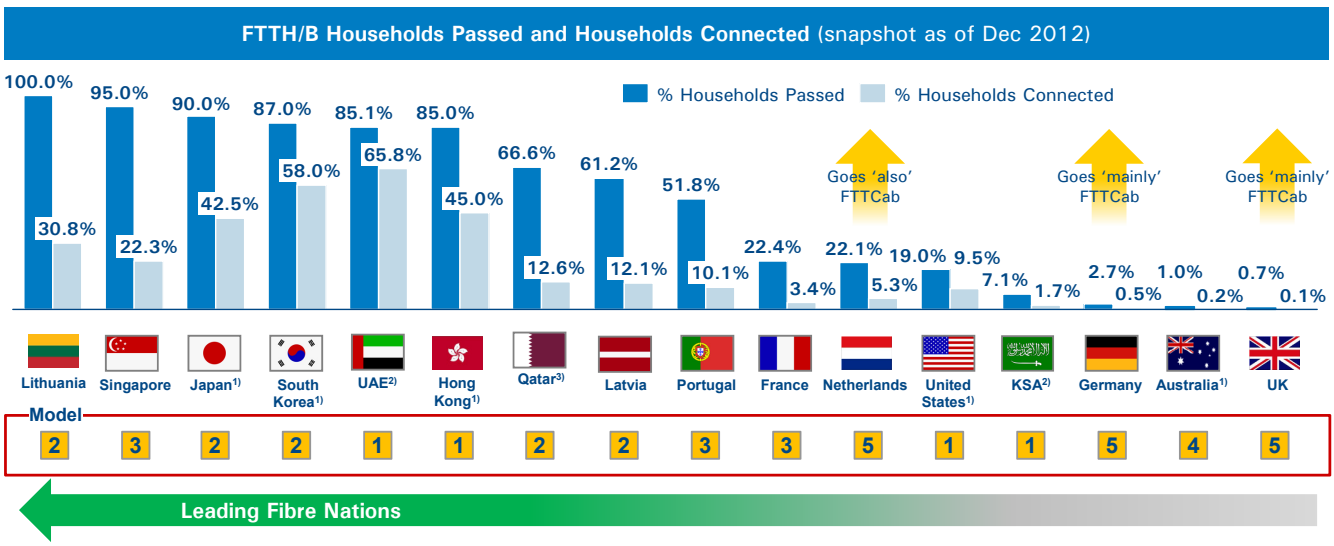
While it is tempting to look at the top and bottom of the list to find winners and losers in the fibre race, this would be an oversimplification that ignores many markets' specific characteristics, such as where FTTCab is a valid alternative. Each example of the various National Fibre models is unique. For example, the UK, due to its relatively compact geography and proud, 100-year history of significant network investments, has a good copper- and coax-based access network. The country enjoys a high proportion of fast broadband (circa 50 percent of homes have access to 50 Mbps or greater). This situation has impacted the timing and reduced the pressure to move fully to fibre solutions.

This gradual approach has also been adopted in other countries where cable and FTTCab address the need for increased connection speed with limited marginal costs, and enable further enhancements to be implemented over time. However, 50 Mbps will rapidly be seen as modest, and the need to move to FTTB/H may be approaching over the next five years. In countries with a very strong copper infrastructure, we may see the remaining meters of copper get further life extension thanks to the expected evolution of new technologies, such as G.Fast.

While it is not a simple decision between good or bad National Fibre models, there are some overarching observations, which are summarized in the following four conceptual categories:

