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THE 5G CONSUMER BUSINESS CASE

An economic study of enhanced mobile broadband

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5G has the potential to drive new revenue streams. Much focus has been on the innovative use cases enabled by 5G's low latency, ultra-high speed and high reliability. However, the first steps towards offering 5G on a commercial scale will be taken within operators' current business: mobile broadband for consumers.

Operators face three key challenges in offering mobile broadband:

1. To manage exponential data traffic growth
2. To cater for rising speed and quality expectations
3. To monetize added customer value

By enabling massive and highly cost-efficient capacity expansion, 5G can help operators to address these challenges, while also creating significant economic benefits.

In this report, we answer the following questions:

1. How can 5G help operators to overcome the challenges of mobile data growth, increased user expectations and efficient monetization of rising customer value?
2. What is the economic case for increasing radio access capacity through:
   - 4G-only deployment, with capacity expansions utilizing existing technology and spectrum assets?
   - 4G+5G deployment, with capacity expansions leveraging new technology and additional 5G spectrum?

5G-enabled devices expected from 2019

To fully benefit from 5G network capabilities, a high penetration of 5G-enabled devices is essential.

The first commercial 5G-enabled devices are expected in 2019, and in 2023, 5G will account for 1 billion mobile subscriptions (11 percent of all mobile subscriptions). The fastest uptake of 5G will be in North America, Western Europe and Asia, with forecast penetration of 37, 16 and 14 percent respectively, by the end of 2023.

Through proactive device strategies, operators could achieve an even faster uptake of 5G devices and further benefit from the capabilities of 5G. This would, however, require targeted marketing efforts to promote a shift to new devices, as well as potential partnerships with device manufacturers.

In addition to the performance and cost efficiencies offered by 5G, operators with a proactive device migration strategy could boost customer value and increase the retention rate within the most advanced and highly valued customer segments.

Key takeaways

- 5G will play a central role in delivering customer value, managing increasing data traffic and enhancing the user experience.
- As networks and technologies evolve, cost per gigabyte will decrease. This will accelerate with the use of Massive MIMO[1] and 5G NR.[2]
- A site fully evolved with 4G and 5G capacity will deliver mobile data 10 times more cost efficiently than a basic 4G site.
- The cost efficiencies enabled in the 4G+5G deployment scenario improved the Net Present Value (NPV) of the modeled operator by 10 to 20 percent over a 5-year period.
- The introduction of new technologies presents opportunities for proactive players. Market effects related to first-mover advantages and improved customer experience boosted the NPV of the modeled operator by another 5 to 15 percent.
- Increasing the speed of 5G device uptake would allow operators to benefit from 5G network efficiencies faster.
- Operators must take advantage of the 12 to 24 month window of opportunity to define their 5G deployment and marketing strategies.

[1] Massive MIMO (Multiple Input Multiple Output) is a 5G functionality that could be introduced in existing 4G networks through the Ericsson software feature pack 5G Plug-Ins

[2] 5G NR (New Radio) is the radio access technology utilized in 5G

ADDRESSING CONSUMER BUSINESS CHALLENGES

Our analysis shows that 5G has the potential to address operators' three key challenges in offering mobile broadband: it can provide cost-efficient functionality to manage traffic growth, help to meet expectations on speed and quality and, as we explore on the following page, monetize customer value in an increasingly competitive market.

Managing mobile data traffic growth

Mobile data consumption is growing rapidly. On a global level, the data traffic in networks has grown at a yearly rate of 65 percent over the last 5 years. Between 2017 and 2023, data traffic is projected to rise at a compound annual growth rate of 40 percent, assuming the current grid. On average, this means eight times more traffic per site. On top of this growth in mobile broadband data, completely new use cases will also evolve – such as Fixed Wireless Access, Massive IoT and Critical IoT – which will further increase the data traffic.

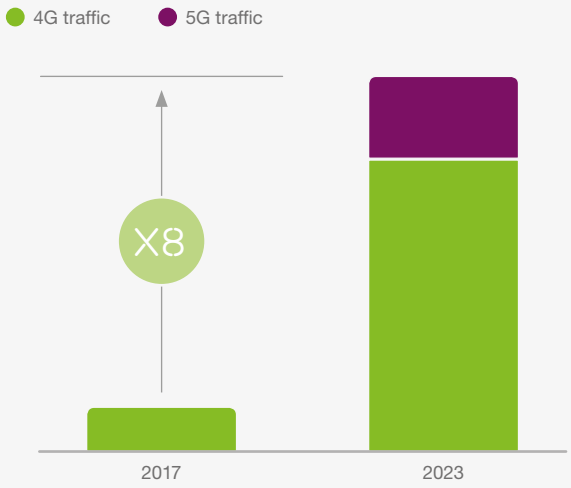
Networks must be evolved and expanded to accommodate this growth. In the near term, a large share of the growth will come from 4G devices, requiring 4G networks to be scaled accordingly. However, as 5G-enabled devices appear in the market, 5G traffic will start to increase. 5G-enabled devices are expected to add a significant amount of traffic to networks, but will also enable new, cost-efficient network functionality to help operators manage the upsurge.

