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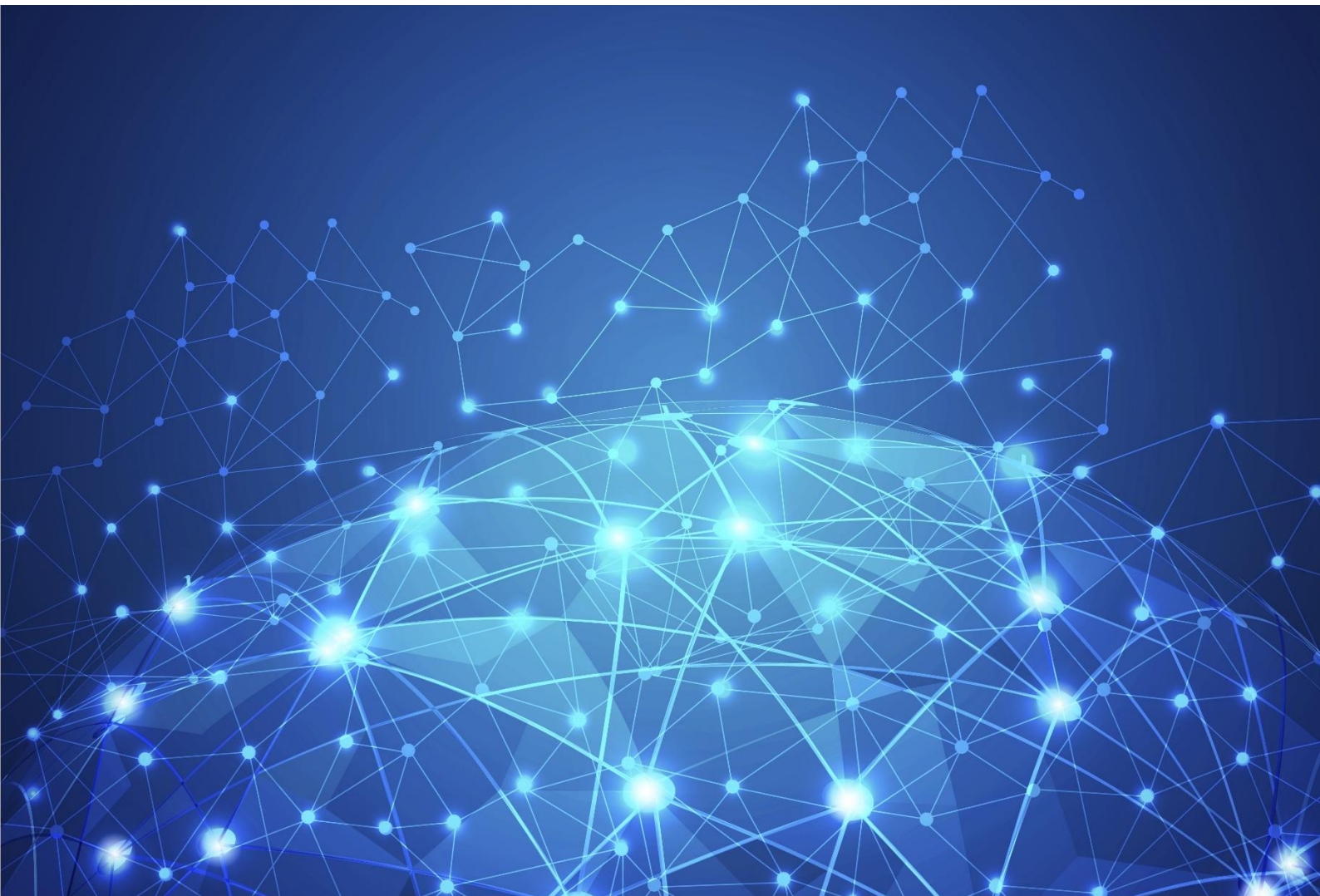
A transformative view on potential evolution of mobile broadband and voice market in India



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1. Executive summary

Analysys Mason has conducted this study to develop a view on the potential evolution of the mobile broadband (MBB) and voice market in India under a scenario of paradigm shift in key industry drivers such as data tariffs and the local content ecosystem.

