

The interplay of stakeholders from different sectors for the deployment of communications infrastructures – a case study from Bahrain

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by

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Abstract:

Bahrain prepares itself for a future based on high-tech industries and tourism. About \$20 billion worth of construction work is under way in the private sector on the Manama north shore alone. New property developments include cities on reclaimed land, the visionary landmark of Durrat al Bahrain and Bahrain international investment Park. These new property developments raise regulatory questions not yet answered in other countries because the construction of new towns, cities and other huge areas in a competitive telecommunication environment is unique. Maybe the construction of the Dutch polder (landfill cells) in the IJssel sea in the middle of the last century is somewhat comparable, however, at that time the incumbent was a monopolist which did not question its obligation to deliver telecom services to such new lands.

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This is different in Bahrain, the incumbent is reluctant, as are its competitors. Their universal approach is to demand exclusivity and with that, consequently, foreclose competition at least for a prolonged period of time. This conflicts not only with the modern concept of competition but also with the paramount goal of ensuring competitive choice for business and residential users. And although state-of-the-art telecommunications networks and services are an inevitable prerequisite for the realization of a bright economic future, some landfill cells in Bahrain may not be provided with such services at all.

From the analysis in Bahrain one can conclude that under the current conditions a principal problem in setting appropriate incentives for infrastructure investment in telecommunications networks exists. This is partly comparable to the current discussions in other countries in which several different kind of solutions are being analysed to promote the deployment of fibre in certain areas. In Bahrain it would be advisable that developers² should play a more active role in providing this infrastructure, by not only making corridors available but potentially also by providing the ducts or even fibre in order to alleviate the investment requirements to telecommunications operators. The fact that the telecommunications market has been opened to competition should lead to an advantage for the users in new developments. Since the demand uncertainty is rather high for telecommunications infrastructure providers (operators), it seems logical that the developers should take a larger share of responsibility when rolling out infrastructures of this kind as they also do for roads, power, water, sewage, etc. From a regulatory standpoint, in order to ensure continued competitive choice for end users, it would be preferable to run an open access policy which on the one hand allows different operators also to install their (fibre or) cable networks in the ducts, and on the other hand allows various operators to use the physical infrastructure deployed by the developer.

The pro-active role of utility providers, developers or the public in telecommunications infrastructure is a phenomenon, which is also being intensively discussed in other parts of the worlds. While competition works well where infrastructure is in place (provided by the incumbent) or in business areas where there is high demand, the roll-out of competitive state-of-art fixed infrastructure might not be economically feasible. The example of Bahrain reinforces that policies need to be developed to reach the desired goals of competition and state-of-the-art infrastructure and services.

² In this text we refer to "developer", however, it may also be the owner.

1 Introduction

1.1 Bahrain – facts and figures

The Kingdom of Bahrain is a small island in the Persian Gulf. It covers an area of 700 square km, which equals approximately the size of Berlin. Bahrain has become independent from the UK in 1971 and its population has grown over one million at the end of 2007, which makes it one of the most densely populated countries in the world. More than half of the inhabitants are expatriates.³

In a region experiencing an oil boom, Bahrain has the fastest growing economy in the Arab world.⁴ Bahrain also has the freest economy in the Middle East according to the 2008 Index of Economic Freedom.⁵ In 2008, Bahrain was named the world's fastest growing financial centre, according to the City of London's Global Financial Centres Index.⁶ Bahrain is attracting some of the biggest global corporate names and calling the shots in the race to become the definitive destination for international investment.⁷

The mobile phone penetration is 107% according to the Telecommunications Service Indicators in the Kingdom of Bahrain issued 30 October 2008 by the Telecommunications Regulatory Authority (TRA). The two main players in the mobile telephony market are the BATELCO (the incumbent) and ZAIN. The number of fixed lines is about 200.000 or 19%, the number of broadband subscribers is 73.000 or 7%⁸. This is a typical picture in the region, which shows the superiority of mobile telephone to fulfil the urgent telephony requirements. Bahrain also hosts a landing point for the FLAG submarine cable.

About US\$ 20 billion worth of work is underway in the private sector on the Manama north shore. These developments include the financial harbour, new cities on reclaimed land (e.g. Amwaj Island, Diar al Muharraq), tourist resorts (e.g. Durrat al Bahrain and Riffa views), industrial regions (e.g. Bahrain International Investment Park) and many others more.