Meeting rising expectations on speed and quality

In parallel to traffic growth, expectations on service quality continue to rise. Consequently, in order to deliver a competitive user experience, operators have to keep increasing their targeted service quality levels.

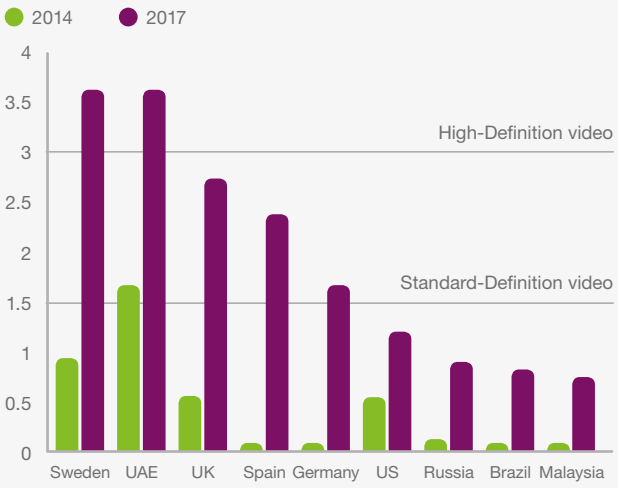
The race for better performance is reflected in Figure 2, showing the user experience[3] delivered in 2014 and 2017 for reference countries.

Figure 1: Global mobile data traffic forecast



Source: Ericsson Mobility Report

Figure 2: Average cell-edge performance (Mbps)



Source: Ericsson analysis of Speedtest Intelligence data from Ookla, 2014 and 2017

Countries such as Sweden and the UAE offer world-leading performance, further strengthening the user experience through continuous network evolution. The requirements on delivering a good user experience are continuously increasing. As more advanced services and devices emerge, operators need to raise their targeted service quality levels even further. For example, video is expected to evolve from High Definition to 2K and 4K, placing higher requirements on speed and quality.

5G is strongly associated with a better user experience. In an Ericsson ConsumerLab study,[4] more than 70 percent of consumers identified performance aspects such as increased speed, better reliability and lower latency as their No. 1 expectation of 5G. This suggests that 5G is not only about new use cases, but also about improving the mobile broadband services that consumers already subscribe to.

[3] User experience is here measured as the downlink throughput delivered with a probability of 90 percent. This is also referred to as cell-edge performance or app coverage. Statistics are generated through On-Device Measurement (ODM) data from the Speedtest platform, provided by Ookla

[4] Ericsson ConsumerLab, Towards a 5G Consumer Future, 2018

STRATEGIC ADVANTAGES FOR MARKET LEADERS

Growth and monetization of customer value

The technological capabilities of 5G will enable completely new use cases and revenue streams for operators. Here, focusing on mobile broadband for consumers, the following three examples show different ways in which operators could benefit from 5G deployment in terms of growth and monetization.

Example one: Frontrunners grow faster

A group of operators are successfully turning data growth into revenue growth. Over the period 2012 to 2016, these 30 frontrunners achieved an average yearly revenue growth of 10 percent[5] through delivering a combination of world-class user experience and the most attractive offerings in their respective markets, and by continuously investing to stay ahead of the competition.

In this context, 5G is a means to deliver customer value in an increasingly competitive market. It enables both traffic growth and an improved user experience, thereby allowing the monetization of new high-demand services, such as mobile video offerings. Enabling data growth is a prerequisite to revenue growth.

Figure 3: Frontrunners turn data growth into revenue growth (percent)

Source: Strategy Analytics, 2017

1 Thirty frontrunners achieved an average yearly revenue growth of 10 percent

2 By rolling out 4G ahead of its competitors, Operator A increased overall revenue by close to 60 percent

3 Operator B leveraged its technology leadership to gain market share – today at a significant 50 percent

Monetization through first-mover advantage

The introduction of new technology has the potential to shift market positions. The market potential of 5G can be estimated by looking at the impact of 4G when it was introduced in 2011 to 2012. Many of the operators that deployed 4G early subsequently gained strategic advantages, such as higher market share, lower churn and increased average revenue per user (ARPU).[6]

Example two: Growth through improved monetization[7]

In 2011, Operator A was in a challenger position, with an ARPU 25 percent lower than its competitors and a market share of 17 percent. With a strong rollout of 4G, timed ahead of its competitors, Operator A increased its market share by 3 percentage points and ARPU by 30 percent – resulting in an overall revenue growth of close to 60 percent. Today, seven years after the introduction of 4G, these first-mover advantages can still be seen.