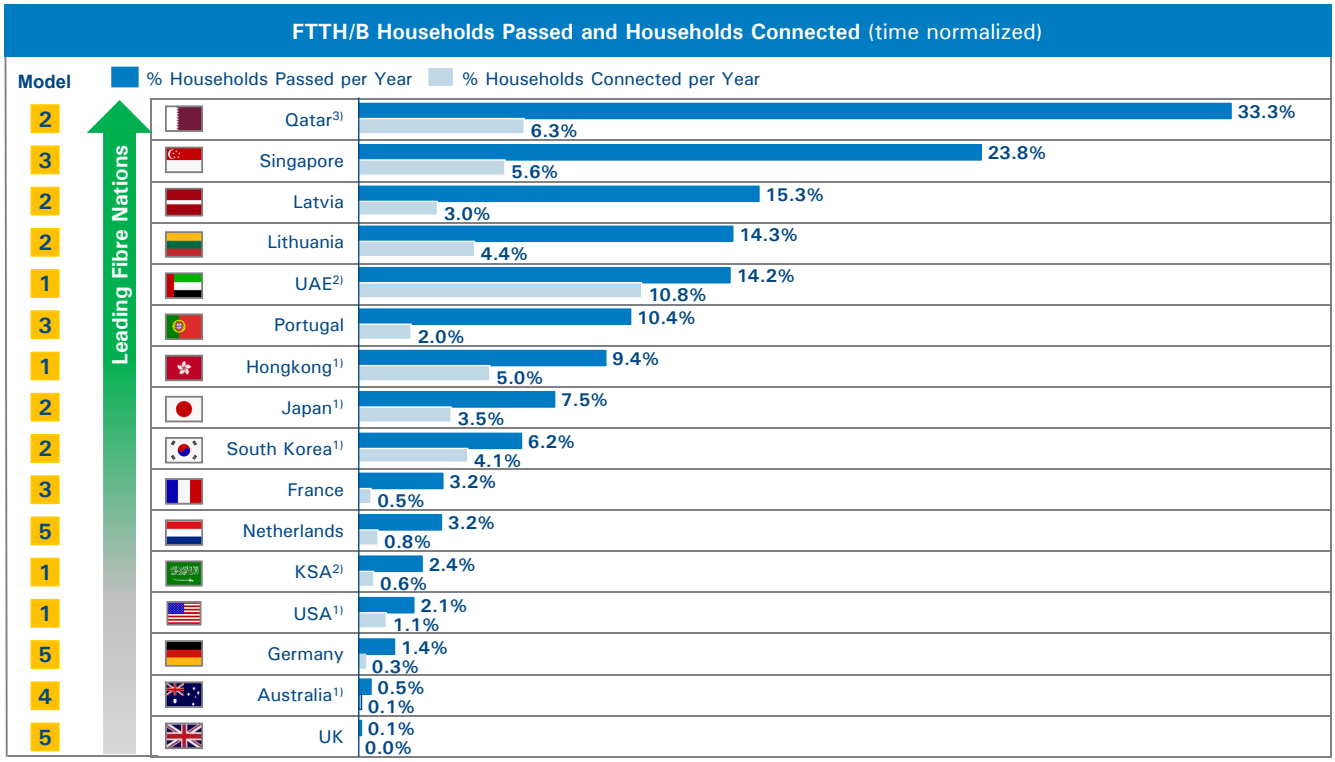
- the unfitting
- the fast
- the unlikely
- the promising

Figure 8: Selected national fibre penetration correlated to underpinning models (Dec 2012)



Source: FTTH Council Dec 2012, Singapore Statistics report, Arthur D. Little analysis; *uptake or HHc is largely determined by various service offerings, pricing and Go To Market strategies, where as HHp is a pure measure of infrastructure achievement
1) As of June 2012 – December figures to be released end of March 2013; 2) As of Sep 2012
3) As of Dec 2012 sourced from Ooredoo and publicly available resources

Figure 9: Selected national fibre penetration correlated to underpinning model



Source: FTTH Council Dec 2012, Singapore Statistics report, Arthur D. Little analysis; % Households Passed/Connected per Year – normalized HHP/HHC actual data with respective roll out start years (Roll out start year is determined based on announcements from operators or govt./regulatory fibre initiatives start date)
Note: 1) As of June 2012; 2) As of Sept 2012; 3) As of Dec 2012 sourced from Ooredoo and publicly available resources

THE UNFITTING

Model 5, which relies on private fibre investment coupled with heavy regulation to encourage consumer service competition, generally does not deliver fibre on any scale! The heavy investments and long pay-back periods involved, coupled with the uncertainty of service take-up rates due to competing infrastructures and the probability of low service prices, clearly discourages those who have the technical capabilities to build such networks. Indeed Europe, where the overarching policy is Model 5, lags behind other regions overall (Figure 3). Where individual countries within Europe have achieved higher penetration, they have done so by adopting attributes of quite different models in their local market (Figure 10 overleaf).

