KEYS TO ASSESSING AN OPPORTUNITY AND BUILDING AN EXCELLENT FTTX BUSINESS CASE

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INTRODUCTION

✧ This content is part of the slides shown at the FTTH Council Conference in Milan.

✧ I have added a few more slides on who we are and **moved that section to the start for clarity**. Please also note that the quality is reduced in the conversion of some graphics to a reasonably sized pdf.

✧ Clearly these pages are not complete without the accompanying voiceover but, if you have any questions, please contact me...

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Thank you
What gives us the right to stand up and talk about this stuff?

WHO ARE WE?
We’re going to share learning from ...

- Helping utilities, investors, operators and smart cities in GCC and Europe with:
  - Due diligence and M&A ($100 bn of deals)
  - License bids (>30 across the team)
  - Building new businesses
  - Business recovery
  - Technology choice
  - Vendor selection processes (e.g. ~$1 bn)
  - Deployment optimisation (e.g. $3.5 bn)

- Developing business strategies and models across
  - DSL, WiMAX, fibre, 3G etc

- Launching new companies/networks/operations
  - Implemented 15,000 kms of fibre
  - Largest WiMAX order ever in EMEA
  - Two IP based operators in GCC
We’ve got content in here about business models

- Our models are among the most sophisticated, accurate and flexible in the World (according to our clients)
- This understanding helps us
  - create business opportunities that others would miss
  - avoid mistakes that others would commit
We’ll talk about lessons from implementations
We’ll share learning from launching operators across three continents in FTTX, xDSL and wireless
We’ll pass on some things we put into the Council’s business guide...

...we were very proud to be asked to contribute heavily to the FTTH Council - Europe’s Business Guide
We’ll pass on some things we know from managing telecom projects and operations…

...we even wrote the book on it!! (published in English, Chinese and Latvian)
And share some anonymous stories from our experience
The company is profitable despite the very low prices. This reflects:
- the hard work of the team
- a focus on operational excellence

...that means the company also operates with good customer satisfaction while having 2,500 subscribers per employee!

Table 1: Lowest cost/megabit by country, operator and tariff – the top 10 (PPP rates)

<table>
<thead>
<tr>
<th>Country, ISP and tariff</th>
<th>$/Mb</th>
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<tbody>
<tr>
<td>Hong Kong, HKBN, (bb Fibre Home 1000)</td>
<td>0.028</td>
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<tr>
<td>Japan, KDDI, (FTTH AU-Hikari Mansion Giga)</td>
<td>0.048</td>
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<tr>
<td>Romania, Romtelecom, (Clicknet Power)</td>
<td>0.163</td>
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<tr>
<td>Sweden, Riksunet, (Riksunet Broadband 100)</td>
<td>0.182</td>
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</table>

(Source: Point Topic www.point-topic.com/content/press/PointTopicBroadbandCostsv4.doc)
It’s highly efficient and we’ll also pass on a few thoughts about this today

A few statistics...

- 120,000 subscribers (>50% on FTTH/x)
- Retail and wholesale
- Business and residential customers
- FTTH services include residential:
  - 100 mbps symmetric
  - >$12 in some cities (profitably)
- Internet, voice and TV
- 1,500 POPs
- FTTH, xDSL and WiMAX
It’s harder to get this right than ever before

OVERVIEW
We could start at a very detailed level but we need to understand the different building blocks...
These are challenging times

So what’s important in building up a business case?
You need to build strategies and business cases using knowledge and experience gained ‘on the ground’

You need to be FAST:

You never get enough time
There may be 100 iterations and scenarios
You need to build strategies and business cases using knowledge and experience gained ‘on the ground’

You need to be ACCURATE:

If you don’t **really** know what you’re doing - errors can cost 10’s or even 100’s of millions of Euros
It’s particularly difficult as FTTH is rarely considered in isolation

How do companies commit to a network to compete with their challengers...

- 3G
- WiMAX
- LTE
- FTTX

VDSL is a valid player where...

- density is too low to do FTTH
- there is no reason to go to FTTH
Sometimes we’re in due diligence mode...

Understand customer needs
Define growth drivers
Assess business model
Validate market growth assumptions
Consider regulatory threats

Assess network design against best practice
Test technical assumptions
Consider future impact of technical choices (capex, opex)
Assess operational capacity and capability
Assess ability to execute project
Identify potential cost savings

Create new business model forecasting costs, revenues and key project indicators

Management Briefing
Data Collection
Interview Key Personnel
Formulate Target Company Hypothesis

Review environment
Review competitor strategy, positioning etc.
Consider impact of regulatory changes
Identify technology trends and impacts
Define strategic responses by competitors

Review and assess business plan
Identify issues and iterate with management
Benchmark against comparable operations

Assess ability to deliver the strategy
Review marketing plan
Identify risks and issues

Baseline starting point

Assess market opportunity
Competitor review

Assess skills and capabilities
Review business plan

Forecast business case
Evaluate corporate strategy

Summary and Recommendations
...we’re digging very deep to make sure the company/opportunity is as advertised...

...with a structured and detailed approach to evaluating the company

<table>
<thead>
<tr>
<th>WEEK</th>
<th>1</th>
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<td>Manage market survey to understand customer needs</td>
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<td>Review and validate full spectrum of potential customers</td>
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<td>Detailed interviews of key customers</td>
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<td>Understand the TARGET customer appetite for the service</td>
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<td>Integrate results of the customer survey</td>
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<td>Assess end user equipment for compatibility</td>
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<td><strong>4. Competitor review</strong></td>
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<td>Review competitor strategy, positioning etc.</td>
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<td>Interview potential competitors (as appropriate)</td>
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<td>Define strategic responses by competitors and the Target</td>
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<td>Plot market prices and market size for each phase</td>
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<td>Assess Management Team</td>
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<td><strong>6. Review Newco business plan</strong></td>
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<td>Build on existing business plan thinking to create model and plan</td>
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<td>Benchmark against comparable operations</td>
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<td><strong>7. Forecast business case</strong></td>
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<td>Assess key inputs, i.e. rental, maintenance, etc</td>
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<td>Create new business model forecasting costs, revenues and key project indicators</td>
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<td><strong>8. Evaluate corporate strategy</strong></td>
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<td>Assess ability to deliver the strategy</td>
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<td>Review and where appropriate advise on marketing plan/strategy</td>
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<td>Identify risks and issues and potential mitigants to these risks</td>
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<td><strong>9. Summary and recommendations</strong></td>
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Sometimes we’re in build a business/SBU from scratch mode...
In Dubai, one of the most sophisticated FTTX countries in the World, we assessed the costs for different technical configurations and network topologies.

You need to understand the cost trade offs of the network choices.
You need to understand the subtle differences from case to case (example of automated scenario testing)

FTTx business cases are rarely “slam dunk” so testing of sensitivity is vital for evaluating risk.

In some cases we also model the economics of the competitor(s) in order to validate what a rational competitor might do in response to client strategy.

This fictional example inspired by a real case shows different availability & competition scenarios (defined on the left) and resulting peak funding (PFR) and rate of return (IRR) and also takes into account the cross-impacts on mobile broadband.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Availability in yr xxxx</th>
<th>Incumbent PFR</th>
<th>Alt 1 PFR</th>
<th>Mob 2-x PFR</th>
<th>Incumbent IRR</th>
<th>Alt 1 IRR</th>
<th>Mob 2-x IRR</th>
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<tbody>
<tr>
<td>Variant 1</td>
<td></td>
<td>101 60% 2% 70% 20%</td>
<td>-2.1</td>
<td>-1.0</td>
<td>-0.8</td>
<td>10%</td>
<td>9%</td>
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<td></td>
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<td>102 55% 2% 70% 28%</td>
<td>-1.8</td>
<td>-0.5</td>
<td>-0.9</td>
<td>10%</td>
<td>9%</td>
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<tr>
<td></td>
<td></td>
<td>103 50% 2% 70% 35%</td>
<td>-1.6</td>
<td>-0.7</td>
<td>-0.9</td>
<td>11%</td>
<td>10%</td>
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<td>104 45% 2% 70% 43%</td>
<td>-1.5</td>
<td>-0.5</td>
<td>-1.0</td>
<td>10%</td>
<td>11%</td>
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<td>105 40% 2% 70% 50%</td>
<td>-1.3</td>
<td>-0.4</td>
<td>-1.1</td>
<td>9%</td>
<td>12%</td>
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</tbody>
</table>