Example three: Growth through extended leadership[7]

Operator B was in a market-leading position in 2012, with a 44 percent market share. Operator B strengthened its position as a technology leader through introducing 4G six months ahead of its competitors, and has since consistently held the highest market share of 4G subscribers. Rather than skimming the market with the highest prices, Operator B leveraged its technology leadership to gain market share – today at a significant 50 percent. Overall revenue has increased by 20 percent.

[5] Ericsson, Growth Codes – Operator Strategies, 2017

[6] Ericsson analysis of the introduction of 4G in the 15 largest countries

[7] Strategy Analytics and GSMA Intelligence, 2017

COMPARING DEPLOYMENT SCENARIOS

As data traffic rises, the capacity of networks needs to be continuously upgraded. When the available 4G capacity is no longer adequate, the network must be densified by adding new sites – either macro sites or small cells. This is where 5G spectrum and capacity could offer an alternative path. By providing an optional way to expand capacity, costly network densification could be avoided.

The network investment decision for 5G is, to a large extent, based on a comparison of the following:

- The cost of building new sites equipped with 4G-only technology
- The alternative cost of deploying 5G radio equipment in a new spectrum band

In addition to these cost considerations, there are market advantages to gain from 5G deployment.

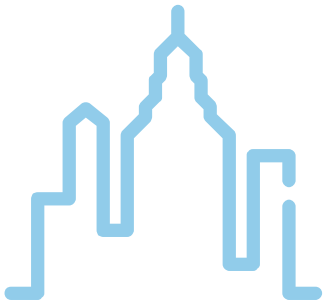
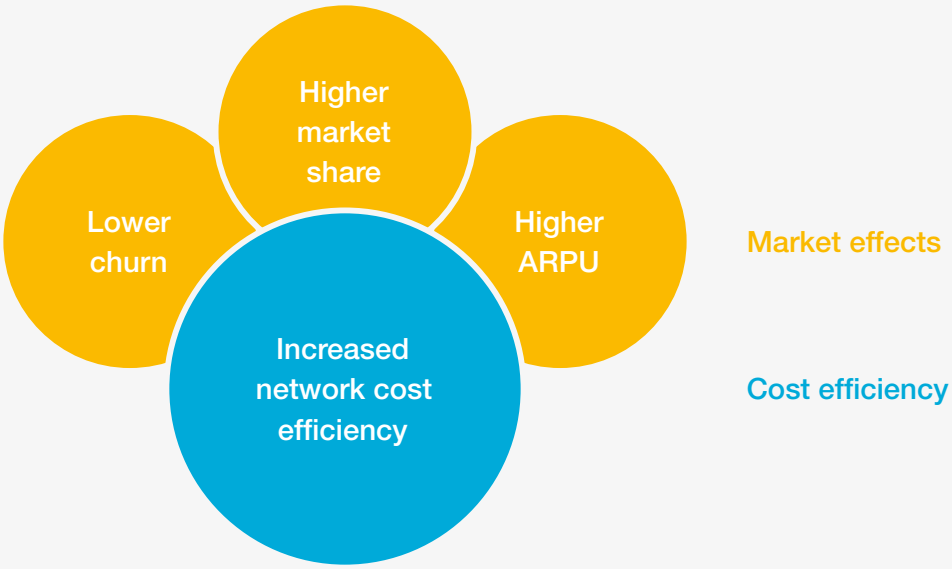


Figure 4: Impact of a 4G+5G scenario in comparison to 4G-only



Modeling a city network

This case study compares two network deployment scenarios for a mid-sized European city:

- The 4G-only deployment scenario
- The 4G+5G deployment scenario

The 4G-only scenario comprises capacity expansions on available 4G spectrum. These are existing assets that are not yet fully utilized.

In the 4G+5G scenario, the operator deploys new 5G technology, significantly adding to the existing capacity per site. 5G-enabled devices will be required to make use of this network capacity. As 5G device penetration increases, the full potential of the 5G assets will be realized.

The site evolution of an operator is here modeled in six steps, representing the capacity expansion on different radio frequency bands. The first five steps utilize the already available 4G spectrum and the last step expands through the new 5G spectrum.The 5G Plug-In feature Massive MIMO is introduced in the fifth step, significantly increasing spectral efficiency of the 4G spectrum assets.