The key drivers of growth in the Indian MBB market are: spectrum and network availability, device availability, data tariffs, the local content ecosystem, competing technologies (such as fixed broadband) and competing form factors (such as televisions and PCs).

A detailed assessment of these drivers suggests that, with the exception of data tariffs and the local content ecosystem, the remaining drivers have a favourable current state (and/or an expected promising evolution in the short-to-medium term) in terms of driving growth in MBB, and hence no paradigm shift is needed on the remaining drivers.

- India's current data tariffs (assessed based on current Average Revenue Per GB of INR228) are significantly higher than those of relevant developed (and developing) countries, when adjusted for per-capita incomes (to normalize for affordability levels). India's data tariffs (price of 1GB pack) as percentage of GNI per capita is currently 2.6%, whereas on an average the developed economies' data tariffs as percentage of GNI per capita currently stand at 0.4-0.5%.
- As far as the local content ecosystem is concerned, the GSMA index of mobile connectivity gives India a score of just 33 on state of content, compared to a typical score of 80 for the UK and the USA. India's score is held back by factors such as the wide range of languages spoken in the country (not being addressed by enough multi-lingual content), as well as a lack of mass-market digital products and services.

The potential evolution of the MBB market in India is then assessed under a scenario in which India reaches the levels of other mature markets in terms of reduction in data tariffs and development of the content ecosystem, while wi-fi offload levels and prevalence of form factors other than mobile remain significantly lower as compared to those mature markets:

- On data tariffs, we set up a transformative scenario where tariffs in India approach 0.42% of GNI per capita in FY20 (developed market levels) from the current levels of 2.6% implying a 75% drop in data tariffs (higher than historical trends) to establish FY2020 ARGB levels of INR57.
- On content ecosystem, our transformative future state scenario assumes that India will move from a current score of 33 to a more developed market score of 80 by implementing a number of significant initiatives, such as adding more multi-lingual content and developing more mass-market applications.

Our analysis concludes that a 75% cut in data tariffs (ARGB of INR57) alone could increase the MBB user base to 645–667 million SIMs, and the level of monthly data usage to ~4.2–4.3GB per SIM in FY20.

In addition, a paradigm shift in the content index score through significant improvement in the availability of multi-lingual content and mass-market digital products and services (in conjunction with a steep decline in data tariffs by 75%) could further increase the level of monthly data usage per SIM (after adjusting for a much lower Wi-Fi offload percentage in India of 17% owing to the shortage of fixed broadband infrastructure, and for limitations on other form factors for media consumption in India), to as high as 10.2GB in FY20. This is comparable to the pre-Wi-Fi data usage in developed markets such as US and UK.

The evolution of the MBB market could have a significant impact on the voice market primarily due to cannibalisation of traditional voice revenues with voice-over-Internet-Protocol (VoIP) and other over-the-top (OTT) applications. A detailed assessment of international case studies on the impact of VoIP and OTT applications on the voice market and the different strategies used by operators to address the decline in voice revenue suggests that voice is becoming commoditised in markets with high MBB penetration. As a result, its share of revenue has fallen to ~25% in some markets in 2015, and could reduce even further in the coming years. In our analysis, for voice we have set up a transformative scenario for India where voice accounts for only 10% of the average revenue per user (ARPU) in FY20 (in conjunction with the accelerated evolution of the MBB market given future state scenarios for key drivers).

Further, from the perspective of consumer affordability, an average monthly increase in data usage to ~10.2GB at the discounted tariff of ~INR57 per GB, coupled with a 10% contribution of voice, translates into a total (data + voice) increased monthly ARPU for an MBB user of ~INR645 in FY20 in our transformative scenario. When aggregated with consumers' annualised device expenditure, expenditure on telecoms equates to 2.7% of GDP per capita for the ~650 million MBB base in FY20. This is in line with the range of current developed country benchmarks (2.4–2.9%) for the same metric. Consumer expenditure on telecoms services and equipment as a percentage of GDP per capita is currently lower in India than in our international benchmark countries, but that could potentially be explained by the lack of a compelling service proposition. Also, if the convergence of wallet (between telecoms and media/entertainment expenditure) by means of content bundling is factored in, then the affordability analysis looks more promising.