| Variant 2 |                         | 201 40% 15% 70% 20% | -2.4 | -1.6 | -0.8 | 4% | -5% | 4% |
|           |                         | 202 45% 17% 70% 28% | -2.3 | -1.2 | -0.9 | 2% | -5% | 5% |
|           |                         | 203 40% 19% 70% 35% | -2.1 | -1.1 | -0.9 | 1% | -6% | 7% |
|           |                         | 204 35% 20% 70% 43% | -2.0 | -0.8 | -1.0 | -1% | -7% | 8% |
|           |                         | 205 25% 22% 70% 50% | -1.8 | -0.6 | -1.1 | -3% | -7% | 9% |

| Variant 3 |                         | 301 50% 9% 90% 60% | -2.3 | -1.3 | -2.0 | 7% | 2% | 6% |
|           |                         | 302 50% 9% 88% 48% | -2.0 | -1.0 | -1.7 | 6% | 2% | 8% |
|           |                         | 303 45% 10% 85% 35% | -1.9 | -0.9 | -1.5 | 6% | 2% | 10% |
|           |                         | 304 40% 11% 83% 23% | -1.7 | -0.6 | -1.2 | 4% | 2% | 11% |
|           |                         | 305 33% 12% 80% 10% | -1.6 | -0.5 | -0.9 | 3% | 3% | 12% |
Sometimes we’re in recovery mode – identifying the high impact issues and/or areas for improvement in the business...
...finding the real problems within the business..
...and then prioritising the ones that can be tackled now..
You need to understand that you lose as well as win with fibre deployments

Ishikawa Diagram - NPV of 2014-2019 Cashflows for FTTH of an Incumbent Ventura Client (numbers broadly representative but disguised)
## Sessions outline

<table>
<thead>
<tr>
<th>TIME</th>
<th>SECTION</th>
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</thead>
<tbody>
<tr>
<td>13:00-14:30</td>
<td><strong>The Strategy of Fibre</strong></td>
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<tr>
<td></td>
<td>Why Fibre is Important</td>
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<td>High Level Success Indicators and Benchmarks</td>
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<td>FTTH in the Telecoms Ecosystem</td>
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<td>Understanding the Opportunity</td>
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<td>What is the impact of competition, maturity etc.</td>
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<td>Why you can't deploy everywhere - and how you decide!</td>
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<td>14:30-15:00</td>
<td>Coffee Break</td>
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<td>15:00-16:30</td>
<td><strong>Session 2</strong></td>
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<td>Understanding the Opportunity - continued</td>
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<td>Deployment Secrets of Capex and Opex - calculating and saving money</td>
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<td>Getting Pricing, Marketing and Services Right</td>
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<td>Calculating market share - and why people are getting this badly wrong</td>
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<td>Why some fibre businesses are under-performing</td>
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<td>What you do about this</td>
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<td>16:30-16:45</td>
<td><strong>Coffee Break</strong></td>
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<tr>
<td>16:45-18:00</td>
<td>Why some fibre businesses are under-performing - continued</td>
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</table>
Why fibre is important

THE STRATEGY OF FIBRE
The economic benefits of basic broadband are statistically proven as well as being obvious to the public and to politicians. The question is no longer about basic broadband but about the delivery of super-fast broadband and future proofing networks, economies and even countries.

Source: Ventura Team / Ovum joint research, 2010
Cable/fibre stocks have been most robust during recent turbulence and are now highest rated on average.
Consumer demand for faster broadband is healthy...and GROWING FAST

- Nielsen’s law for bandwidth is analogous to Moore’s Law for silicon
- Defined several years ago but our study of historical data for several European countries suggests that it provides a good guide to what is happening
- Spain and UK just behind N curve – other countries are ahead

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<th>CAGR</th>
<th>Compound over 10 years</th>
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<tr>
<td>Nielsen</td>
<td>50%</td>
<td>57x</td>
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<td>Moore</td>
<td>60%</td>
<td>100x</td>
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Source: Ventura study for FTTH Council Europe
... and with FTTx we do already see higher traffic per home.

Our 2007 study of traffic on FTTH networks in Europe showed that:

- Fibre customers generate 3-4 times the traffic of xDSL homes.
- Filesharing is a large traffic generator but does not account for all the difference.
And the world of gigabit services is already with us...

Fastest advertised broadband speeds, using fibre, Kbit/s, Oct 2009

- Slovak Republic
- Portugal
- Japan
- Turkey
- Sweden
- Korea
- Iceland
- France
- Finland
- Austria
- Australia
- Netherlands
- United States
- Norway
- Denmark
- Italy

PT and SK to 1,000 Mbit/s (1 Gbit/s)
... but there is no universal “killer app” ...

1968 video phone advert.

In the ‘00ies the mobile industry partly justified huge investments in 3G on video calling – with equal success!
Larger file transfers will be driven further upwards by increasing TV resolutions etc.

http://www.w3schools.com/browsers/browsers_display.asp

Source: Ventura Team derived from Wikipedia data
Maybe you thought HD was a problem for networks...then along came 3D

3D TV Quality of Experience and Resolution Increasing Over Time

- **2009 - 2010: Half resolution based distribution**
  - Bit rate range: 6 to 8 Mbps (MPEG-4 AVC)

- **2011 - 2012: Full HD resolution per eye based distribution**
  - Bit rate range: 10 to 14 Mbps (MPEG-4 MVC)

- **2012 - 2013: 1080p60 per eye based distribution**
  - Bit rate range: 20 to 24 Mbps (MPEG-4 MVC)
  - Beginning of depth map based distribution to save bandwidth

Source: Motorola
... then along comes Ultra HD TV with 16 times the resolution of HDTV
It doesn’t matter where you start...

... every country will need as much fibre as they can afford in the end!
...and where fibre is competitive on price – it kills DSL

Where fibre is available at comparable prices, it will displace xDSL and WiMAX as the preferred home technology

A number of FTTx projects have taken 70% or more share of homes passed

These cases have benefitted from one or more of the following factors:

- 30%+ bundle price discount
- Killer content
- Great demographics and strong desire for true broadband
- High dissatisfaction with existing providers
- Local loyalty
How do the market conditions look as you go east across Europe towards the Gulf?

<table>
<thead>
<tr>
<th>Market</th>
<th>EUROPE</th>
<th>GULF</th>
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</thead>
<tbody>
<tr>
<td>Broadband Penetration</td>
<td>Medium to High</td>
<td>Low</td>
</tr>
<tr>
<td>Prices</td>
<td>Medium to Low</td>
<td>High</td>
</tr>
<tr>
<td>DSL Speeds</td>
<td>High (&lt;=20meg)</td>
<td>Low (2 – 4meg)</td>
</tr>
<tr>
<td>Copper Distances (Exchange to Homes)</td>
<td>Medium - Low</td>
<td>High</td>
</tr>
<tr>
<td>Copper Quality</td>
<td>Mainly Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Fibre/Cable Competition</td>
<td>Common</td>
<td>Very Little</td>
</tr>
<tr>
<td>Customer Expectation (of broadband speed)</td>
<td>High</td>
<td>Low</td>
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</table>
How does the competition from other technologies look?

<table>
<thead>
<tr>
<th>Technology</th>
<th>EUROPE</th>
<th>GULF</th>
</tr>
</thead>
<tbody>
<tr>
<td>3G+</td>
<td>Used in addition to fixed services at home/office</td>
<td>High uptake – filling in gaps in DSL coverage or where DSL speed/quality is poor</td>
</tr>
<tr>
<td>WiMAX/LTE</td>
<td>Niche competitor</td>
<td>Fast rollout competitor to DSL with advantages on area covered and deployment speed</td>
</tr>
<tr>
<td>DSL</td>
<td>Strong competitor – often in 8 – 20 meg speed range</td>
<td>Weak competitor – low speeds, poor quality</td>
</tr>
<tr>
<td>Fibre</td>
<td>Ultimate fixed technology</td>
<td>Will be the killer fixed technology but only sporadic coverage in region</td>
</tr>
</tbody>
</table>
There will be significant changes during the next 15 years...

All OECD households will ultimately be un-wired or re-wired at a tremendous cost

- Fibre will co-exist with moderate bandwidth wireless solutions
- Twisted copper wires as a telecommunications services access technology will be reduced to a fringe technology

Over the next 15 years we believe that:

- FTTx will become the dominant access technology for delivery of a vast array of broadband enabled services
- Wireless technologies will compete on mobility but not on speed versus fibre
- There will be some uncertainty in regulation at first but frameworks are already stabilising in some markets and eventually we expect fairly standard EU and ME FTTH models to emerge
- The fibre industry will follow a similar path to the cable TV industry in terms of local, fragmented suppliers consolidating into national and international players
Failure to build out fibre now means it may never be deployed to the home

- If countries delay deployment of fibre, the risk is that other limited broadband services (e.g. WiMAX, LTE, HSDPA, ADSL) may discourage future investment in fibre.