In total, 80MHz of available 4G FDD/TDD spectrum is assumed, representing the spectrum allocation of a typical European operator (allocated to the low and mid-bands, such as 800MHz, 900MHz, 2100MHz and 2600MHz), with the final 5G step adding 80MHz on mid-band (such as 3500MHz).

5G DEPLOYMENT TO BOOST CAPACITY

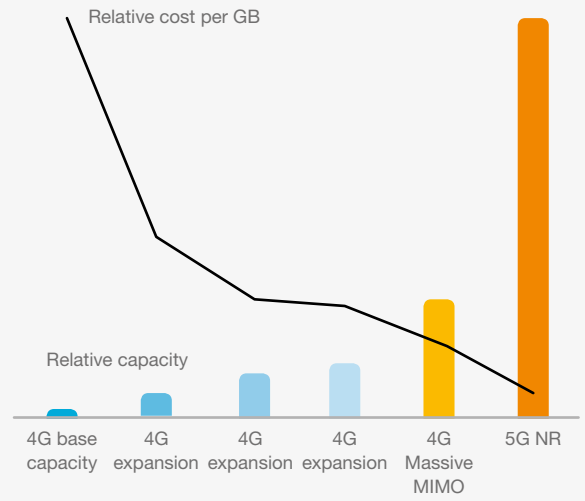
The modeled network in this study demonstrates that 5G will have an important role to play in meeting future capacity needs in a cost-efficient way. It also highlights that 5G capacity could be deployed incrementally, when and where needed, to ensure a sound business case.

Significant capacity contributions from Massive MIMO and 5G

As can be seen in Figure 5, each evolution step adds capacity to the site. The first four steps, utilizing 4G spectrum, add capacity in proportion to the bandwidth assets provided. However, the Massive MIMO step provides a much greater contribution to capacity, due to the high spectral efficiency. This functionality is also utilized in the last step (5G NR expansion). In addition to Massive MIMO, the 5G step leverages an 80MHz broad spectrum band and a 5G spectral efficiency gain, resulting in a huge contribution to capacity.[8]

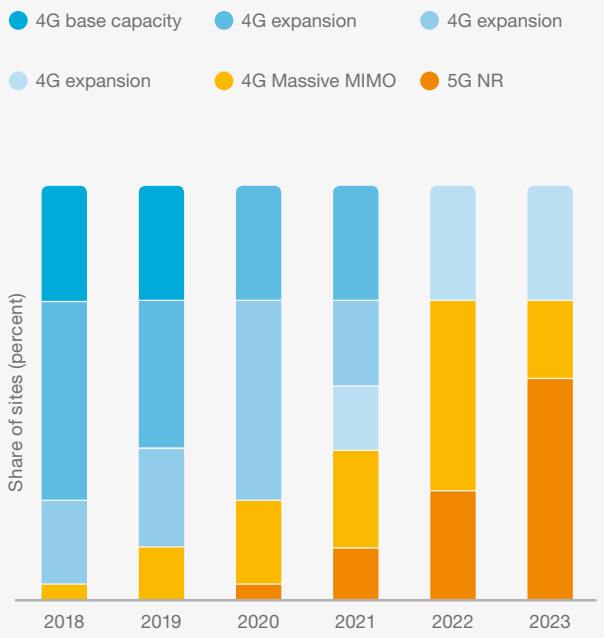
Along with the capacity increase at each step, the cost efficiency of the site also increases. A site fully evolved with 4G and 5G capacity will deliver mobile data 10 times more cost efficiently than a basic 4G site does today. On a network level, this efficiency gain will be needed to manage the significant increase in mobile data traffic, considering a limited capex budget.

Figure 5: Relative capacity and cost efficiency per step – assuming a fully utilized site



Source: Ericsson modeling

Figure 6: Network evolution to meet traffic demand



Source: Ericsson modeling

5G introduction strategies

Over the coming years, three phases of the evolution to 5G were identified:

1. Today

Before 5G spectrum becomes available, the need for additional capacity could be handled through 4G expansions on existing sites. Additional radio equipment should, however, be prepared for 5G. Operators deploying 5G-ready equipment ensure a competitive advantage once 5G is launched, through lower installation costs and faster time to market.

2. Near future

Operators need to consider 5G in their existing network densification plans. The new sites should be equipped with 5G radio from the start, allowing for further traffic growth and lower deployment costs (avoiding repeated site visits, as upgrades can be done remotely).