From an industry structure perspective, we conclude that to make viable margins in a transformed scenario (data-led market with ARGBs of INR57), an operator will need a market share of approximately 18%. To get to that kind of market share in a transformative scenario, an operator will in turn need investments which only the four to five large operators in India could sustain in the medium to long term, thus having an impact on a potentially viable industry structure in the future.

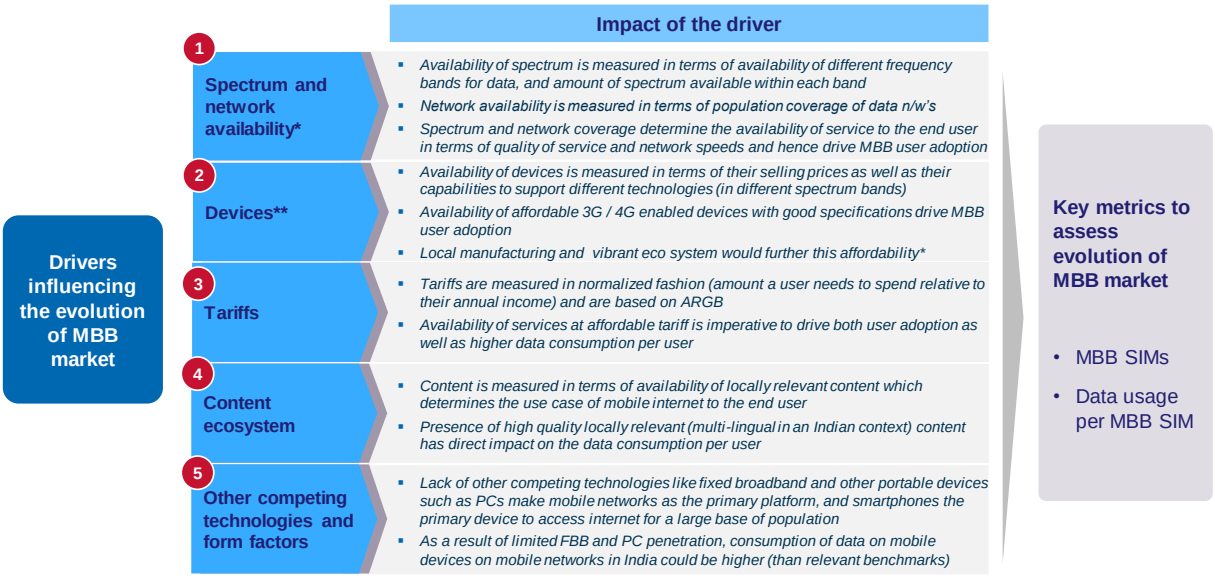
2. Assessment of MBB drivers in India

We start by examining the current state of the key drivers of MBB (and how they are expected to evolve in the short to medium term), and then identify areas for transformative change via intervention across the drivers.

The MBB market in India is still at a nascent stage. According to the Telecom Regulatory Authority of India (TRAI), there were around 120 million MBB subscribers in India as of December 2015, despite there being over 310 million[1] 3G-enabled devices in the market. As a result, there is a need to investigate the potential causes for the slow adoption of MBB services in the country.

In this section we assess the key drivers of growth in the Indian MBB market: spectrum and network availability, devices, tariffs, the content ecosystem, and other competing technologies and form factors. Their relative impact on the MBB market is measured in terms of one of the following two key metrics: MBB SIMs and level of monthly data usage per SIM. Figure 2.1 summarises the impact of each of these drivers on the Indian MBB market.