³ See Arabian Business.com from 27 February 2008, <http://www.arabianbusiness.com/512344-bahrain-witnesses-population-explosion>

⁴ See Arabian Business.com from 1 February 2007 citing the United Nations Economic and Social Commission for Western Asia, http://www.arabianbusiness.com/index.php?option=com_content&view=article&id=7116

⁵ published by the Heritage Foundation/Wall Street Journal, <http://www.heritage.org/research/features/index/country.cfm?id=Bahrain>

⁶ See <http://www.hedgefundsreview.com/public/showPage.html?page=744774>

⁷ See arabian business.com from 25 April 2008, <http://www.arabianbusiness.com/517455-bahrain-calling>

⁸ This includes mobile and wireless broadband.



Figure 1: Bahrain 2030 National Planning Development Strategies (SOM)

All these developments require state-of-the-art telecommunications infrastructure. The needs of international companies will not be fulfilled by mobile telephony alone. An advanced fixed infrastructure based on fibre-optic cables needs to be established along with the new developments in order to establish Bahrain as the preferred location for businesses in the Middle East.

A regulator dealing with these developments faces the question which regulatory policy to follow in order to achieve the goals

- ensuring competitive choice for business and residential users and
- creating sufficient incentives for investment in facilities enabling the establishment of telecommunications networks to ensure that, despite potential or actual obstacles, the respective networks will be rolled out to users in new developments.

These two goals emphasize the dichotomy between incentives for investment and competition policy makers face worldwide. As the study has affirmed that the incentives for investment are higher if no regulatory obligations to offer wholesale products are to be expected. On the other hand incentives for investment might not exist at all for a second operator, which would lead to a monopoly like situation. Incentives for investment and competition are conflicting goals and regulatory measures are necessary to balance these goals in an effective way.

1.2 Bahrain: telecom law and institutional system

In general, the Telecommunications Law of Bahrain is a fairly highly-developed law from an international point of view; however, some rules are somewhat limited in scope. The interconnection and access obligations are asymmetrical. The rules for rights of way and universal service are not very elaborate and thus open to interpretation. Several issues are being taken care of via individual regulation by TRA (e.g. market definition, significant market power, etc.).

The institutional system involved in the planning of telecommunications infrastructure in new developments on public or private land does not yet sufficiently reflect the competitive landscape in Telecoms. The Economic Development Board (EDB) is a public agency with an overall responsibility for formulating and overseeing the economic development strategy of Bahrain, and for creating the right climate to attract direct investment into the Kingdom. EDB is in the position to foster awareness about the need for state-of-the-art telecommunications infrastructure in new developments and to attract those companies which can contribute to the future telecommunications environment in Bahrain.

The connection of utilities (water, sewers, roads, ...) to a new development is coordinated by the Central Planning Unit (CPU). The CPU is responsible for public land and acts as an interface to developers. The incumbent (Batelco) still provides the sole interface for telecommunications. The building permits on private land are issued by MOSS (municipal one-stop shop). Private buildings need to comply with Batelco's standards for ducts and telco boxes in the various classes of buildings. These procedures do not yet reflect the competitive environment in telecommunications. A suitable step forward would be to make the interface to the telecommunications industry operator-neutral, and provide guidelines for private developments which reflect the needs of multiple competing operators.

This diversity in competence for telecoms, building permits and right-of-ways can be seen in a lot of countries. While there is a central regulatory authority, the other aspects of deploying networks are being dealt with on other levels of the state⁹. Sometimes that can be national (e.g. building law in Germany), state level in a federal system or municipal (e.g. for granting Right-of-way)¹⁰. It becomes even more confusing in case other utilities (water, energy, roads, railroad) are being part of the process. This, of course, also applies respectively to the participating levels of state in infrastructure policy.

⁹ In the experience of the authors, this can be said for Austria, Australia, Canada, Germany and the UK.

¹⁰ Which can also be dealt with on a quasi-national level as in Canada where the Federation of Canadian Municipalities (FCM) handles these issues.