- If fibre is considered in the future, the market may be saturated with relatively slow broadband services which may persuade an operator that there is not enough available market to make a fibre rollout worthwhile.

If a network does not cover enough customers a fibre rollout cannot get the Capex down to a level that will make a return for the investor.

AnalyssMason for BSG

Deployment costs per premises connected (GBP)
IS THERE ANY REAL OPPORTUNITY?

High Level Indicators and Benchmarks
What’s important in an FTTH project?

There are some simple questions. E.g. where does your project fit against these criteria?

<table>
<thead>
<tr>
<th>Market Size</th>
<th>&lt;2000 homes to pass</th>
<th>2000 - 5000 homes to pass</th>
<th>5000 - 20000 homes to pass</th>
<th>20000 - 50000 homes to pass</th>
<th>&gt;50000 homes to pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Density</td>
<td>Individual houses in low density developments</td>
<td>Few or no blocks but dense homes with grass verge or other low cost</td>
<td>Mixed high density houses / apartment blocks</td>
<td>Mainly apartment blocks - &gt;16 homes per block</td>
<td>New build apartments or high density homes</td>
</tr>
</tbody>
</table>

We have built a simple model to help potential entrants consider a project
- providing encouragement for good projects
- identifying areas likely to require attention

Model built for the FTTH Council Europe
Consider the opportunity...

<table>
<thead>
<tr>
<th>Market Size</th>
<th>&lt;2000 homes to pass</th>
<th>2000 - 5000 homes to pass</th>
<th>5000 - 20000 homes to pass</th>
<th>20000 - 50000 homes to pass</th>
<th>&gt;50000 homes to pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition</td>
<td>Established FTTH or upgraded &amp; effective cable TV, Dominant sat TV provider</td>
<td>Well financed and agile cable/ VDSL/FTTH competitor(s)</td>
<td>Cable TV not upgraded, unbundlers, moderately strong sat TV</td>
<td>High growth in broadband, Untapped potential in TV</td>
<td>Little broadband, Major problems with supply</td>
</tr>
<tr>
<td>Market Maturity</td>
<td>Saturated with existing FTTH true broadband</td>
<td>Slow sales of existing 20 Mbit/s or HDTV offers</td>
<td>Rapid evolution of products and fierce price competition</td>
<td>Early growth in mass market phase</td>
<td>High prices for slow speeds</td>
</tr>
<tr>
<td>Management Team</td>
<td>No team and poor proposition to potential recruits</td>
<td>No team or weak team, Major uncertainties re recruitment proposition</td>
<td>Team(s) identified &amp; good proposition to them tested and viable</td>
<td>Leader in place with ability to manage build/run transition</td>
<td>Team proven in similar project &amp; highly committed to this project</td>
</tr>
<tr>
<td>Channels or Existing Customer Base</td>
<td>No presence</td>
<td>Channels or partnerships - eg with housing associations</td>
<td>Relevant and good relationship with target market</td>
<td>Providing telecom services to target market already</td>
<td>Already loved as a telecom provider</td>
</tr>
</tbody>
</table>
...then consider your ability to execute

<table>
<thead>
<tr>
<th>Complexity of Services</th>
<th>Access to Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Systems</td>
<td>Construction Method</td>
</tr>
<tr>
<td>Management Team</td>
<td>Building Density</td>
</tr>
<tr>
<td>Access to Home</td>
<td>Ease of Deployment</td>
</tr>
</tbody>
</table>

### Access to Capital
- Insufficient finance. >14% WACC.
- Mainly Dug - high quality pavements
- Few or no blocks but dense homes with grass verge or other low cost
- No right to build and hostile authorities
- Costs 12 or more months revenue.
- Technology driven.
- Paying 3rd party for bespoke build
- >25% added to fixed costs

### Construction Methodology
- Confident of revenues and build to budget
- Some ducts available
- Mixed high density houses / apartment blocks
- Rights slow to obtain. Shortage of skilled contractors
- Costs 9 or months revenue
- Lacking clear leadership
- Build from scratch
- No wholesale. Fixed costs add >15% to fixed costs

### Building Density
- Can finance viable scale
- Extensive duct network owned or leaseable
- Mainly apartment blocks - >16 homes per block
- Reasonable rights to build. Moderate difficulties
- Access to existing ducts/fibres with existing right of access
- Experienced in 3 play. Can manage build-operate transition
- Multiple product variants & pricing across multiple services

### Ease of Deployment
- ~10% WACC
- Aerial cable rights secured
- New build apartments or high density homes
- No material obstacles to deployment
- Contractors bear construction risk
- Customers keen to pay access costs

### Access to the Home
- ~8% WACC
- WACC <8%. Grants. Shareholder guarantees.
- Mainly apartment blocks - >16 homes per block
- Good generalists
- Experienced in all functions & good commercially focussed leader
- Wholesale available for all main services
- Broadband only viable in the market

### Management Team
- Strong experience in all functions & good commercially focussed leader
- Established and proven system
- Established and proven system

### IT Systems
- Established and proven system
- Established and proven system
- Ready made over web

### Competitive Offerings
- Wholesale available for all main services
- Broadband only viable in the market
- Established and proven system
The Ventura Team opportunity dashboard

- Plots inputs against various criteria
- No definitive rules but caution advised if:
  - zero greens
  - 2 or more reds on either dashboard
- Detailed explanation of each criteria provided in a freely available report

Critical Issues
Significant risk and ‘red flag’ for the project

Concerns
Manageable but of concern

Okay
Good or encouraging position
<table>
<thead>
<tr>
<th><strong>CRITERIA FOR TARGETED AREA</strong></th>
<th>&lt;10</th>
<th>10 - 20</th>
<th>20 - 50</th>
<th>50 – 100</th>
<th>&gt;100</th>
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</thead>
<tbody>
<tr>
<td><strong>Price for BB ($) - monthly</strong></td>
<td></td>
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</tr>
<tr>
<td>Subscriber Target</td>
<td>&lt;5k</td>
<td>5k – 20k</td>
<td>20k – 50k</td>
<td>50k – 100k</td>
<td>&gt;100k</td>
</tr>
<tr>
<td><strong>Current/Planned Technologies</strong></td>
<td>Existing fibre or fast cable</td>
<td>Some fibre and/or significant VDSL</td>
<td>Good DSL</td>
<td>WiMAX and ‘bad DSL’</td>
<td>‘Bad DSL’ and 3G</td>
</tr>
<tr>
<td>Density of Housing</td>
<td>&lt;10% in apartments</td>
<td>10 – 25% in apartments</td>
<td>25 – 50% in apartments</td>
<td>&gt;80% medium apartment blocks</td>
<td>&gt;80% large apartment block</td>
</tr>
<tr>
<td>Routing fibre</td>
<td>No ducts and high cost to dig</td>
<td>No/low ducts and high dig costs</td>
<td>Some ducts and/or medium cost digging</td>
<td>Good duct access and low dig costs</td>
<td>High percentage of ducts available</td>
</tr>
<tr>
<td>TV</td>
<td>High satellite/cable penetration + piracy + content laws</td>
<td>High satellite/cable penetration + piracy</td>
<td>15 - 50% satellite/cable penetration</td>
<td>&lt;15% satellite/cable penetration</td>
<td>Very low satellite penetration</td>
</tr>
</tbody>
</table>
UNDERSTANDING THE OPPORTUNITY

How will competition, market maturity etc. impact the business?
When you’re trying to establish market estimates you need to consider the overall economic position

- There is potential for growth of telecom spending per head where:
  - Spending is lower than other countries in the region
  - Typical benchmarks of telecom spend compared to GDP would suggest $400 – 600 per annum as being more typical for a country such as Oman

  ![Graph showing telecom spending per capita and total telecom spending for different countries](source: World Factbook)

- Classic wisdom about the percentages of GDP spent on telecoms do not work in countries where other entertainments are limited
  - So these countries are likely to exceed this type of benchmark
The speeds in the market will evolve over time – good news for fibre - not good news for xDSL/WiMAX!

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But how fast can WiMAX go really?

- How many customers can share roughly 40 meg of bandwidth and have a good service?
- If your IP transit costs are high then how can you afford to let users have a high speed service?

How fast can ADSL really go?