Figure 2.1: Growth drivers in the Indian MBB market [Source: Analysys Mason, 2016]



In the following sub-sections, we assess the current state of each of the five drivers listed above, and we identify those where a transformative change/intervention might be required.

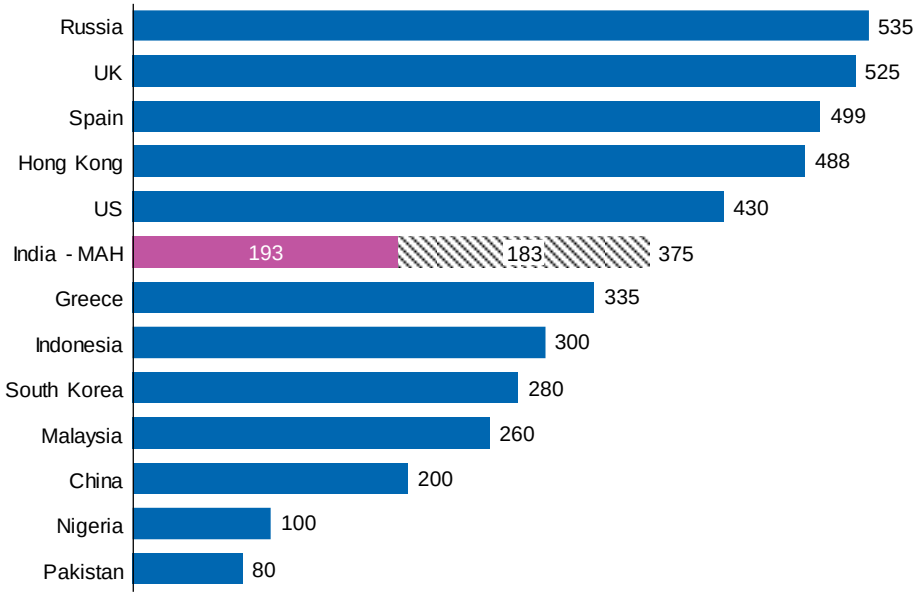
[1] *Source: Nokia MBiT Index 2016*

2.1. Spectrum and network availability

India no longer has a lack of available spectrum. In terms of network availability, for the first time supply will precede demand, with 4G coverage not being an issue.

Spectrum availability in India has improved significantly over the last few years as a sufficient amount of MBB spectrum is available at industry aggregate level. Figure 2.2 shows a comparison of MBB spectrum[2] in India (for Maharashtra, which has been chosen as a representative circle) against some of the developed and developing markets included in our benchmark. The dashed portion shows the amount of additional MBB spectrum that is expected to be auctioned in India in 2016.

Figure 2.2: Amount of currently allocated MBB spectrum[2] by country [Source: TeleGeography, 2016]



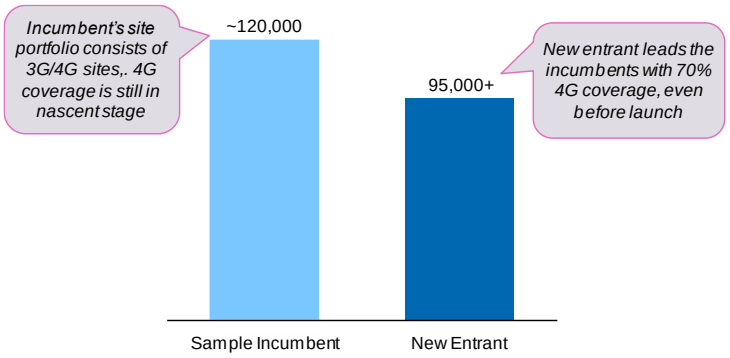
Availability of spectrum in India will improve even further (both in terms of capacity and availability of lower-frequency bands) given the amount of spectrum that will be available for auction during the course of 2016, spectrum sharing and trading and spectrum re-farming options.