3. Mid-term

The number of 5G devices will increase and the true potential of 5G's network capabilities will start to materialize. In the 4G+5G deployment scenario, almost 30 percent of the sites will have implemented 5G as a sixth complementary capacity step by the end of 2023.

A proactive migration of high traffic users to 5G would result in network delivery improvements (for example, 4G offload), as well as improved retention within this high value customer segment.

[8] The spectral efficiency gain of Massive MIMO depends on parameters such as topology and user density. The most significant gain will be seen in dense urban environments, as modeled here

VALUE IMPACT OF 5G

Cost per gigabyte will continue to decrease

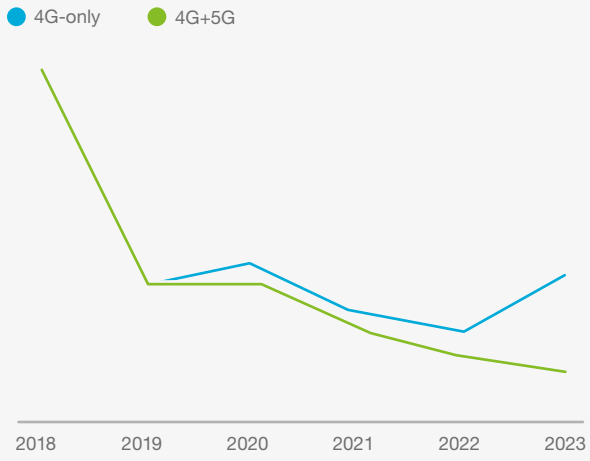
The modeled network shows two events around the year 2021:

1. The amount of traffic reaches a level where the capacity of 4G networks is not sufficient, even if the available spectrum is fully utilized (final expansion step).
2. The share of 5G-enabled devices increases to a substantial level, enabling the 5G NR expansion step of the network evolution. The 5G capacity offloads the 4G network and minimizes the need for new sites.

As seen in Figure 7, there is little difference between the costs of the two deployment scenarios up until 2020. As 5G spectrum is not yet available and 5G device penetration is low, any capacity expansion is done on the 4G network.

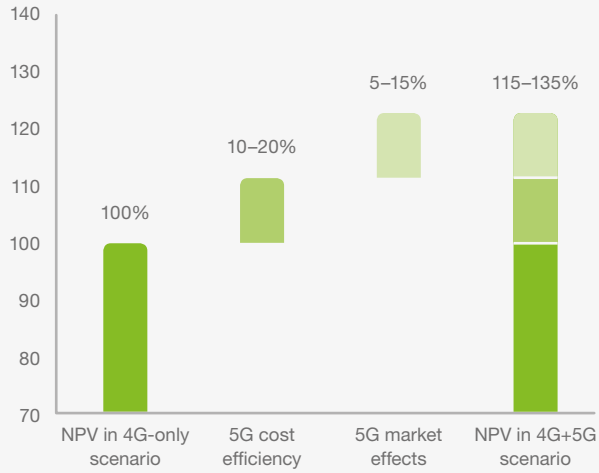
By 2023, there will be a significant need for additional capacity to cope with traffic and performance requirements. In the 4G-only scenario, a significant amount of the new capacity will be built on new sites; this will have a huge impact on production cost per gigabyte. In the 4G+5G scenario, on the other hand, the additional capacity provided by 5G is more cost efficient and the need for network densification is limited. As 5G device penetration increases, deployment of additional capacity will become increasingly cost effective.

Figure 7: Network cost (capex and opex) per gigabyte



Source: Ericsson modeling

Figure 8: NPV impact of 5G (percent)



Source: Ericsson modeling

A site fully evolved with 4G and 5G capacity will deliver mobile data 10 times more cost efficiently than a basic 4G site

To provide an overall valuation of the impact of 5G, the NPV of the two deployment scenarios was compared. This showed an improvement of 10 to 20 percent in the 4G+5G scenario – a direct consequence of the cost efficiencies provided by 5G.

5G provides additional market gains

In the previous market examples, we saw operators gaining a competitive advantage through early deployment of 4G. Today, it is 5G that has the potential to create new market opportunities. Based on assumptions[9] on improved monetization and first-mover advantages, an operator would boost its NPV by 5 to 15 percent, in addition to the 10 to 20 percent gain related to the cost efficiency of 5G.

Such market effects must be evaluated in each separate case. However, our analysis points to significant revenue and market gains presented by the introduction of 5G.

[9] Market gain assumptions: 3 percentage points increased market share, 10 percent higher ARPU for 5G users, 10 percent lower churn for 5G users. 5G users also assumed to consume twice the amount of mobile data

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