- 28 meg service (non standard) in France

How fast can VDSL go?

- Phantom mode, vectoring etc. will play their part but so will....
...terrible quality copper from the cabinet
The speeds in the market will evolve over time – good news for fibre - not good news for xDSL/WiMAX!

If you had a 2 megabit/s service on WiMAX in 2007 you might have covered 99% of the speed range of current users

- By 2011 that might only be 80%
- By 2015 that might be as low as 25%

How are you going to compete when your service is significantly slower than most other fixed services?

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</table>

A 2 mbps service is faster than, or equivalent to x% of speeds in the market.
The scarcity of good quality DSL means the speed breakdown below is not untypical*

The distribution of speeds normally has more users at the low rather than high end of usage

The shape is unlikely to change but the pattern will move right over time as speeds gradually increase

* KSA Internet Survey – Arab Advisors 2007
The fastest speeds are not the most popular

- Don’t delude yourself that all your customers will take your fastest Internet service... they won’t.
- Halo services (e.g. 1 gigabit/s) can be good for marketing purposes but may just be 2% of your subscribers.
- Look at Bahrain’s breakdown of subscribers by connection speed (right)
Time to install is still an issue

The ability to deploy services quickly (even same day for self-install) will provide a competitive edge against some current providers.

An incumbent’s time to install DSL
How do you decide where to build?

YOU CAN’T DEPLOY FTTH EVERYWHERE
You don’t cover everywhere with fibre – you need to select your target town/cities and the areas within them

- Fibre deployments are rarely suited to a complete town or city
- You are trying to find an acceptable compromise between the:
  - Cost of digging and deploying fibre
  - The number of homes and businesses that are passed
  - The continuity of the areas passed. You can’t market to one small street in one part of a city then another 5 kilometres away. Your target areas must be sufficiently large to be worth the cost and effort of marketing

- The key metrics that drive the capex will be:
  - The number of metres of fibre laid per home passed
  - The number of metres of fibre laid per subscriber
  - The cost per metre to dig the above

...the following slides show the impact of differing densities of population and some quick and dirty ways of working on the business case
Beta results from Ventura’s European country model support the view that you have to select fibre locations carefully.

GPON is a more cost effective approach than P2P especially in low density areas.

![Graph showing Passive Infrastructure CAPEX (GBP) per Home Passed by Geotype and Technology for Sweden.](image-url)
Beta results from Ventura’s European model support the view that you have to select fibre locations carefully.

Only 50%-70% homes are economic (at most)

Estimated Total CAPEX (GBP m) for Greenfield GPON in Sweden
The density of homes passed is influenced by the mix between apartments in multi-dwelling units (MDU’s) and villas

- The cost for outside plant (OSP) increases as the density of population decreases
  - Fewer apartments and more villas means more street dig to pass a potential subscriber

- In addition, the cost is influenced by:
  - Imposition of municipality specifications e.g.
    - 70 centimetre depth
    - 20 centimetre width
    - Concrete over ducts then resin
    - Need to mill one metre of road around trench and resurface
  - Depth of tarmac replacement means micro-groove networks (25 cms down) could be ripped up during road renovation
  - Rock under the ground makes cost very high for any blade based method of fibre digging

A represents the cost for a rollout in an area where 33% of people live in apartments

B represents the cost where 90% of people in an area live in apartments
You need to understand the subtle differences from case to case (example of automated scenario testing)

FTTx business cases are rarely “slam dunk” so testing of sensitivity is vital for evaluating risk.

In some cases we also model the economics of the competitor(s) in order to validate what a rational competitor might do in response to client strategy.

This fictional example inspired by a real case shows different availability & competition scenarios (defined on the left) and resulting peak funding (PFR) and rate of return (IRR) and also takes into account the cross-impacts on mobile broadband.
Finding the ratio of villas to MDU’s

- In some countries, e.g. KSA, the ratio of people living in villas to those living in apartments is known.
- To calculate the number of MDU’s you then need to estimate the average number of apartments in each MDU.

- You can do this by:
  - walking around the streets
  - looking at pictures of the different towns/cities (e.g. on Flickr, tourist sites etc)
There are three options for estimating the street lengths required:

- **GIS data**
  - Digital maps of road lengths are combined with Census data (if available) to provide figures for homes passed for a given street length.
  - This is the most accurate as you can apply it across a complete town/city then tune down the results to get the best compromise.

- **Diagrams**
  - In block style cities you can estimate a typical area by walking around streets and measuring the average road width, house front length (e.g. 20 m for a compound home in KSA), road crossing length etc.

- **Google Earth**
  - Google Earth allows you to look at sample areas in cities and assess the street length needed to pass the houses and businesses shown.

- **The homes in a given town or city should be available from Census data or from the local Ministry of Information.**
Choosing where to dig within each city is vital

- Looking at one capital city you can identify roads to pass by
  - looking for blocks of a reasonable size on maps of
  - Identifying all the homes passed on these roads
  - Calculating the distance dug compared to the homes passed
This example shows the impact of different choices of area

- 875k homes - 3860 kms
- 582k homes – 1490 kms
  - 33% homes
  - 61% fibre dig

Do you need:
  - big subscriber coverage?
  - OR
  - better profitability?

The answer will depend on how good the basic economics are. Smaller and more focussed deployments are needed if
  - competition is fierce
  - or
  - economics are poor
Using diagrams to model the local geography and restrictions!

The diagram on the right represents a block style city layout.

Villas are shown with a V and apartment blocks (MDUs) with an A.

By approximating the number of apartments per MDU you can estimate the street length needed to pass a certain number of homes.

The actual trench length can then be calculated using the 1.75 multiplier of street length (if you are digging).
Riyadh

Google Earth allows you to look at street layouts in detail to estimate road lengths in sample area.

- 2 kilometre radius
- Detail area 1
Riyadh

- Detail area 1
- Approx 260 units
Riyadh

Top right of detail area 1
Experience highlight: Roll-out schedule

Top down models

For a top down case and model a general assumption about the shape of the deployment curve suffices.

This should be developed after considering logistical issues including for new dig planning and municipal permissions which can impose long delays.

Also it is not practical to build too much of an urban area at once for three main reasons:

- Permissions
- Traffic disruption
- Availability of skilled labour and supervisors

Example: typical phasing in major urban area. Construction takes 4 years peaking in yrs 2-3.
Experience highlight: Roll-out schedule

**Bottom-up plans**

- Although we might help select technology by detailed areas, deployment and construction plans bottom-up come from the operator’s network planning department.
- These plans provide inputs to a financial model, ideally at a summary level.
- Detailed interaction is required between consultant and planner to ensure that the plans reflect the economic optimisation and that the model reflects the plans and estimated costs accurately.
Getting the important stuff right

PRICING, SERVICES
AND MARKETING
Check the telecom spending per capita against your assumptions on revenues - example Oman

There is potential for growth of telecom spending per head:

- If spending is lower than other countries in the region
- Typical benchmarks of telecom spend compared to GDP would suggest $400 – 600 per annum as being more typical for a country such as Oman

Omani GDP/capita of $19,100 in 2007 (Source: World Factbook)
Where you are will have an impact on your expectations for the business

- The opportunity is obviously higher in countries with higher ARPU’s.
- This is typical in countries that have just de-regulated

![Broadband baskets graph](source: Taiigan)
### What is your market’s ability and willingness to pay?

<table>
<thead>
<tr>
<th>Factor</th>
<th>How do we think about this factor?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordability</td>
<td>Look at spending as percentage of GDP – compare to benchmarks. Is your market under-spending or already above expected values? What is the distribution of wealth in the country? Compare prices to similar markets Do market surveys However… in some countries, the lack of alternative entertainment mean that the Internet can take further share of ‘wallet’</td>
</tr>
<tr>
<td>Competition</td>
<td>You can’t turn back time If prices for equivalent services are below your target ARPU then you won’t achieve your objectives</td>
</tr>
</tbody>
</table>
What is your market’s willingness to pay?

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Take up</td>
<td>There is a natural distribution of prices that people are willing to pay. If 80% of people would pay for a service below X then don’t expect your’s to sell at 2X</td>
</tr>
</tbody>
</table>

...this will impact the subscribers you can win and hence overall revenues
How much more are they prepared to pay for the same service?

Source: Ofcom
How much more are they prepared to pay for double the speed?
And while we’re at it... how many households have access to a PC?