As regards network availability, while 3G coverage in India is improving rapidly, 4G supply, in terms of network coverage, has exceeded demand for the first time in Indian telecoms history, driven by the new entrant's extensive 4G network roll-out. As seen in Figure 2.3, the new entrant claims to have already achieved 70% population coverage with over 95 000 4G sites. From a network availability perspective, this abundance of 4G supply could change consumers'

[2] *MBB spectrum for Indian circles has been calculated as a sum of 2*paired frequency division duplexing (FDD) spectrum in the 800, 1800 and 2100MHz band and 1*unpaired time division duplexing (TDD) spectrum in the 2300 and 2500MHz bands. For the other countries in our benchmark, MBB spectrum figures have been sourced from TeleGeography.*

consumption behaviour for the first time in the country as subscribers get access to higher-quality high-speed broadband networks.

Figure 2.3: Comparison of MBB supply in terms of number of sites Q1-2016 [Source: Analysys Mason, 2016]

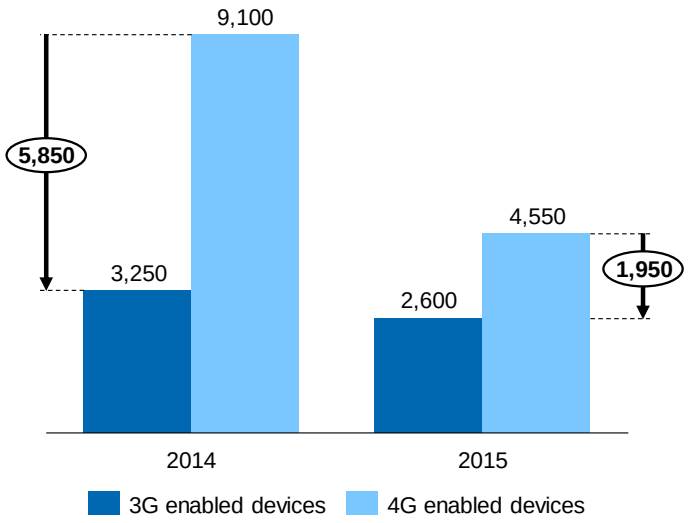


Given the promising situation on both spectrum and network (and with the situation expected to get even better in the near future), the MBB market India is well set for the next wave of paradigm shift and accelerated adoption. Furthermore, regulatory reforms on spectrum trading, spectrum sharing and proactive policy frameworks promoting Internet penetration towards a 'Digital India' augur well for the industry.

2.2. Devices

With the rapid convergence of 3G into 3G+4G devices, and a steep decline in prices, device availability and affordability could stop being a barrier to adoption in the coming years.

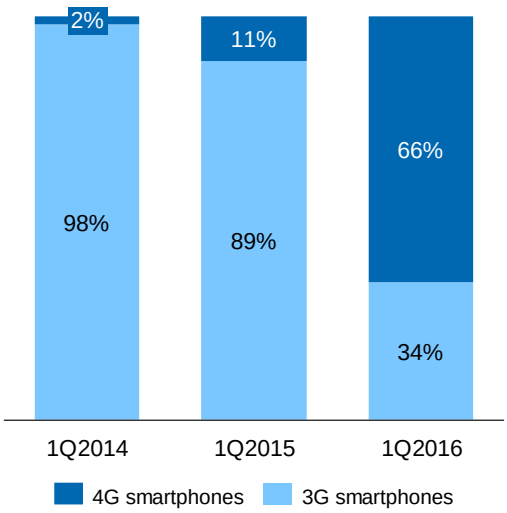
Figure 2.4: Decline in the price of entry-level 3G / 4G devices (INR) [Source: Nokia MBiT Index, 2016]



As illustrated in Figure 2.4, the prices of the cheapest available 3G and 3G+4G devices (with minimum specifications[3]) have been declining over the last few years. In addition, the difference in the prices of 3G and 4G devices has been converging at a rapid pace. As a result of continuing convergence between 3G and 4G device prices as well as the increasing proliferation of 4G networks, 4G device shipments as a share of overall smartphone sales have increased significantly in the last two years, as shown in Figure 2.5.