THE FAST

Model 1 (Private investment, unregulated) achieves a higher penetration rate than its opposite, Model 5, without the policy or regulation overhead, but is unlikely to achieve widespread coverage, thus creating a digital divide. It encourages less than efficient parallel infrastructures and hence investments, which with better coordination could achieve higher coverage at no extra cost. In such a model, network investments are focused first on densely populated areas, gradually expanding to less populated areas, while rural areas and the digital divide remain a public issue.

THE UNLIKELY

The well-intended government-controlled fibre Model 4, while probably resulting in the most uniform and widespread infrastructure, will do so at a slower and perhaps less financially efficient way. The industry, through competition, has developed provision efficiency at both infrastructure and service levels, which Model 4 generally does not fully exploit.

THE PROMISING

Models 2 and 3, which adopt a hybrid approach generally achieve the highest levels of penetration and do so in a more timely and financially efficient way than other models. The hybrid approach is a combination of free market competition, graded government coordination and geographically-targeted public investment open to competitive bid.

The difference between Models 2 and 3 is the level of competition in the market. Model 3 is applicable for highly competitive markets with multiple players with balanced competitive positions, and Model 2 where a government-controlled, heavily-influenced incumbent is dominant. In those markets where governments retain a significant stake in the incumbent, the temptation is to drive National Fibre through that incumbent, but this can have significant adverse effects, destroying essential service level competition unless policy safeguards, such as a transparent wholesale model, are put in place.

Figure 10: European national fibre penetration and degree of compliance to overarching EU fibre model (Model 5 – private investment/heavy regulation")

EU Model Variations

Compliance with EU regulation: HIGHER … LOWER

	Households Passed as % of total Households	Households Connected as % of total Households	Fibre Unbundling	Price Regulation	Comment
EU total	14.0%	3.0%	✓	✓	Unbundling with price regulation for dominant players recommended
UK	0.7%	0.1%	✓	?	Currently virtual loop unbundling for incumbent, no price regulation yet
Germany	2.7%	0.5%	✓	✓	Fibre loop access regulated for incumbent with ex-post price control
Netherlands	22.1%	5.3%	✓	✓	Local loop unbundling with price regulation in place for incumbent
France	22.4%	3.4%	✗	✗	Graded regulation depending on area density/competition
Romania	33.6%	1.2%	✗	✗	Currently no requirements for fibre unbundling and price regulation
Slovakia	36.1%	11.2%	?	✗	Independent offer for wholesale access from incumbent since 2011 – pricing issues persistent
Denmark	37.7%	12.4%	?	?	Only WBA* regulation – fibre unbundling regulation under way
Slovenia	43.0%	12.3%	✓	(✓)	Fibre unbundling and price regulation in place since 2011. >40% network was deployed before enforcement of WS
Sweden	46.9%	22.7%	✓	(✓)	Functional separation of incumbent, with price regulation (dark fibre), Utilities and >100 regional companies active in FTTH/B business
Bulgaria	52.6%	14.7%	✗	✗	Currently no requirements for fibre unbundling and price regulation in place
Portugal	53.0%	8.0%	✗	✗	Deregulated fibre in dense areas – regulation only applying to rural low competitive areas
Latvia	61.2%	12.1%	?	✗	Inadequate progress on fibre local loop unbundling – only theoretically in place – and high wholesale access charges
Lithuania	100.0%	30.8%	?	?	Suggestions for unbundling with price regulation from regulator developed – not implemented (yet)

✓ In place and enforced ? In development or not enforced ✗ Not in place and not in development

Source: HHP and HHC data as of Dec 2012, from FTTH council and other publicly available resources *WBA = Wholesale Broadband Access (regulation heavy in case of Slovenia, regulation put in place after deployment; in Sweden, utilities built and then sold assets to incumbent)

The Golden Rules for Successful National Fibre Models

An analysis of the most promising examples of National Fibre markets and the models underpinning those cases has identified a number of golden rules, generally applicable to all of the analyzed models:

- **Believe that ultra-broadband is an essential infrastructure for national competitiveness.** Especially in Europe, there is an immediate urgency to reassess the regulatory framework in order to attract investments and investors, who are increasingly looking to other markets given the poor European economic outlook.
- **Create an investment friendly business environment and avoid heavy regulation**, such as ubiquitous mandatory open access with cost-oriented price regulation, in highly competitive markets, especially where there is an absence of significant public money for fibre networks. Adopt regulatory measures for legacy networks with no counter-effects on other fibre investments. For example, lower copper access charges might reduce incentives to invest in cable or mobile broadband
- **Focus regulation on intermodal competition** – Mobile operators and cable companies increasingly compete with fixed line services. The focus of regulatory policy should, therefore, clearly change from an intramodal towards a more intermodal holistic approach
- **Capitalize on the competitive capabilities of all players in the market**
- **In many (generally larger) countries, governments need to be prepared to invest public money** to achieve a high penetration of fibre and this should be done through a national economic development framework

In the generally preferred Model 3 or Model 2 (in those markets with a heavily government-controlled incumbent), there are vital success factors that underpin successful implementation:

- **Combine private endeavors with graded and targeted public policy coordination and public financial incentives**, which requires skillful government-led coordination of attractive free market investments in black areas vs. less attractive, white areas requiring public financial support
- **Establish and ensure equal and open competition for these public funds to all operators**
- **Ensure public finance is targeted to avoid distorting the natural competitive composition of the market**, avoid subsidizing other operator costs
- **Ensure that a transparent and symmetrical wholesale model exists for interconnection of the access networks**

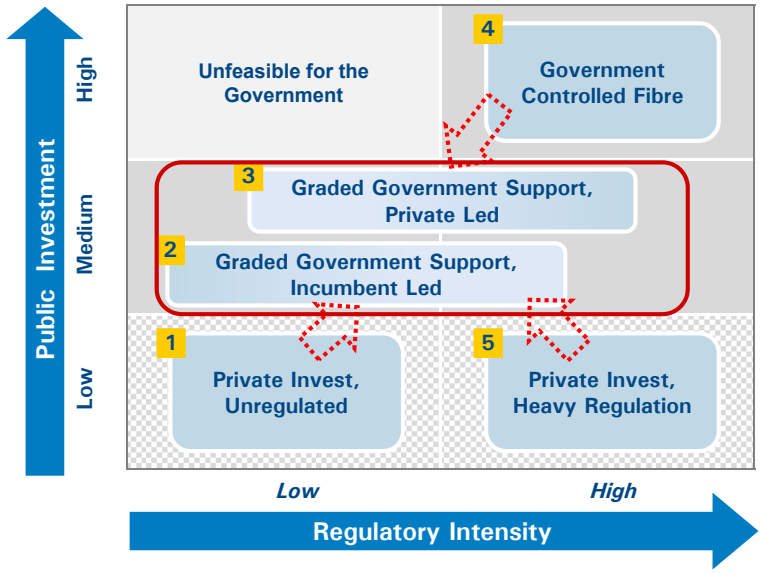
Eventually, more favorable context conditions may apply and the launch of specific models should be accompanied by actions taken in other policy areas, in order to:

- **Increase national digital literacy and stimulate demand**
- **Support the purchase of highly technological equipment by SMBs and consumers (e.g. tablets and laptops)**
- **Strengthen the ICT industrial policy**
- **Nurture the Venture Capital ecosystem**
- **Support the development of local OTT players**

While Public-Private Partnerships can be complex, there are many good examples where a hybrid approach has been applied. In many countries, similar schemes have already been successfully applied in other infrastructure or public service areas. For example, in France they have established a system specifically for fibre deployment in low-density areas. In the Netherlands, KPN created a mixed private finance model for fibre, which is helping to push penetration levels. In Saudi Arabia, the government successfully established an industry fund, the Universal Service Fund, for the development of mobile infrastructure in remote areas. While these or other examples would need to be adapted to fit specific national situations, there are benchmarks or templates from which to start.

Our overall assessment, as shown in Figure 11 overleaf, points towards the hybrid models, achievable by reducing regulatory pressure and committing public money, and illustrates some of the key questions to be considered when defining a National Fibre strategy in each specific national situation.