Source: OECD

You may struggle to get to 90% penetration at this end of the OECD spectrum
Build the pricing model for residential (example below)

<table>
<thead>
<tr>
<th>Prod Type</th>
<th>Product name</th>
<th>Description</th>
<th>Activation</th>
<th>Line rental</th>
<th>Monthly package fee</th>
<th>Overage</th>
<th>Mix inside BB, Voice, TV</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB</td>
<td>BB all day</td>
<td>flat plan, free voice calls to NS users</td>
<td>41</td>
<td>0</td>
<td>0</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BB night</td>
<td>semi-flat plan, unlimited access in off-peak</td>
<td>12</td>
<td>10</td>
<td>0</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BB weekend</td>
<td>semi-flat plan, unlimited access over weekends</td>
<td>12</td>
<td>10</td>
<td>0</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BB pay as you go</td>
<td>Time based</td>
<td>0</td>
<td>19</td>
<td>0</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Voice</td>
<td>Voice without limits</td>
<td>Flat plan, unlimited local/national calls</td>
<td>100</td>
<td>10</td>
<td>10</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voice city</td>
<td>Flat plan, unlimited local calls</td>
<td>5</td>
<td>10</td>
<td>0</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voice pay as you go</td>
<td>Time based</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>TV</td>
<td>TV basic</td>
<td>Access to high quality (cable, STBox) free-to-air channels and limited satellite channels</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TV premium</td>
<td>Subscription to Nova type Digital TV package</td>
<td>0</td>
<td>45</td>
<td>0</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TV VoD</td>
<td>Video on Demand (movies, matches)</td>
<td>0</td>
<td>9</td>
<td>0</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TV extended basic</td>
<td>Basic + additional satellite channels</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set-top box one-off</td>
<td>One-off fee on top of activation</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set-top box monthly rent</td>
<td>Monthly fee on top of line rental and packages</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>

Initial take up of different product offerings within each category (e.g. BB)

Take up of set top boxes – rental or purchase

Associated overage estimate

Basic fee for a product option

Different product offerings
### Example business products and pricing

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Product name</th>
<th>Description</th>
<th>No of phone lines</th>
<th>No of PCs</th>
<th>Activation</th>
<th>Monthly fee</th>
<th>Overage</th>
<th>Take-up within segment</th>
<th>Average number of lines</th>
<th>Take-up within segment (model)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB + Voice</td>
<td>Netstream Office</td>
<td>unlimited BB+voice</td>
<td>1</td>
<td>&lt;=2</td>
<td>100</td>
<td>100</td>
<td>50</td>
<td>66%</td>
<td>1</td>
<td>66%</td>
</tr>
<tr>
<td>BB + Voice</td>
<td>Netstream Office pay as you go</td>
<td>pay as you go BB+voice</td>
<td>1</td>
<td>&lt;=2</td>
<td>100</td>
<td>63</td>
<td>50</td>
<td>34%</td>
<td>1</td>
<td>34%</td>
</tr>
<tr>
<td>BB + Voice</td>
<td>Netstream Small LAN</td>
<td>BB+voice</td>
<td>2</td>
<td>&lt;=5</td>
<td>300</td>
<td>360</td>
<td>170</td>
<td>100%</td>
<td>2</td>
<td>60%</td>
</tr>
<tr>
<td>BB + Voice</td>
<td>Netstream Medium LAN</td>
<td>BB+voice</td>
<td>3</td>
<td>&lt;=10</td>
<td>300</td>
<td>420</td>
<td>170</td>
<td>100%</td>
<td>3</td>
<td>40%</td>
</tr>
<tr>
<td>BB + Voice</td>
<td>Netstream Big LAN</td>
<td>BB+voice</td>
<td>&gt;3</td>
<td>&gt;10</td>
<td>500</td>
<td>5000</td>
<td>200</td>
<td>100%</td>
<td>5</td>
<td>100%</td>
</tr>
</tbody>
</table>

2 products for micro businesses (micro segment in model)

2 products for small/medium businesses (small segment in model)

Large business product
The subscribers that you acquire will relate to the homes ready to market in a year and your penetration rates.

The chart below shows the penetration over time for the homes that are passed and marketable in a year.

For example, the first row shows the homes marketable in year 1 and shows that in year 2, the penetration will be 24%.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>20%</td>
<td>24%</td>
<td>28%</td>
<td>32%</td>
<td>36%</td>
<td>40%</td>
<td>44%</td>
<td>48%</td>
<td>48%</td>
<td>48%</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>24%</td>
<td>28%</td>
<td>32%</td>
<td>36%</td>
<td>40%</td>
<td>44%</td>
<td>48%</td>
<td>48%</td>
<td>48%</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>24%</td>
<td>28%</td>
<td>32%</td>
<td>36%</td>
<td>40%</td>
<td>44%</td>
<td>48%</td>
<td>48%</td>
<td>48%</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>24%</td>
<td>28%</td>
<td>32%</td>
<td>36%</td>
<td>40%</td>
<td>44%</td>
<td>48%</td>
<td>48%</td>
<td>48%</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>24%</td>
<td>28%</td>
<td>32%</td>
<td>36%</td>
<td>40%</td>
<td>44%</td>
<td>48%</td>
<td>48%</td>
<td>48%</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>24%</td>
<td>28%</td>
<td>32%</td>
<td>36%</td>
<td>40%</td>
<td>44%</td>
<td>48%</td>
<td>48%</td>
<td>48%</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>24%</td>
<td>28%</td>
<td>32%</td>
<td>36%</td>
<td>40%</td>
<td>44%</td>
<td>48%</td>
<td>48%</td>
<td>48%</td>
</tr>
</tbody>
</table>
How will pricing compare across technologies over time (example thinking)?

**Fibre will maintain premium opportunity for pricing**

**Faster DSL will be close on price and erode at similar rate**

**WiMAX and ‘Bad’ DSL will become increasingly uncompetitive in the face of competition**
What will happen to ARPU’s

**ARPU reduction will depend heavily on the situation in the market**

- If the incumbent has been the only supplier then you will see high prices and competition will drive significant erosion of ARPU’s
  - E.g. Oman $80 per month
- If competition has been in place for some time then you will see much lower prices already and erosion is likely to be much lower
  - E.g. Sweden – you can get a 100 Mbps service for $12 per month

**General trends can be seen that are applicable to most countries**

- Broadband will erode over time
- Voice ARPU’s will erode over time due to competition and the impact of VoIP services, Skype etc.
- TV ARPU will increase slightly over time as extra services are added

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB ARPU trend</td>
<td>100%</td>
<td>95%</td>
<td>93%</td>
<td>73%</td>
<td>58%</td>
<td>48%</td>
<td>48%</td>
<td>46%</td>
<td>40%</td>
<td>38%</td>
</tr>
<tr>
<td>Voice ARPU trend</td>
<td>100%</td>
<td>94%</td>
<td>89%</td>
<td>83%</td>
<td>79%</td>
<td>75%</td>
<td>71%</td>
<td>67%</td>
<td>63%</td>
<td>59%</td>
</tr>
<tr>
<td>TV ARPU trend</td>
<td>100%</td>
<td>103%</td>
<td>106%</td>
<td>109%</td>
<td>113%</td>
<td>116%</td>
<td>119%</td>
<td>123%</td>
<td>127%</td>
<td>130%</td>
</tr>
<tr>
<td>Monthly Rental</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Revenue Generating Units (RGU’s) – What services do customers buy?

- Not every residential customer will buy all of your services.
- Your model should price each service separately and then apply a percentage take up figure for each (e.g. voice, Internet and TV).

### Residential mix of product penetration

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers who pay for Internet</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Customers who pay for Voice</td>
<td>25%</td>
<td>25%</td>
<td>28%</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>Customers who pay for TV</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
</tbody>
</table>

### Total RGU's

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1.3</td>
<td>1.4</td>
<td>1.4</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Total revenue is then made up of

- Monthly blended Internet price times penetration of Internet to customer base **plus**
- Monthly blended Voice price times penetration of Voice to customer base **plus**
- Monthly blended TV price times penetration of TV to customer base **plus**
- Monthly rental price times percentage of customers that pay monthly rental
- One off activation cost (if charged)
TV revenues

TV is a difficult area as it always looks appealing but experience suggests that it can be tricky

In the GCC, the potential for TV is limited in some countries because:

- There is already high penetration rate of satellite services (so you can argue people don’t need fibre based TV)
- Low pay TV take up within satellite users means that there is not high potential for paid TV content
- Censorship laws mean that a fixed network could not screen the same content that people are accessing from satellite

In Europe, there are markets where TV is dominant (more important than Internet connection or voice) in marketing terms (e.g. Portugal)
Activation or connection revenues can make a significant difference to a business case

- You can start by charging an activation/connection fee to 100% of new subscribers
- This percentage will reduce over time however if competition offer free connection (e.g. an xDSL player)
- Business activation charges are likely to last longer than charges for residential customers
How much can you realistically achieve?

