Unlimited mobile data and near zero marginal cost – a paradigm shift in telco business models

European winners and losers in 4.5G and 5G – a study of 30 operators

4.5G and 5G technologies, new radio spectrum bands and the evolving infrastructure vendor ecosystem radically change mobile network operators’ cost dynamics and chart a sustainable path towards unlimited mobile data, mass market fixed-to-mobile broadband substitution and the Internet of Things. We witness a paradigm shift with profound implications on spectrum valuation, network sharing, M&A, MVNO economics and mobile data pricing.

Rewheel research PRO study, 25th September 2017

Key findings

- Mobile capacity abundance¹ is disrupting converged operator fixed-line broadband centric business models
- While data traffic increased up to 7 times the last four years mobile-only operator CAPEX fell or was mostly flat
- Mobile-only and mobile-centric² operators grew their mobile service revenue and cash flow the last 4 years
- Mobile-only and mobile-centric operator service revenue growth was driven by market share gains, customers willingness to pay a bit more for unlimited plans and fixed-to-mobile broadband substitution gains
- Converged operator mobile service revenue and cash flow continued to fall across the board
- Despite the heavy investments in fiber fixed revenues continue to decline across the board
- The fully allocated cost per gigabyte is a very unreliable (Mickey Mouse) metric
- Peak speed network upgrades have driven mobile network CAPEX the last four years
- Ultra-competitive network gear market feeds the flat mobile network CAPEX
- CAPEX elasticity and the spectrum valuation CAPEX paradox
- Will mobile network CAPEX stay flat in the long run?

¹Mobile-centric operators sell fixed-line broadband but put mobile-first by selling affordable unlimited mobile data e.g. Elisa Finland

²Mobile-centric operators sell fixed-line broadband but put mobile-first by selling affordable unlimited mobile data e.g. Elisa Finland

30 Western European operators from the Deutsche Telekom, Vodafone, Telefonica, Orange, Telecom Italia, Hutchison, Telekom Austria, Swisscom, Telia, Telenor, Vimpelcom, Sunrise, Salt, Play, Elisa and DNA groups

- Cash flow grown in 8 out of 10 mobile-only operators
- Mobile-centric operators (sell unlimited mobile data) managed to grow their cash flow
- Cash flow of converged (incumbent) operators fell across the board due to FTTH rollout, lower mobile and lower fixed-line revenues

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**Context of study**

**Mobile capacity abundance and near zero marginal mobile data cost**

In March 2017 in a study[^1] titled ‘Capacity utilization and fixed-to-mobile broadband substitution potential – A study of 64 European operators’ we reported that most European mobile operators utilized in 2016 a tiny fraction of their available network capacity and that mobile operators could carry today 100 GB per person per month and will soon have enough capacity (TDD/massive MIMO) for 200 GB per person per month or 500 GB per household.

As we wrote back in March 2017 many in the industry have held and are still holding the mistaken conviction that mobile operators are running out or soon will run out of capacity. A spectrum crunch has been prophesized the last 10 years by the industry due to the explosive growth in smartphone use and proliferation of data-only connected mobile devices. However, given that the average mobile network performance and speeds have been rising[^4] across the continent, miraculously, the capacity crunch is being deferred every year to the very near future. Moreover, the doomsayers have been claiming that the imminent network capacity crunch will soon trigger an unsustainable capital expenditure path (sharp CAPEX increases) and lead to lower or negative cash flows.

For example Justin Funnel from Credit Suisse equity research in a June 2017 research note titled ‘Unlimited mobile data plans Popular, but how sustainable?’ rated Elisa in Finland as an Underperform stock after – mistakenly – concluding that “…Finland may hit network congestion issues within 3-4 years, so CAPEX would have to rise”. The Credit Suisse analysts basically copied our March 2017 study but by conveniently missing one important technology innovation arrived to the opposite – incorrect – conclusion i.e. Finnish operators will run out of network capacity in 3-4 years and therefore CAPEX will rise.

Seven years ago, in September 2010, against a backdrop of doomsayers, we proclaimed[^6] that “Operator profits CAN be sustained even with twentyfold surge in mobile data traffic”. We used a cased study[^8], see chart below, to show that mobile operator CAPEX will remain flat the next five years even with a 20-fold surge in mobile data traffic if certain network modernization and cost optimization steps were taken.