1.3 Methodology

This paper examines what kind of state-of-the art telecommunications infrastructure and services would be expected in Bahrain's new developments to emerge (demand side). As a next step we investigated emerging market solutions and obstacles for investment (supply side). A benchmark of countries with a comparable environment has been conducted in order to find a blueprint for a useful regulatory environment. Since no easily applicable environment is available, our analysis has focused on the classification of the market solutions (i.e. operational models) which have emerged in Bahrain. These models have in common that the investment for telecommunications is being shared between developers and telecommunications operators. Developers could not only be private project developers but also public institutions like municipalities, the government or other authorities. From the different models described in this paper general conclusions about public – private interplay can be drawn. Recommendations for a regulatory environment which fulfil the above mentioned goals conclude our paper.

2 Demand and supply side considerations

Firstly, one has to take a look at the demand and the supply side of the Bahraini telecom market.

2.1 Demand side

The current market in Bahrain shows a dominance of mobile services. Broadband service penetration is with 7% relatively low in international comparison. On the other hand international studies predict increasing bandwidth requirement. Next generation broadband offering 100 Mbit/s and more will be required in the next three to five years.

According to the OECD broadband portal (<http://www.oecd.org/sti/ict/broadband>):

*" ... the number of broadband subscribers in the OECD increased 24% from 178 million in June 2006 to **221 million in June 2007**. This growth increased broadband penetration rates in the OECD from 15.1 in June 2006 to **18.8 subscriptions per 100 inhabitants one year later.**"*

ICT is seen as a main driver for economic growth.¹¹ According to the 13th implementation report of the European Commission¹² the fixed market is declining, the mobile market is maturing and the only sector of significant growth is the broadband market. Although mobile broadband is gaining importance according to international studies¹³, the

¹¹ See implementation report [EC 2008] and Europe's i2010 strategy.

¹² See [EC 2008]

http://ec.europa.eu/information_society/newsroom/cf/itemlongdetail.cfm?item_id=3963

¹³ European Commission: "Mobile broadband technologies (e.g. UMTS-HSPA, W-CDMA, OFDM), generally allow transmission speeds lower than recent wired technologies (respectively, in principle, up to 15 Mbit/s compared to speeds exceeding 100 Mbit/s). Moreover, they often represent the most expensive broadband access vehicle. However, take-up of mobile broadband has developed significantly in a number of Member States in recent years (e.g. Bulgaria, Denmark, Germany, Greece, Spain, Ireland, Italy, Luxembourg, Austria,

technology which allows the most economical and future-proof solution for ubiquitous broadband is the use of fibre optics cables.

Details of demand and especially the dynamics of demand development are not known with certainty, but it is universally recognised that services will require ever-increasing bandwidth. This phenomenon is also known from other industries as "supply-initiated demand" or "supply-induced" demand.¹⁴ This means that one can also assume that demand will develop as supply of broadband becomes more readily available. Some future applications are High definition TV (HDTV), e-commerce, e-Health, social networking, B2B processes and enterprise networks. Especially for global businesses, bandwidth is paramount. Demand is driven by outsourcing, back-up and business continuity applications, access to data in the company's intranet, and communications between different branches of a global company.

We conclude that given the economic growth Bahrain is experiencing, bandwidth demand will be rising sharply. Indeed the availability of state-of-the-art telecommunications infrastructure will be an important part of the decision of a company to choose Bahrain as the preferred location.

2.2 Supply side

The market players in Bahrain are

- the incumbent operator Batelco
- Other licensed operators
- Developers
- Authorities
 - central planning unit CPU – coordinating utilities with developers on public ground
 - municipal one stop shop MOSS – a one stop for building applications and
 - Economic development board EDB – a public agency overseeing the economic development strategy of Bahrain.

Although one might expect that operators are lining up to deploy fibre infrastructure in every development we have identified obstacles potentially limiting the deployment of state-of-the-art telecommunications networks in new property developments:

Portugal, Romania, Slovenia, Slovakia), including Member States facing fixed network coverage gaps or experiencing a high level of fixed-to-mobile substitution." [EC 2008]

¹⁴ "The significant increase in demand by users for higher broadband capacity is leading Internet Service Providers and telecommunication operators to place emphasis on how to meet the requirements for network capacity. In the last 20 years the focus was on using fibre in the backbone part of the network, up to the local Main Distribution Frames. In the coming years the focus will be on bringing fibre ever closer to the end-user in order to be able to deliver the desired bandwidth. For the period 2010-2020 speeds of 50 Mbit/s downstream and 10 Mbit/s upstream may be required to enable the parallel consumption of services (HDTV, radio, videoconferencing, security etc.) over the network. These speeds are significantly higher than the current OECD definition of broadband at 256 kbit/s, but are necessary to allow the end-user to enjoy a full range of services in parallel and to allow competition between the providers of these services over the network", see [OECD 2008] p. 4