Further, with 4G device prices potentially rapidly converging with those of 3G devices in the coming years, smartphone shipments are expected to comprise mostly of both 3G & 4G capability rather than 3G-only smartphones. As seen in Figure 2.6, this trend is particularly evident in new launches and R&D trends of handset chipset manufacturers such as MediaTek, which announced the launch of only one 3G platform and around six new LTE platforms over the past year. In terms of chipset sales, MediaTek's LTE chipsets saw a five-fold increase in sales during 2014–15. This indicates a continuing shift towards LTE, both from a supply and demand side, as is apparent from leading indicators, the effect of which, if not yet apparent, will be seen in real handset sales in the coming years. Moreover, Government's 'Made in India' initiatives and renewed push by OEMs to manufacture locally (Samsung, Gionee, Foxconn, OPPO, etc.) in recent times are furthering this rapid convergence and availability. There are already trends with Indian device manufacturers launching 4G phones below INR3,000, which may further decline in over next 3-4 years.

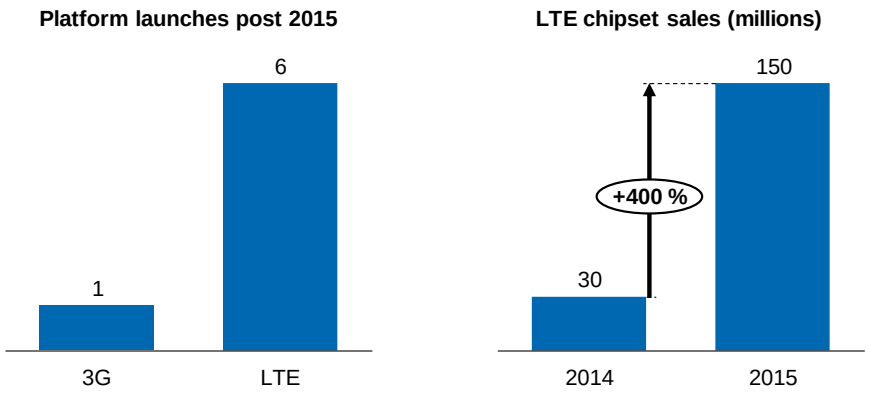
Figure 2.5: Split of smartphone shipments[4] by technology [Source: Cybermedia Research, Analysys Mason, 2016]



[3] *Price of a 3G/ 4G handset with at least 1GB of RAM and a screen size of more than 4 inches at the end of the year*

[4] *The split between 3G and 4G device shipments for 1Q 2014 is based on Analysys Mason estimates*

Figure 2.6: MediaTek's LTE chipset sales and platform launches by technology [Source: MediaTek, 2016]



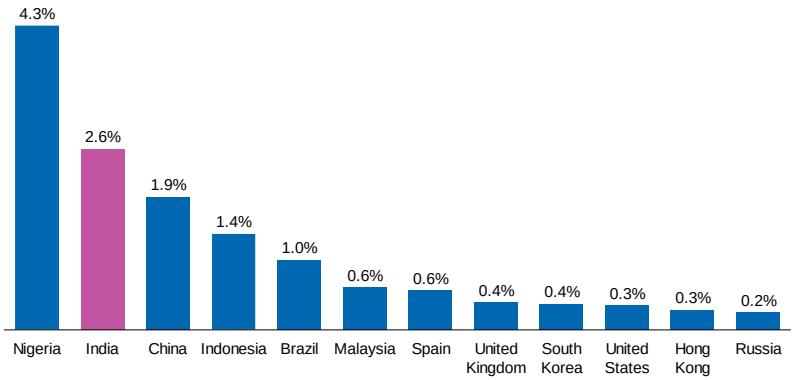
2.3. Tariffs

Data tariffs in India are quite expensive compared to other markets when adjusted for per-capita incomes, and a decline in tariffs can have a transformative impact on the evolution of the MBB market

Figure 2.7 shows a comparison of data tariffs in India against those in other countries. In order to compare the data tariffs across countries, we measure annualised realised tariff[5] per GB of data as a percentage of GNI per capita in order to normalise for per-capita incomes in the countries. The chart shows that an average user in India spends 2.6% of its annual income to consume 1GB of data per month, which is much higher than the average of 0.2–0.4% in the developed markets included in our benchmark.