![CAPEX intensity chart](chart.png)

Our forecasts made seven years ago proved spot on as far as Finnish operators are concerned: 20x traffic -> flat CAPEX.

As seen in the chart above the data traffic in Elisa’s Finnish network has grown by more than 20x the last six years (exceeded 20 GB per unique user per month during 2Q2017) but CAPEX & OPEX remained flat.

The fact that mobile network CAPEX does not increase – but rather decreases in some cases – while mobile data traffic nearly doubles every year suggests a zero or nearly zero marginal mobile data cost structure (i.e. near zero costs are triggered purely by expanding network capacity in order to accommodate the increased mobile data traffic).

Mobile network CAPEX typically comprises of new technology upgrades such as LTE-Advanced (peak speed upgrades towards Gigabit LTE), network modernization programs, coverage expansions, capacity expansions, etc. The cost of expanding network capacity in order to accommodate the increased mobile data traffic (marginal mobile data cost), which is declining fast9, is actually quite low10. In our consulting engagements we have calculated the actual cost of data traffic driven 4G capacity expansions in real networks. The annual cost11 of expanding a 4G network’s aggregate capacity by a Gbit/s is as low as few hundred thousand EUR which is roughly the equivalent of €0.1 per GB; a near zero marginal mobile data cost if one considers that consumers are paying few hundred EUR per year for their smartphone or mobile broadband plans.

The relatively small cost of traffic driven capacity expansions could be offset by lower coverage expansion expenditure or other CAPEX efficiencies (e.g. vendor price elasticity – as described in Section 1.4) so that the total mobile network CAPEX remains flat while data traffic continuous to grow yielding an effective zero marginal mobile data cost.

Moreover, when operators upgrade their network peak speeds (e.g. Gigabit LTE) as a by-product they are increasing the network capacity. If total mobile network CAPEX remains flat despite the LTE-Advanced peak speed upgrades while data traffic continues to grow during the period this too will yield an effective zero marginal mobile data cost.

Our calculations show that the doomsayers will again be proven wrong. Mobile network CAPEX will stay flat the next five years with the help of 3.4-3.8 GHz spectrum and Massive MIMO even if data traffic grows another 10-fold (from 20 GB in 2016 to 200 GB per unique user per month in 2021) as forecasted12 by Finnish operators.

In this empirical study we examine the reported CAPEX of thirty European mobile operators for which data were available the last four years (2013 – 2016) with the aim of determining the impact that the substantial (ranging from 2-fold to 7-fold) data traffic

10http://mobile-experts-blog.blogspot.fi/2017/01/mobile-5g-will-succeed-but-not-way-that.html
115-year CAPEX depreciation plus annual OPEX of traffic driven network cost

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growth may have had on expenditure levels the last four years. Was Elisa the only operator where traffic grew substantially the last four years but CAPEX stayed flat?

Our operator sample comprises of thirty European operators from the Deutsche Telekom, Vodafone, Telefonica, Orange, Telecom Italia, Hutchison, Telekom Austria, Swisscom, Telia, Telenor, Vimpelcom, Sunrise, Salt, Play, Elisa and DNA groups that are sub divided in three groups. The first group consists of ten mobile-only operators, the second group consist of ten mobile operators that sell fixed-line broadband but they do not own a national DSL/cable/Fiber network and the third group consists of ten fixed-line DSL/cable/Fiber incumbent operators.

Our empirical study showed that in the last 4 years total\(^1\) CAPEX was nearly flat or fell for 15 out of 30 operators sampled even though mobile data traffic increased by up to 7 times. Moreover, total CAPEX of mobile-only & mobile-centric\(^2\) operators fell or was nearly flat the last 4 years even though they carry much higher data traffic in their networks and traffic grew faster than in converged operator networks. Many mobile-only and mobile-centric operators had in 2016 a fully allocated mobile network CAPEX of ≈ €0.2 per GB carried.