- **Uncertainty on the demand side** – given the long timeframes for development and uncertainty of occupancy, the demand side is hard to assess by the telecommunications operators. This implies that neither developers nor telecommunications operators can easily justify an investment based on a business plan which has a very large number of parameters which are unknown or hard to estimate.
- **Uncertainty on the supply side** – technological development in state-of-the-art telecommunications infrastructure will lead to falling equipment prices. Therefore for economical reasons, operators will delay investment as long as possible in order to take advantage of technological advances.
- **Regulatory uncertainty** – investors might be required by the regulator to open up infrastructure to competition later on, which will make business cases uncertain. Especially for Batelco the situation is complex due to the fact that the determination of their significant market power in certain retail markets and the determination of dominance in wholesale markets currently covers the whole Kingdom of Bahrain (with the exception of Amwaj Island).
- **Connections to new developments** – Telecommunications infrastructure and services in new developments have to be regarded in context with the connection to the backbone network. Today the incumbent telecommunications operator Batelco is the only backbone provider. Investors have the choice to roll-out their own infrastructure or to acquire wholesale products from Batelco. Both alternatives are considered time consuming and expensive.
- **Management of expectations** – In our discussions and interviews we have also found out, that developers' and operators' expectations are not always in line. Developers sometimes deal with the topic of telecommunications too late and expect operators to line up for the deployment of networks which is not the case any longer because the market has been liberalized and a competitive environment implies uncertainties whether substantial investments in such networks will generate the required return. Sometimes, therefore, no operator is willing to invest into a new development. Operators expect exclusivity in return for investment. The TRA and the government rely on competition and state-of-the-art infrastructure in order to attract foreign investment.

We conclude that a number of obstacles exist, which limit the investment in state-of-the-art telecommunications networks and services.

3 The international comparison

3.1 Regulatory benchmark

To find ideas for these market considerations and their regulatory treatment, a benchmark has been conducted in order to find a comparable environment. The countries which have been evaluated were Hong Kong, United Arab Emirates and France. The legal background is somewhat different in the respective countries, but the issue of

telecommunications services within private developments is in general either addressed via the rules regarding rights of way, access provision, or licence conditions. In addition, the possibility of addressing these issues within the framework of universal services can also be considered. In all of these three countries, the possibility of using private lands for telecommunications purposes is laid down in the respective telecommunications laws. However, the extent to which these kinds of general provisions are applied or detailed in more elaborate provisions varies greatly.

In summary, the benchmark shows that there is no fully-developed regulatory approach and treatment of new property developments that could easily be adapted to Bahrain although policies have been developed to overcome potential and real obstacles to investment. There is no such thing as a template regulation of new property developments, but rather that regulation has to be tailored to the local/national situation. On the one hand, this is due to the fact that the most comparable country in terms of large new property developments, the UAE, indeed faces similar problems, but the national regulator has not taken action so far, and developers are keen to receive some answers, as they are in a similar situation to Bahrain. On the other hand, the other two benchmarked countries, France and Hong Kong, both do have certain regulatory elements which deliver insights, but neither has a conceptual overall regulatory solution which could be adopted in Bahrain. The results from France e.g. show the importance of regulation but not how to facilitate customer choice on the one hand, or how to stimulate competition or create incentives for investments by the operators on the other hand.

This is the case in Hong Kong, which has had comparable regulation, especially with regard to in-house cabling, in place for several years. This is also true for the other issues which were researched during the benchmark: the imposition of universal service obligations may – in theory – be an appropriate tool, as may licence amendments. However, in none of the countries researched (nor in other countries as far as the authors are aware) was a tool of this kind used in practice to solve a problem comparable to the issue of regulating new property developments. However, the extensive regulation in Hong Kong may deliver a template in case a regulator decides to issue a comparable set of guidelines and codes of practice. On the other hand, the regulation in Hong Kong exhibits a great degree of detail, and therefore would increase the resources required in order to deal with the issue.