Going forward, there is room for a further decline in data tariffs in India to reach a level that is more in line with the average in developed markets.

Figure 2.7: Benchmark of annualised realized tariffs[5] per GB of data as % of GNI per capita, 2015 [Source: World Bank, Analysys Mason, 2016]



[5] *Annualized realized data tariffs have been calculated as average revenue per GB multiplied by number of months in a year*

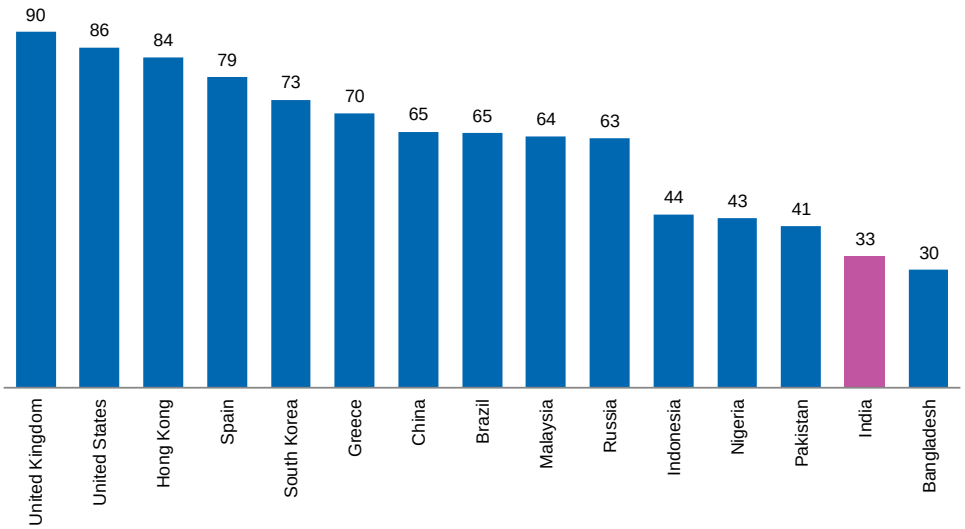
2.4. Content ecosystem

Locally relevant content is the other driver that is currently lacking (compared to other markets) and needs to be addressed for the next transformative leap in the evolution of the MBB market

Consumption of content, particularly short-format videos, has been the single largest driver of growth in mobile data usage in India. However, content availability has remained a challenge, especially among the non-English speaking masses. The enormous diversity of Indian population poses a unique challenge for content providers in the sense that a one-size-fits-all approach does little to improve availability of locally relevant content to the masses. Regional preferences play a significant role in determining content consumption patterns in various parts of the country.

India's lack of mobile content has also been highlighted in a recent report by the GSMA[6]. The report measures the content ecosystem across countries in terms of two key indicators: availability and local relevance. In terms of availability, limited accessibility of the top 100 apps to the average user is due to a lack of relevant content for the regional population in video and audio mobile apps (which drive a large share of data usage), driving India's score to as low as 23. India's low score (44) in local relevance is primarily driven by unavailability of non-video and website content in local and regional languages. Further, this is driven by the lack of mass-market utility applications such as e-governance services. The report indicates that India's content ecosystem lags significantly behind key developed and developing countries. Figure 2.8 compares content scores for a representative set of countries including India, which ranks lower than countries like Nigeria and Pakistan on the GSMA's content index score.