Despite the fact that mobile data traffic increased by up to 7 times in the last 4 years total\(^1\) CAPEX was nearly flat or fell for 15 out of 30 operators sampled

\(^1\)Total CAPEX: Capital expenditure in mobile network, fixed (fibre/cable/DSL) networks, IT, etc, excluding spectrum licenses

\(^2\)European operators from the Deutsche Telekom, Vodafone, Telefonica, Orange, Telecom Italia, Hutchison, Telekom Austria, Swisscom, Telia, Telenor, Vimpelcom, Sunrise, Salt, Play, Elisa and DNA groups

Operators with higher CAPEX were predominantly converged operators with heavy fibre rollout

Operators with lower CAPEX were predominantly mobile-only operators

Compound annual growth rate (CAGR) of operator mobile data traffic volume 2013-2016

\(^1\)Total CAPEX: Capital expenditure in mobile network, fixed (Fiber/cable/DSL) networks, IT, etc, excluding spectrum licenses

\(^2\)Mobile-centric operators sell fixed-line broadband but put mobile-first by selling affordable unlimited mobile data e.g. Elisa Finland
Study highlights

Cash flow performance of mobile-only versus converged fixed-line incumbent operators

- Among the operators that sell fixed-line broadband mobile-centric operators (i.e. sell unlimited mobile data) were the only operators that managed to grow their cash flow.
- A mobile-only operator generated 1.5x more cash in a sub 10 million population EU market the last two years than Vodafone or Orange generated in a big EU market from their converged operators. Remarkable!
- Deutsche Telekom’s, Vodafone’s, Telefonica’s, Orange’s and Telecom Italia’s aggregate cash flow has fallen from 25.7 billion EUR in 2013 to 16.8 billion in 2016 in their big EU markets. Ouch!
- The 8.9 billion EUR decrease in the converged fixed-line incumbent cash flow was driven by the revenue loss of more than 6 billion EUR and by higher investments in FTTH networks i.e. CAPEX was up 3.6 billion EUR the last four years.

Mobile-only and mobile-centric operators grew cash flow the last 4 years.

The cash flow of converged fixed-mobile incumbents fell across the board!

Cash flow of converged (incumbent) operators fell across the board due to FTTH rollout, lower mobile and lower fixed-line revenues

Cash flow grew in 8 out of 10 mobile-only operators

Mobile-centric operators (sell unlimited mobile data) managed to grow their cash flow

Mobile-only network
Sell fixed-line broadband
Fixed-line DSL/cable/fibre incumbents

CAGR of operator cash flow (EBITDA-CAPEX) 2013-2016

0% 10% 20% 30% 40% 50% 60%

Mobile-only and mobile-centric operators grew cash flow the last 4 years.
The cash flow of converged fixed-mobile incumbents fell across the board!

Cash flow grew in 8 out of 10 mobile-only operators
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Cash flow of converged (incumbent) operators fell across the board due to FTTH rollout, lower mobile and lower fixed-line revenues

Mobile service revenue growth of mobile-only versus converged fixed-line incumbents

- Mobile-only and mobile-centric operators grew their mobile service revenue the last 4 years. Converged operator mobile service revenue continued to fall across the board!

Mobile-only & mobile-centric operators grew their mobile service revenue the last 4 years. Converged operator mobile service revenue continue to fall!

Mobile-only operators grew their mobile service revenue substantially
Mobile-centric operators (sell unlimited mobile data) grew their mobile service revenue
Converged operator mobile service revenue continue to fall

Mobile-only network
Sell fixed-line broadband
Fixed-line DSL/cable/fibre incumbents

CAGR of mobile service revenue 2013-2016

-20% -15% -10% -5% 0% 5% 10% 15% 20%
Fixed-line revenues of converged operators – No recovery in sight
- Despite the heavy investments in fiber fixed revenues continue to decline across the board
- Only two operators substantially grew their fixed revenues (after acquiring a cable operator). However, one of those two operators reported a decline in fixed revenues in 2016 and in 1H2017!

Fully allocated CAPEX per gigabyte – Meaningful metric?
- In 2016 many mobile-only and mobile-centric operators had a fully allocated mobile network CAPEX of \( \approx \€0.2 \) per GB as seen in the chart below. In 2017 this will fall to \( \€0.1 \) per GB and in 2018 below \( \€0.05 \) per GB...
Fully allocated cost per gigabyte – A very unreliable (Mickey Mouse) metric!

- While many operators have identical or similar fully allocated cost per subscriber (i.e. identical or similar actual cost level) their fully allocated cost per GB varied as much as 18 times in 2016.
- 3 in Austria had in 2016 a fully allocated cost per GB of €1.4.