CALCULATING YOUR MARKET SHARE
Overall market estimation

- You can rely on analysts information on market size but the challenges are that:
  - They rarely agree with each other
  - The influence of 3G broadband is very difficult to understand. What will the market have done in 3 years as you deploy a fibre network if the mobile companies are rolling out 3G+?
  - The reports are good for assessing stable changes in the market but the mathematical models struggle to cope with discontinuities caused by:
    - New operators in the market
    - New technology offerings from existing players

- Figures you should know include the population and number of households per region and town. This is often in Census data – allowing you to identify the overall number of customers you might serve.
Japan shows that fixed and mobile broadband can co-exist

Japan shows how mobile broadband (3G) and fixed broadband (DSL, Cable, Fibre) take up can co-exist

FIXED BROADBAND
26.3% penetration of 100 people

GDP per capita, 2009

Simple correlation = 0.70

3G
83% of mobile subscribers
And this is unlikely to change (Ofcom survey from the UK)...
What’s the headroom for your service?

Current and targeted super-fast broadband coverage

Source: Cullen International February 2010 estimates and Ofcom estimates based on press releases by operators and governments
An example of calculating the addressable market

Geo-marketing and census data was used to define clusters/blocks with an attractive density of potential customers. Clusters and the residences and businesses were then combined with the adjacent street lengths. This information was then aggregated for each municipality.

Individual municipalities were selected with a realistic roll-out rate. This defines the total market for residential and business as well as the number of clusters and route kilometres required over time.

<table>
<thead>
<tr>
<th>Name</th>
<th>Length (m)</th>
<th>Units</th>
<th>Residential</th>
<th>Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Α.Γ. ΣΤΕΦΑΝΟΣ</td>
<td>2523</td>
<td>421</td>
<td>309</td>
<td>13</td>
</tr>
<tr>
<td>ΚΡΥΟΝΕΡΙ</td>
<td>954</td>
<td>110</td>
<td>70</td>
<td>4</td>
</tr>
<tr>
<td>ΔΡΟΣΙΑ</td>
<td>162</td>
<td>395</td>
<td>236</td>
<td>10</td>
</tr>
<tr>
<td>ΕΚΑΛΗ</td>
<td>647</td>
<td>179</td>
<td>120</td>
<td>6</td>
</tr>
<tr>
<td>Ν. ΕΡΥΘΡΑΙΑ</td>
<td>17473</td>
<td>2463</td>
<td>1949</td>
<td>73</td>
</tr>
<tr>
<td>ΚΗΦΙΣΙΑ</td>
<td>32603</td>
<td>8054</td>
<td>6025</td>
<td>183</td>
</tr>
<tr>
<td>ΠΕΥΚΗ</td>
<td>24256</td>
<td>3998</td>
<td>3236</td>
<td>89</td>
</tr>
<tr>
<td>ΚΑΜΑΤΕΡΟ</td>
<td>11270</td>
<td>1146</td>
<td>852</td>
<td>32</td>
</tr>
<tr>
<td>ΗΡΑΚΛΕΙΟ</td>
<td>62894</td>
<td>13546</td>
<td>11125</td>
<td>295</td>
</tr>
<tr>
<td>ΙΩΝ</td>
<td>130769</td>
<td>17222</td>
<td>13628</td>
<td>473</td>
</tr>
<tr>
<td>ΠΕΤΡΟΥΠΟΛΗ</td>
<td>49841</td>
<td>11104</td>
<td>8454</td>
<td>260</td>
</tr>
<tr>
<td>Ν. ΦΛΑΔΕΛΦΕΙΑ</td>
<td>39093</td>
<td>6695</td>
<td>5459</td>
<td>175</td>
</tr>
<tr>
<td>Α.Γ. ΑΝΑΡΓΥΡΟΙ</td>
<td>55550</td>
<td>6460</td>
<td>5021</td>
<td>177</td>
</tr>
<tr>
<td>ΒΡΙΛΗΣΣΙΑ</td>
<td>23171</td>
<td>4171</td>
<td>3237</td>
<td>96</td>
</tr>
<tr>
<td>ΠΑΛΛΗΝΗ</td>
<td>3527</td>
<td>526</td>
<td>400</td>
<td>16</td>
</tr>
</tbody>
</table>

Clusters and the residences and businesses were then combined with the adjacent street lengths. This information was then aggregated for each municipality.
Even if DSL has reasonable penetration there will be an opportunity for fibre – example figures

- Overall Homes in Country
- Addressable by DSL 70%
- Not Penetrated
  - 30% not addressable by DSL
  - Actual DSL Subs
  - 30% not addressable by DSL

Traditional market thinking is not needed as fibre kills xDSL...

But you might need to think like this is your competitor is cable!
Calculating the addressable market

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 1</td>
<td>35%</td>
<td>80%</td>
<td>95%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

- Individual regions have a rollout profile applied to them for the cumulative percentage of the route kilometres that are complete.

<table>
<thead>
<tr>
<th>Passed to Released Ratio Released to Passed</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>80%</td>
<td>85%</td>
<td>95%</td>
<td>98%</td>
<td>98%</td>
<td>98%</td>
<td>98%</td>
<td>98%</td>
<td>98%</td>
<td>98%</td>
</tr>
</tbody>
</table>

- A conservative passed to released ratio is used to reflect potential issues about where the company will choose to concentrate marketing effort and also the status of connectivity to some municipalities.
The key is to still consider reasonable overall penetration of fixed broadband

Mobile broadband will have its place but cannot support HD TV, fast file transfers etc. Fast fibre will become the technology of choice in homes while mobile broadband will:

- Cover gaps in the market left by DSL, fibre
- Succeed where DSL is very poor
Dividing up the market

-The incumbent frequently retains 50% of markets after deregulation. They may do worse but this is a conservative look at the future.

-If there are three new players then why are you going to get more than your ‘fair share’ of net adds (new subscribers). If there’s not a good reason (beyond good marketing etc.) then you aren’t

-When you build the model of overall market size, ensure that your share of net adds is reasonably close to your fair share year by year
Let’s consider an example

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber to Home</td>
<td>0</td>
<td>37</td>
<td>156</td>
<td>335</td>
<td>551</td>
<td>707</td>
<td>808</td>
<td>863</td>
<td>893</td>
<td>943</td>
<td>986</td>
</tr>
<tr>
<td>WiMax or other Broadband</td>
<td>73</td>
<td>290</td>
<td>870</td>
<td>1,160</td>
<td>1,299</td>
<td>1,351</td>
<td>1,378</td>
<td>1,406</td>
<td>1,420</td>
<td>1,420</td>
<td>1,420</td>
</tr>
<tr>
<td>ADSL</td>
<td>1,015</td>
<td>1,545</td>
<td>1,921</td>
<td>2,191</td>
<td>2,410</td>
<td>2,579</td>
<td>2,708</td>
<td>2,789</td>
<td>2,873</td>
<td>2,959</td>
<td>3,048</td>
</tr>
<tr>
<td>Total Data lines</td>
<td>1,088</td>
<td>1,872</td>
<td>2,947</td>
<td>3,686</td>
<td>4,260</td>
<td>4,637</td>
<td>4,894</td>
<td>5,058</td>
<td>5,186</td>
<td>5,321</td>
<td>5,453</td>
</tr>
</tbody>
</table>

| Penetration of Homes          | 17%  | 29%  | 44%  | 53%  | 60%  | 63%  | 65%  | 65%  | 65%  | 65%  | 64%  |

![Graph showing data lines by technology and penetration of homes over years 2009 to 2019.](image)
The company believes it can achieve the following performance

<table>
<thead>
<tr>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Fiber to Home</td>
<td></td>
<td></td>
<td></td>
<td>22</td>
<td>68</td>
<td>126</td>
<td>190</td>
<td>226</td>
<td>248</td>
<td>264</td>
<td>273</td>
</tr>
<tr>
<td>WiMax or other wireless</td>
<td></td>
<td>48</td>
<td>218</td>
<td>300</td>
<td>348</td>
<td>363</td>
<td>377</td>
<td>385</td>
<td>388</td>
<td>388</td>
<td></td>
</tr>
<tr>
<td>ADSL</td>
<td>100</td>
<td>145</td>
<td>160</td>
<td>174</td>
<td>174</td>
<td>174</td>
<td>174</td>
<td>174</td>
<td>174</td>
<td>174</td>
<td>174</td>
</tr>
<tr>
<td>TOTAL SUBSCRIBERS</td>
<td>100</td>
<td>193</td>
<td>377</td>
<td>496</td>
<td>590</td>
<td>662</td>
<td>741</td>
<td>785</td>
<td>811</td>
<td>826</td>
<td>835</td>
</tr>
</tbody>
</table>
Market share does not look unreasonable