In fall 2008 the European Commission has issued a draft recommendation on the Regulated Access to Next Generation Access Networks (NGA). The Commission emphasises that Broadband is a key Community objective for the further development of the European economy and there is therefore a need to make the transition to fibre-based access networks in an efficient but timely manner. The incentives for investment are addressed by including a risk premium when calculating the cost of access to new infrastructure elements. The remedies in markets 4 and 5 are enhanced regarding access to NGA. Although the European Commission recognises the role of network infrastructure competition it also concedes that technological or economic feasibility may limit the extent to which such duplication is possible. This draft recommendation extends the current regulatory approach to NGA. It is an open question if it would provide sufficient incentives for investment in the Case of Bahrain, where in new developments no infrastructure exists.

3.2 Technical environment in the international context

Various international studies show that the advancement of telecommunications goes hand in hand with economic growth. Many countries are considering the funding of national backbone networks and fibre based access networks in order to gain a competitive advantage. For this case study we have evaluated, how state-of-the-art telecommunications infrastructure and services would have to look like. We conclude that the opportunity to install fibre based access networks in new developments must not be missed. The risk for the economic future of Bahrain associated with inadequate telecommunications infrastructure seem to be simply too big.

International examples are:

- **Singapore's** Next Generation National Infocomm Infrastructure (NGN II) comprises the ultra high-speed Next Generation National Broadband Network (NBN) and the pervasive Wireless Broadband Network (WBN). Next Gen NBN will be capable of ultra high speeds of symmetric 1 Gbit/s or more, with initial provisioning of 100 Mbit/s.
- **The New Zealand's Institute's** recommendation is that the New Zealand government move rapidly to create a new regulatory and funding model for rapid roll-out of fibre infrastructure. This proposal includes granting a local monopoly for the provision of fibre networks with obligations to connect 75% of the population within 10 years and to operate the network as an open access platform granting open and equal access to all who request such access. This would ensure a "neutral" basis for service competition. This shows how important it is to achieve the basis for a network by investment by one party to deploy the basic network.
- The example of **Aurora in Australia** can be used as a reference for the fact that a duct infrastructure – even at zero cost – might not be sufficient to attract state-of-the-art telecommunications infrastructure.¹⁵ In the case of Aurora, state and local government together with a developer have developed a model which makes FTTH services available on a widespread basis. The capital costs of the FTTH infrastructure are borne by the local government and the developer in a ratio of 2:1. The operator gains exclusivity for three years and has to offer wholesale services afterwards. This project reflects the reality that it might require a contribution from the developer to procure an advanced services and infrastructure solution.
- Some local governments are also directly investing in local access networks. They use a range of models: provide dark fibre, form public private partnerships to offer services over these facilities or in some cases become full service providers. The typical example of an open access municipal network is Stokab, a dark fibre provider in **Stockholm** owned by the municipality. Stokab was founded in 1994

¹⁵ Aurora case study.

and has the mandate to provide dark fibre and lease it to operators at cost-oriented prices.

These international case studies and publications raise the question of whether it would be economically the best situation for new property developments if the developer/owner were to undertake the commitment that it undertakes with regard to roads, power and water supply, and also invest in the telecommunication infrastructure. In many cases, fibre optic cables are a critical component in the next generation infrastructure, because fibre optic cables are long-lived and costly to install¹⁶. Due to the high and largely sunk costs of these fibre facilities, and the very high transmission rates that they support, it may be desirable for multiple service providers to share access to local fibre facilities¹⁷.

4 Operational models

Based on these international insights we analysed the current situation in the Bahraini market in regard to the deployment of telecom services for the new developments and derived several "operational models". The different functions relate to the extent of the activity of either the developer and/or the telecom operator in the value chain. The different coverage of the value chain by either developer or telecom operator leads to different operational models and to specific regulatory issues for each of the models. The models can be described by looking at who is responsible for supplying the different elements of the value chain, i.e.

- corridors
- ducts (in the case of fixed networks) or space (with respect to mobile networks)¹⁸
- the physical transmission medium (for example fibre)
- active elements
- network operation
- service provision

The spectrum of existing models reaches from developers taking care of telecommunications infrastructure and services to developers just providing rights of way for telecom operators to deploy cables and other network elements (Figure 2).

¹⁶ Lehr, Sirbu, Gillett, 2005.

¹⁷ Lehr, Sirbu, Gillett, 2005.