While O2 UK and 3 UK have almost identical fully allocated cost per subscriber (i.e. identical cost level) 3’s fully allocated cost per GB in 2016 was nearly 6 times lower.

While T-Mobile NL and 3 AT have similar fully allocated cost per subscriber (and almost identical cost per pop covered) 3’s fully allocated cost per GB in 2016 was 18 times lower.

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– Fully allocated GB cost is a very unreliable metric because marginal mobile data cost are near zero (insignificant), hence they do not drive operator total costs

Operating performance of mobile-only versus converged fixed-line incumbent operators

In our March 2017 study we reported that there are significant fixed-to-mobile broadband substitution gains that can be realized if operators unleash the abundant capacity in their networks by offering unlimited data plans. We tested this postulation in an April 2017 study\(^9\) titled ‘O2 could drive fixed-to-mobile broadband substitution in Germany by connecting millions of households with HD TV service on its high capacity LTE network’. Therein we showed that O2’s high capacity LTE network, if put in use along a mobile-centric unlimited everything strategy, could drive fixed-to-mobile broadband substitution and disrupt the German tight oligopoly market. Our calculations showed that with a mobile-centric unlimited everything turnaround strategy O2 could return to revenue growth and greatly improve its profitability even after spending 1.2 billion EUR more in cumulative 2017-2021 CAPEX compared to the no change scenario. A mobile-centric strategy could turn O2’s poor financial performance around and reverse the mobile service revenue and profitability decline caused by its failed ‘me too’ fixed-mobile converged strategy.

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\(^9\)Assuming Elisa and 3 Austria acquire 80MHz of 3.4GHz - 3.6GHz TDD spectrum (O2 already holds 84 MHz of 3.5 GHz spectrum)

\(^{15}\)http://research.rewheel.fi/insights/2017_apr_pro_o2_germany_turaround/
So does a mobile-only or mobile-centric strategy pay or as many believe the future belongs to fixed-line incumbents?

In this empirical study we also analysed the mobile service revenue and cash flow growth and as well fixed-line revenue growth where applicable for the thirty European mobile operators mentioned above. Our aim was to determine if mobile-only and mobile-centric operators fared better or worse the last four years (2013 – 2016) compared to fixed-line converged incumbent operators or mobile operators that sell fixed-line broadband.

Our analysis showed that mobile-only & mobile-centric operators grew their cash flow the last 4 years while the cash flow of converged fixed-line incumbents fell across the board.

- A mobile-only operator generated 1.5x more cash in a sub 10 million population EU market the last two years than Vodafone or Orange generated in a big EU market from their converged operators. Remarkable!
- Deutsche Telecom’s, Vodafone’s, Telefonica’s, Orange’s and Telecom Itali’s aggregate cash flow has fallen from 25.7 billion EUR in 2013 to 16.8 billion in 2016 in their big EU markets. Ouch!
- The 8.9 billion EUR decrease in the converged fixed-line incumbent cash flow was driven by the revenue loss of more than 6 billion EUR and by higher investments in FTTH networks i.e. CAPEX was up 3.6 billion EUR the last four years.

In the charts below we depict the stellar financial performance – double digit growth rates in mobile service revenue and cash flow growth – of a mobile-only operator against the extremely poor performance of the fixed-line incumbent operator in the same market.

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16Mobile-centric operators sell fixed-line broadband but put mobile-first by selling affordable unlimited mobile data e.g. Elisa Finland
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About Rewheel

Founded in 2009, Rewheel is a Helsinki-Finland based boutique management consultancy specialising in the appraisal of mobile data-centric business models with emphasis on network economics, spectrum, capacity, regulatory analysis and competition assessments.

Rewheel's clients are mainly pro-competitive mobile network operators, telco groups, MVNO groups, sector regulators, governments, global internet firms, mobile data-centric start ups, PE and VC investors.

We delivered spectrum valuation, mobile data strategy and network economics management consultancy work for clients in the United Kingdom, United States, Ireland, Switzerland, Finland, Sweden, Belgium, Greece, Poland, Slovenia, Hungary, Russia, Romania. Buyers of our research reports (see: Digital Fuel Monitor) and related strategic workshops include many companies and authorities across Europe and worldwide.

Since 2010 we have been supporting many European challenger mobile operators in multiband (700, 700 SDL, 800, 900, 1500 SDL, 1800, 2600, 3.5 GHz) spectrum auctions.

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