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FTTx</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>7%</td>
<td>12%</td>
<td>18%</td>
<td>23%</td>
<td>26%</td>
<td>28%</td>
<td>28%</td>
</tr>
<tr>
<td>WiMAX or other</td>
<td>0%</td>
<td>16%</td>
<td>25%</td>
<td>26%</td>
<td>27%</td>
<td>27%</td>
<td>27%</td>
<td>27%</td>
<td>27%</td>
<td>27%</td>
<td>27%</td>
</tr>
<tr>
<td>ADSL</td>
<td>10%</td>
<td>9%</td>
<td>8%</td>
<td>8%</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Overall Market Share</td>
<td>9%</td>
<td>10%</td>
<td>13%</td>
<td>13%</td>
<td>14%</td>
<td>14%</td>
<td>15%</td>
<td>16%</td>
<td>16%</td>
<td>16%</td>
<td>15%</td>
</tr>
</tbody>
</table>
However is the share of net adds reasonable?

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FTTx</td>
<td>12%</td>
<td>21%</td>
<td>37%</td>
<td>64%</td>
<td>67%</td>
<td>73%</td>
<td>31%</td>
<td>27%</td>
<td>27%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WiMAX or other</td>
<td>22%</td>
<td>29%</td>
<td>28%</td>
<td>34%</td>
<td>28%</td>
<td>54%</td>
<td>27%</td>
<td>27%</td>
<td></td>
<td>31%</td>
<td>21%</td>
</tr>
<tr>
<td>ADSL</td>
<td>8%</td>
<td>4%</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Churn

Average the end of year customers in the current and next year
Apply churn percentage to this average customers in year number
Conservative churn figures are:
  15% for DSL
  10% for fibre

However, if fibre has little competition and/or the market has strong pent up demand for Internet, then the churn could be as low as 1% (e.g. Free and Verizon are seeing this level of churn)

The churn figure is important because your capex needs to be linked to the number of new connections (end of year subscribers plus churn) or it will under-estimate the real costs

Note: A number of customers will cancel even though they have ordered the service. Some business models will include up to 5% for ‘pre-install cancels’
And what you need to change

WHY FIBRE BUSINESSES ARE UNDER-PERFORMING
There are around 200 major issues we’ve identified...

- IT investments – bleeding to death... quickly
- If you build it – they will come
- Incorrect cost estimation
- OSP costs too high
- Bad technical design (ISP-OSP integration)
- The negative (opex) impact of too many products
- If you build it they will come
- Failure to communicate benefits
- Competing in a maelstrom
- Losing by succeeding – misunderstanding the business case
- Wrong marketing – national adverts for local situations
- Benchmarking the worst – not the best
- Death by IP transit
- “Be first or be somewhere else”
- The wrong benchmarks
- Failure to manage cash

We’ve covered a few already.... here are some more
...finding the real problems within the business.

FTTX

OPERATIONS

- PROCESSES
  - CRITICAL
    - IT investments – bleeding to death... quickly
    - If you build it – they will come
  - SERIOUS
    - Incorrect cost estimation
  - PROBLEMS
    - OSP costs too high

- PROVISIONING
  - CRITICAL
    - Bad technical design (ISP-OSP integration)
  - SERIOUS
    - The negative (opex) impact of too many products
  - PROBLEMS
    - If you build it they will come

- CUSTOMER CARE
  - CRITICAL
    - If you build it they will come
  - SERIOUS
    - Failure to communicate benefits
  - PROBLEMS
    - Competing in a maelstrom

COSTS

- OPEX
  - CRITICAL
    - If you build it they will come
  - SERIOUS
    - The negative (opex) impact of too many products
  - PROBLEMS
    - Failure to communicate benefits

- THIRD PARTY
  - CRITICAL
    - Competing in a maelstrom
  - SERIOUS
    - The negative (opex) impact of too many products
  - PROBLEMS
    - Failure to communicate benefits

USERS

- SUBSCRIBERS
  - CRITICAL
    - Wrong marketing – national adverts for local situations
  - SERIOUS
    - Benchmarking the worst – not the best
  - PROBLEMS
    - Death by IP transit

- TAKE UP
  - CRITICAL
    - Wrong marketing – national adverts for local situations
  - SERIOUS
    - Benchmarking the worst – not the best
  - PROBLEMS
    - Death by IP transit

SERVICES

- MARGINS
  - CRITICAL
    - “Be first or be somewhere else”
  - SERIOUS
    - The wrong benchmarks
  - PROBLEMS
    - Failure to manage cash

- TV
  - CRITICAL
    - “Be first or be somewhere else”
  - SERIOUS
    - The wrong benchmarks
  - PROBLEMS
    - Failure to manage cash
WHY FIBRE BUSINESSES ARE UNDER-PERFORMING

IT INVESTMENTS – BLEEDING TO DEATH QUICKLY
IT can save you…. But your OSS/BSS choice can just as easily damage the business badly

You can spend tens of millions of Euros on bespoke software but the issues can be:

- That’s a lot of money to amortise
- You may get the development A team or, if you’re not ‘important’ enough, get the C team – I’ve experienced this... it’s very painful (delays, confusion, rework, extra costs etc)

There are alternatives that are lower cost (though lower flexibility)
WHY FIBRE BUSINESSES ARE UNDER-PERFORMING

BAD FINANCIAL MANAGEMENT....
Dell customers pay immediately by credit card before construction has begun.

Dell pays component suppliers 44 days (on average) after the customer pays for the PC.

Dell therefore has a negative cash conversion cycle…
Cash flow cycle

Cans/bottles from suppliers only become liable for payment at the point they enter the production line.

They effectively have zero stock for these items.
How are you managing cash?

Are you exploiting vendor finance?

In the growth phase, set-top boxes can be 30% of your working capital

- Are you currently recovering set top boxes from churning customers and pre-install cancels?
WHY FIBRE BUSINESSES ARE UNDER-PERFORMING

IF YOU BUILD IT – THEY WILL COME....
If you build it... they won’t come! Just providing fibre isn’t enough.

- In June 2010, there were
  - 1.47 million homes passed by fibre in Portugal
  - And there were... **70,000 subscribers :(**

- Overall fibre penetration in Europe is not good enough

- Without a clear understanding of the benefits – customers will not come to your service
Lessons from >20 Years of Competition in Europe

Success Factor

Network driven companies fail, marketeers win

Early launch or quality problems drag down performance for years.

Regulation can make or break competition

Market conditions keep changing so company culture must foster initiative & adaptability with financial management

Winners have high productivity and are lean in costs
WHY FIBRE BUSINESSES ARE UNDER-PERFORMING

PRICING ISSUES
Excessive premium over xDSL

Ratio of Very High Speed Price to High Speed Price By Country (PPP)

Very High Speed (>35 Meg) Price to High Speed (12 to 32 Meg) Price By Country (PPP)
Getting the price wrong

...price here and the market’s told you that you’re not going to get 90% penetration
Do you defend price or volume?

Profit (Yellow) = Revenue – Costs (Blue)

- 100 units at 100 Euros
- Variable Cost of 40 Euros per unit

You can choose to lose sales or drop prices… what do you do?