¹⁸ As stated above. international comparative studies show that 60 to 80 % of the cost for the telecommunications infrastructure can be attributed to the establishment of ducts and passive components. See e.g.

OECD: Public rights of way for fibre deployment to the home, April 2008
EURESCOM P1651: Fibre in Access Network Greenfield Scenarios, 2007;
Banerjee, Sirbu 2005: Towards Technologically and Competitively Neutral Fiber to the Home (FTTH) Infrastructure;

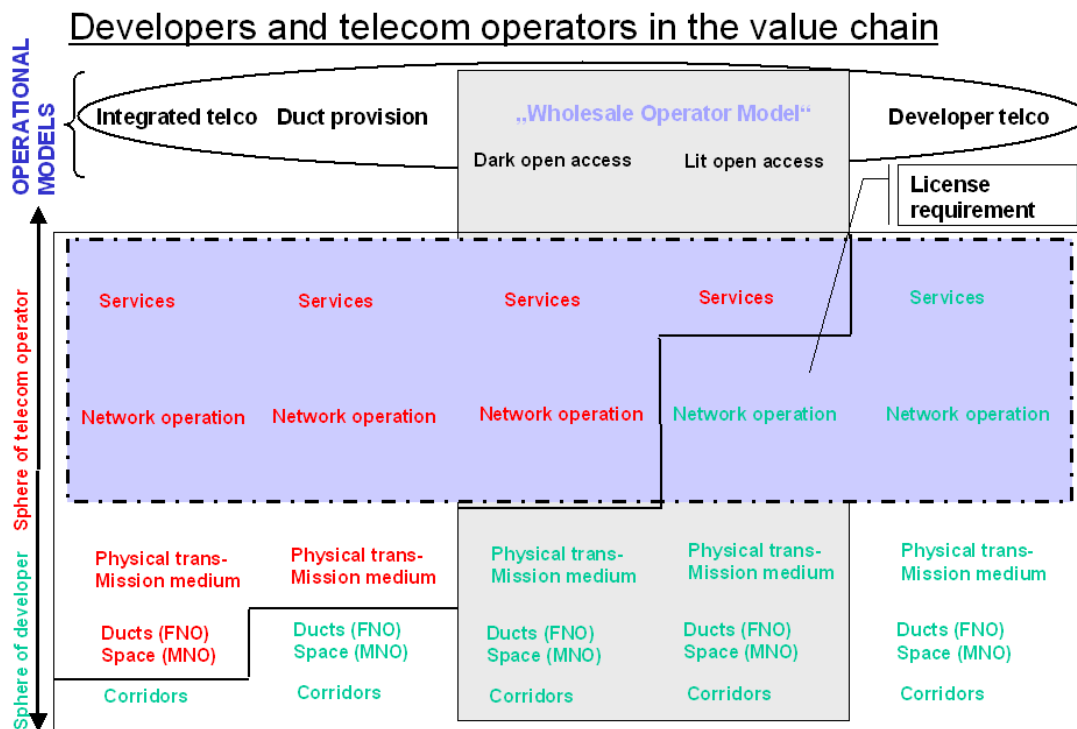


Figure 2: operational models

This led us to a classification of the following operational models:

- **Integrated Telco** – In this model, the involvement of the developer is minimal and only consists of making corridors available for operators to install the required telecommunications infrastructure, including all passive elements. In such an environment, it would in theory be possible to have several independent infrastructures, which would all start from scratch without any historic burden. However, it is doubtful if replication of an integrated network will be economically feasible. There is a significant risk that no infrastructure will be built prior to demand. Despite the openness of this model for infrastructure competition, it runs a high risk of meeting neither the goal of state-of-the-art telecommunications infrastructure nor competition or choice for consumers.
- **Duct provision** – The developer moves further down the value chain in this approach by also laying the ducts so that telecom operators are relieved from a major part of the capital expenditure relating to the digging and laying of physical infrastructure. The costs of ducting is shared between operators and therefore less investment is required. Comparing the duct provision model to the integrated telco model it is obvious that this risk that a viable business case cannot be justified is much lower in the duct provision model due to the larger share of investment undertaken by the developer. In such a model there needs to be, in addition to general technical guidelines, rules for joint use of ducts (including issues of spare capacity and the coordination process) on non-discriminatory, reasonable and fair terms.
- **Wholesale model based on home-run fibre (dark open access)** – Investment by the developer is greater than in the previous models, and now also covers the physical transmission medium (cable). From a technical point of view a fibre access network

can be built as passive optical network, active star or point-to-point home-run fibre.¹⁹ In this model home-run fibre is offered "dark" and thus outside the area of licences required by the Telecommunications Law. Regarding likely regulatory treatment, we believe that a regulator needs to get involved in developing rules for sharing fibre infrastructure on fair, reasonable and non-discriminatory terms. Comparable wholesale products in the copper environment are unbundling and access to distribution points.