Figure 11: Balanced models combine public coordination of infrastructure competition to achieve national goals while maintaining healthy service level competition



Key questions when choosing a model

- What is the likelihood of national coverage?
- How quickly will national coverage be achieved?
- How much duplication can be avoided while assuring higher standards and a future-proof solution?
- How efficiently will public money be used to build fibre where it would not otherwise occur?
- How to avoid public money being used where a free commercial situation exists?
- To what extent can safeguards be made to ensure public money is used for fibre build and not distortion of service level competition?
- Which model best balances the many interests of the various stakeholders?

Source: Arthur D. Little

Conclusions

There are clear socioeconomic benefits from high-speed, low-latency, super-fast broadband. These benefits are tangible at the national level in terms of permanent contribution to economic growth, employment and the strength and diversity of business ecosystem, especially in terms of the SMB segment.

The term 'high-speed' is redefined every year. Globally, it is time for fibre, but the business case is challenging, especially considering how the telecom industry has evolved. The industry has, in many countries, undergone decades of regulatory policy that has successfully replaced monopolistic control with free market competition. Now the industry faces a challenge not encountered since long before liberalization. It is time for a decisive, quick re-build to fibre on a massive scale. The investments needed are vast. Some nations have already been successful, while others, including many mature economies, are lagging significantly behind.

Left purely to a free market model, nations will witness a digital divide; while some areas are not served at all, other areas have a patchwork of duplicated hot spots that are localized in city centers with potentially sub-optimal infrastructures. More differentiated regulation is now required that recognizes appropriate levels of regulatory intensity at infrastructure and service competition levels. The single regulatory approach of telecom-focused infrastructure and service as one indivisible bundle, which has also given Over-the-Top providers a free ride to revenues at the expense of telecom operators' infrastructure investment, is no longer feasible.

The key success factors for the development of winning National Fibre Strategies are:

- Reduction of regulation pressure in order to create a more investment-friendly environment by introducing new remuneration and wholesale pricing mechanisms
- Maintenance of cross-operator competition in fibre deployments in economically viable areas in return for an absence of regulation
- A publically-initiated fair and open orchestration of those operators in second- and third-tier areas where free-market economics can be extended with modest conditions, such as reciprocal open access between operators
- A publically-initiated, fair and open approach with a combination of public and private funding directed to coordinated fibre build in those least economically attractive areas – again with appropriate conditions to ensure reciprocal access and the prevention of internal cross-subsidy that would otherwise distort or reduce competition in super-fast services

A multi-tiered, hybrid approach that differentiates between infrastructure and service-level competition can drive an optimum balance between national economic interests, free-market economics and a healthy telecommunications industry, that is able to provide affordable leading edge ICT services so necessary for economies going forward.

Arthur D. Little Experience

Arthur D. Little uses innovation in products, services, technologies, process and business models to help our clients achieve growth in the Technology, Information, Media and Electronics (TIME) sectors. Arthur D. Little has deep industry knowledge of the telecom and IT sectors, based on extensive client work, addressing market analysis, strategy, and performance improvement for telecom operators and ICT service providers. We continually support leading global operators in developing their strategies, offerings and routes to market. Furthermore, Arthur D. Little continues to invest in the development of intellectual capital, exploring what's next, hosting and contributing to global events and conferences, and helping to shape opinions that drive the growth in the TIME industries we serve.

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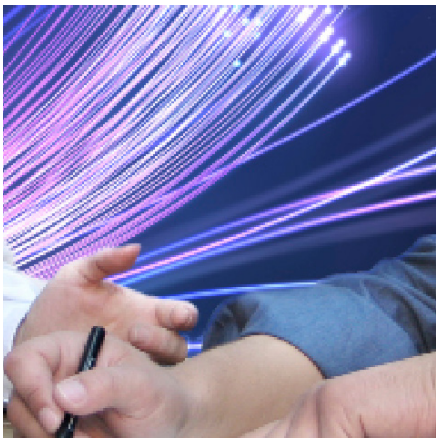

Arthur D. Little

As the world's first consultancy, Arthur D. Little has been at the forefront of innovation for more than 125 years. We are acknowledged as a thought leader in linking strategy, technology and innovation. Our consultants consistently develop enduring next generation solutions to master our clients' business complexity and to deliver sustainable results suited to the economic reality of each of our clients.

Arthur D. Little has offices in the most important business cities around the world. We are proud to serve many of the Fortune 500 companies globally, in addition to other leading firms and public sector organizations.

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