Note Ignore legend on chart “Profit….”
WHY FIBRE BUSINESSES ARE UNDER-PERFORMING

DEATH BY IP TRANSIT
Your bandwidth requirements will change over time

⚠️ You need to recognise that one way to defend revenues is to increase service speed over time. An example of service speed evolution is shown below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level Services (0.5 meg)</td>
<td>0.5</td>
<td>0.5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2.5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Entry Level Services (1 meg)</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>2 Meg Service (basic product - rates will rise over time)</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>6 Meg Service (middle product - rates will rise over time)</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>24</td>
<td>30</td>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td>10 Meg Service (high end product - rates will rise over time)</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>40</td>
<td>40</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>100 Meg Service (halo product - very low availability)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

⚠️ Broadband speeds should roughly double over 2 years but if a country is starting at a very low service speed (e.g. 256 kbps) then that should be the start point of any calculation rather than if you launch a 4 mbps service. Doubling this latter speed from the first year would be unrealistic.
Bandwidth costs can be a killer

If you assume an **unlimited** broadband service then you can look at the monthly costs per user of providing IP transit

<table>
<thead>
<tr>
<th></th>
<th>Europe</th>
<th>GCC</th>
<th>Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per megabit/s/month</td>
<td>~1 €</td>
<td>~150 €</td>
<td>1000’s €</td>
</tr>
<tr>
<td>Cost per user per month</td>
<td>0.25 – 1 €</td>
<td>10 – 20 €</td>
<td>100 – 200 €</td>
</tr>
</tbody>
</table>

You clearly cannot afford to pay some of these prices so you may have to:

- limit bandwidth use per user
- find ways to reduce your IP transit charges (tricky if you don’t have your own gateway)
And peering and caching will not ‘save you’ from these costs

Source ITU, Ventura Team LLP
Prevalence of bit/data caps among surveyed offers, by technology, Oct 2009 (OECD)

- **DSL**: 73% without bitcaps, 27% with bitcaps
- **Cable**: 74% without bitcaps, 26% with bitcaps
- **FTTH**: 76% without bitcaps, 24% with bitcaps

Can you cap it – yes you can!
Average bit/data cap size, by technology, USD PPP, October 2009

..but there is still an expectation of more from fibre providers

Note – you can’t keep everybody happy

One WiMAX provider is getting regular complaints from one user both direct and on the web. This unhappy customer ‘only’ downloaded 200 Gbytes in January
WHY FIBRE BUSINESSES ARE UNDER-PERFORMING

COMPETING IN A MAELSTROM – THE IMPORTANCE OF ‘CLEAR BLUE WATER’
“Be first or be somewhere else”

Magyar Telecom is fighting in some areas where there are three fibre competitors

- They’re doing pretty well but that makes life more difficult for them
- The maximum ‘fair’ penetration they could get is 33%
...but how sensitive are cases to penetration?

EXAMPLE

- 50,000 homes passed
- 5 metres of street dig per home passed

<table>
<thead>
<tr>
<th>Service</th>
<th>Avg Rev / Home / Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadband</td>
<td>20</td>
</tr>
<tr>
<td>Telephone (rental and calls)</td>
<td>10</td>
</tr>
<tr>
<td>TV</td>
<td>12</td>
</tr>
<tr>
<td>Security or other misc items</td>
<td>2</td>
</tr>
</tbody>
</table>

| Total                            | 44                     |

**PENETRATION**

<table>
<thead>
<tr>
<th>First Year Penetration</th>
<th>30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Penetration</td>
<td>60%</td>
</tr>
</tbody>
</table>
Is it worth it (the Sandberg Curve)?

- Saturated fibre markets (e.g. Denmark) can be very difficult to differentiate in.
- **Think about concentrating on**
  - operational efficiencies to improve margins
  - acquisitions to create operators with the right critical mass

![Graph showing Business Value vs Number of Subscribers (k)]

- **Market pricing**
  - Examples of price per broadband customer
    - €1,000 (Bostream to B2 ‘04)
    - €2,000 (B2 to TeleNor ‘05)
    - €1,200 (Ella to NextGenTel 2005)
    - €200-250 per customer typically across C&E Europe
NETWORK DESIGN ISSUES
“The chamber is here somewhere...”
Knowing how far you have to dig is not enough - you then need to get the OSP costing right

- The vendor selection process has created a number of different network designs and also variations in the approach to OSP
- To clarify this situation you should ask vendors to submit their OSP quotations using a consistent approach that is logical and will reduce the risk for both parties as will be explained
An OSP RFP approach

There are two cases to consider that have different mixes between subscribers in:
- Villas (individual houses)
- Apartments (i.e. flats within multi-dwelling units MDU’s)

The information provides a total for homes passed. This means:
- the total villas and apartments that the fibre passes
- the total includes all the apartments in each MDU passed. For the avoidance of doubt, an MDU passed with X apartments in it counts as X homes passed

For the avoidance of doubt:
- Hotels are treated as a single subscriber (i.e. they will probably have a high speed connection they distribute throughout the hotel themselves)
- Furnished apartments are treated as an MDU with a connection in each apartment

Compounds, where there is already existing ducting, should be quoted as a separate fixed price per connection

Green field connections to villas should be quoted per home passed

The number and type of business connections should be treated as in the RFP
# Example OSP RFP Cases

<table>
<thead>
<tr>
<th>CASE A</th>
<th>Low Density</th>
<th>CASE B</th>
<th>High Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total homes passed (total villas</td>
<td>803,478</td>
<td>Total homes passed (total villas</td>
<td>803,478</td>
</tr>
<tr>
<td>plus apartments)</td>
<td></td>
<td>plus apartments)</td>
<td></td>
</tr>
<tr>
<td>Total residential subscribers</td>
<td>321,391</td>
<td>Total residential subscribers</td>
<td>321,391</td>
</tr>
<tr>
<td>(villas and apartments</td>
<td></td>
<td>(villas and apartments</td>
<td></td>
</tr>
<tr>
<td>connected to our service)</td>
<td></td>
<td>connected to our service)</td>
<td></td>
</tr>
<tr>
<td>Number of subscribers in villas</td>
<td>241,043</td>
<td>Number of subscribers in villas</td>
<td>32,139</td>
</tr>
<tr>
<td>(75% of total)</td>
<td>(25% of total)</td>
<td>(10% of total)</td>
<td></td>
</tr>
<tr>
<td>Number of subscribers in apartments</td>
<td>80,348</td>
<td>Number of subscribers in apartments</td>
<td>289,252</td>
</tr>
<tr>
<td>(25% of total)</td>
<td></td>
<td>(90% of total)</td>
<td></td>
</tr>
<tr>
<td>Subscribers per MDU</td>
<td>5</td>
<td>Subscribers per MDU</td>
<td>5</td>
</tr>
<tr>
<td>MDU’s connected</td>
<td>16070</td>
<td>MDU’s connected</td>
<td>57850</td>
</tr>
</tbody>
</table>
The vendor should prepare a quotation for both case A (75% of total subscribers in villas) and case B (10% of subscribers in villas)

The actual price paid to the OSP contractor will be based on the actual percentage of villas as a percentage of the total FTTx subscribers connected by the vendor

<table>
<thead>
<tr>
<th>Percentage of subscribers in villas</th>
<th>Price paid for OSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>PRICE FOR CASE B</td>
</tr>
<tr>
<td>75%</td>
<td>PRICE FOR CASE A</td>
</tr>
</tbody>
</table>
For example – let’s say the actual percentage of villas connected in the phase as a percentage of the total FTTx subscribers connected by the vendor was 56%.

The price for OSP will be interpolated between the Case A and Case B prices from the vendor.

So now you understand the cost to go down the street, next you need to connect to homes/businesses.
Inside plant (ISP) – connecting a home from the street

- In addition to connecting along streets, you need to connect into homes.
- The cost of this varies enormously depending on the approach.

The connection from the street to the home then needs to be made.
Simple estimation of ISP costs

You can estimate the average distance to a:
- Villa
- Apartment
- Business

Using dig costs from contractors you can then identify the cost per connection.
- You almost certainly do not want to connect up every house/villa unless it is a new build area
- However, you may want to put micro-duct to every apartment in an MDU as this may be more cost effective

If you are ordering a turnkey FTTH system then insist the ISP is included in the overall pricing. The following slide shows why...
The Outside Plant (OSP) design can influence Inside Plant (ISP) costs

One supplier suggested 4 way terminal blocks in the street for a GCC rollout. It seemed okay but this created an enormous problem.

20m Extra Dig Outside Homes to Connect Subscribers at 25 RO per metre
Thank you...

Richard Jones - Partner
richard@venturateam.com
mobile: +44 7811 166033

Market Experience
- Egypt
- Qatar
- Oman
- Saudi Arabia
- Dubai
- Poland
- Ireland
- UK
- German
- Mali
- Sweden
- Hungary
- Greece
- France
- Rwanda
- Estonia

Operator Experience Includes:
- Telecom Egypt
- Vodafone (various operations)
- Atheeb Consortium (Saudi)
- Millicom International Cellular
- Batelco
- Colt Communications
- BT
- STC
- Pipex
- Riksnet
- Cable and Wireless
- Eircom
- Turk Telekom
- Bulgarian Telecom
- Invitel+Pantel
- Neuf Telecom
- Deutsche Telecom
- Deutsche Telekom
- MLL Telecom