- **Wholesale model based on lit open access (lit open access)** – Compared to the dark open access model, the developer can go further and also get involved in network provision, meaning that he operates the network (and may enter the sphere of licensed activities according to the Telecommunications Law). Solutions with lit open access can also involve home-run fibre but also hybrid-fibre copper networks. The connection of a service provider requires less investment as in the previous case. Wholesale products will be bitstream access as well as access to distribution points.
- **Developer telco** – In this most extreme model, the developer also enters the value chain element of service provision. Any specific feature of a network operator is thus no longer in place, the developer has complete control over all functions of a network operator, and is therefore called "developer telco". In this model, the degree of competition achieved is zero. The protection of consumers may require the involvement of the regulator and therefore it does not seem to be a viable option, especially if it involves any kind of exclusivity. Since competition at the infrastructure level is non-existent, we consider this model in itself to be a market failure.

We have found examples for all these operational models in Bahrain. It should also be noted, that as an option developers might provide wholesale and retail services, in which case a possible price squeeze should be watched by the regulator. The dilemma seems to be that there is a strong probability that higher-speed broadband will be crucial in order to maintain competitiveness. However there is, as yet, no clear commercial model for widespread network deployment in new developments.

For the regulator, this poses a significant problem: On the one hand mandatory duct access might be regarded as sufficient to alleviate telecom operators from a significant part of the investment. On the other hand there remains a risk that still no telecom operator undertakes the investment. Developers in one project have gone as far as installing GPON and active components to attract a sufficient number of service providers.

These findings imply that facility-based competition is uncertain given demand and other risks. Developers who are building these new property developments have an important role and responsibility in this respect. They can mitigate the risks associated with the deployment of networks at minimal incremental cost and thereby contribute to the value of the development and help to overcome obstacles. Developers are well-placed to take on the additional costs to lower the barriers for complementary investment by telecom

¹⁹ For a description and comparison of these deployment models see Banerjee, Sirbu (2005).

operators. This can also be justified by the fact that developers are also the ones to gain from the increased value of the developments.

The main question is, what regulatory measures are required in order to achieve the deepest possible level of infrastructure competition while maintaining the goals of competition and state-of-the-art telecommunications infrastructure and services.

5 Recommendations for a regulatory environment

This section of the paper describes some recommendations for a regulatory environment to fulfil the goals described above. In general the telecommunications law provides all instruments to deal with the problem at hand. From the findings as aforementioned we have derived the following:

- Of course, the regulatory authority should only intervene in case of market failure.
- The provision of wireless services has to be assured so that the customers have at least the possibility of using this communications service. The regulatory authority should enforce the corresponding use of private property for mobile facilities.
- Developments at which the passive infrastructure (at least ducts) is already in place when a regulatory policy is adopted in respect to new developments require that a regulator works out a special solution because the policy outlined here may not cover the specifics of the investment already undertaken and the business model the investor relies upon. Whereas the previous statement refers to fixed networks, these developments should be under the obligation to grant the use of private property for mobile networks and to ensure fixed line connections to the mobile network infrastructure (such as base stations) at competitive rates. Retail rates may be subject to ex post tariff regulation in case market failure prompts the regulator to investigate a geographical market and apply the relevant provisions of the Telecommunications Law. The law gives the regulatory authority the possibility to take action against practices which restrict competition. This may be especially applicable in case a developer/owner signs a contract with one operator granting exclusivity.
- For new developments, the regulatory authority should implement a symmetrical open access policy. Open access should be implemented at the layer where monopoly-like behaviour (only one infrastructure is deemed economically feasible) is observed. Additionally, the open access policy is supported by duct access obligations.
- In case symmetrical open access policy is insufficient in terms of competition and consumer choice, the regulatory authority will have to undertake an analysis of competition conditions and to consider appropriate remedies.
- Considering the consequence that such an open access policy may lead to a refusal by the operators to deploy their networks in new developments, the regulator or other authorities have to encourage the developers/owners to deploy the telecommunication infrastructure at their own expense and to have it operated by a third party, providing open access to all interested parties. The developers are the ones which have the

easiest way of recouping the necessary investments (as they do with their investment in power, water, streets etc.) by adding a corresponding surcharge to the purchase prices.

- The policies described above may be accompanied by additional regulations, such as obligations to publish a reference offer, technical rules, etc.

These recommendations do not require a change of law. In addition to these measures there are some specific regulatory measures which are more of an option for future developments after the legal framework in Bahrain has been amended correspondingly:

- Access obligations are limited to licensed operator which are in a dominant position. As long as a network on such a new development is not seen as a separate network or the operator is not seen as a public telecommunications operator, there would be no possibility to gain access to this network by another operator based on the interconnection obligations. In that respect an amelioration of Section 57 (e) of the Bahrain Telecommunications Law should be considered after which not only dominant operators, but all operators would be obliged to offer access. This would prevent defining each new development as single market with a corresponding SMP. In other countries there is quite often an access obligation for operators running an access network. This is based on the idea that not only the customers' range of choice is improved by that (especially in case carrier selection is provided for) but that end-to-end-connectivity between networks is also promoted. Quite often such access networks (e.g. mobile networks) are result in a structural monopoly. If so, it would generally be possible to deal with such access networks under the rules for dominant operators. A change in the law, making it possible to impose access obligations without determining dominance, would be more transparent and more reliable.
- Another option to be considered in the future might be a change to the public law applicable to developers/real estate owners. Considering the fact that developers/owners are paying for roads, water and power supply infrastructure, this could be amended for telecommunications infrastructure. One possibility, of course, would be to introduce a corresponding obligation in the applicable construction or building laws. Another possibility would be to add a corresponding requirement for the issuance of a building permit. This is an option that is being further explored in France. Very recently – after the completion of the benchmark – it was announced that France is considering amending its construction laws to force owners and developers to ensure that new structures (apartment buildings with more than 25 units) are being equipped with a broadband connection / access.
- A further idea might be to require all network infrastructure providers who have established a network on a new development to offer wholesale services and to allow for service competition. SMP obligations applicable to one of the potential operators should not result in a bias; one could instead make the obligations for such infrastructure providers identical. There is, however, no legal provision to support this policy and this might require introducing licence amendments which permit the regulator to levy obligations upon all licensees in regard to interoperability,

interconnection or wholesale access, for instance, provided that such amendments are possible pursuant to the Telecommunications Law.

6 Conclusion

Given the huge investment in new property developments, infrastructure-based competition should turn out to be the rule. One would expect fibre to every home, abundant bandwidth, smart cities and telecommunications operators lining up in order to provide these enhanced services. As markets are being transformed to competition, however, our study has revealed a number of obstacles for investment in state-of-the-art telecommunications infrastructure and services and pointed out regulatory measures required.

Our study shows that incentives for investment and competition are conflicting goals, since the incentives for investment are highest under a monopoly-like situation. In several situations operators have argued for some kind of exclusivity as reward for investment. This implies that any regulatory framework will need to strike the right balance between incentivising efficient investment and ensuring sustainable competition.

Our study shows that the market left to its own is likely to foreclose competition by granting exclusivity to one operator on the one hand or not develop state-of-the-art infrastructure on the other hand. The Telecommunications Regulatory Authority needs to make use of the regulatory instruments in order to balance incentives for investment with the emergence of a healthy competitive environment in state-of-the-art telecommunications.

The environment in Bahrain can be compared to the need to replace fixed access infrastructure worldwide. The roll-out of NGA especially in rural areas compares to new developments, because the existing copper infrastructure is not adequate to fulfil demand in future broadband services. Therefore politicians and NRAs face the difficult task to incentivise investment in state-of-art-infrastructure. Regulatory holidays have been discussed in Germany as a means to allow a first mover advantage. This can be compared to granting some kind of exclusivity.

Exclusivity is clearly an unwanted development. The operational models in Bahrain point out to a model where investment can be distributed to other players which also benefit from the roll-out of state-of-the-art telecommunications infrastructure. In the case of Bahrain these are the developers/owner, however, in an international perspective, it could also be communities, utility companies or the government.

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