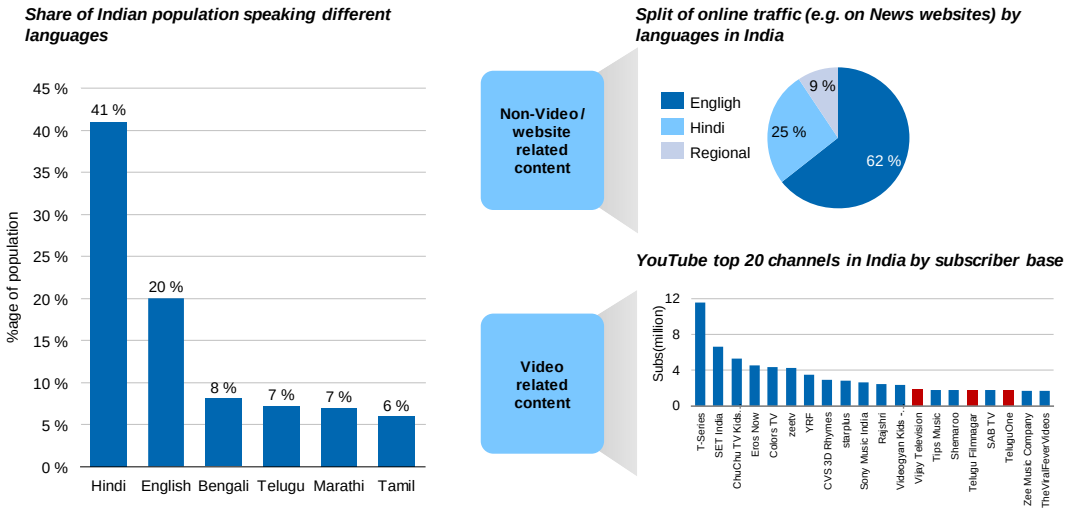
Figure 2.8: Mobile content index score by country, 2015[Source: GSMA Mobile Connectivity Index, 2016]



[6] *Source: GSMA Mobile Connectivity Index*

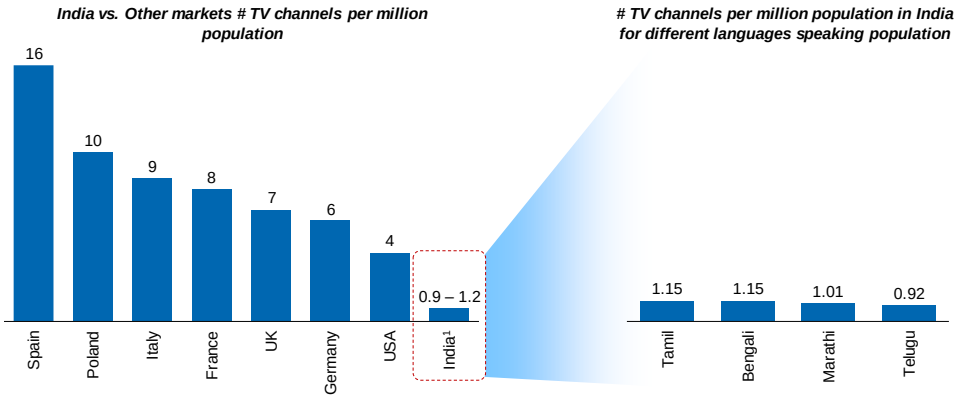
India's multi-lingual characteristic is a key driver of lack of relevant content ecosystem in India for a broad-based mass of population. Google estimates that the next 300 million Internet users in India will come from the non-English speaking population. However, at present supply is heavily skewed towards English content, which is of little relevance to the next wave of Internet users in India. As shown in Figure 2.9, English is spoken by only 20% of the population, whereas its share of traffic of non-video content on the web is as high as 62%. Similarly, of the top 20 channels on YouTube in India, there are only 3 channels serving content in regional languages. The cognisance of this fact has led technology giants such as Facebook and Google to incorporate support for additional regional languages in their products. Google's recently launched Indic Keyboard supports 11 Indian languages, including Hindi, Bangla, Punjabi, Assamese, Oriya, Gujarati, Marathi, Tamil, Telugu, Malayalam and Kannada.

Figure 2.9: Comparison of vernacular content demand and supply landscape in India, 2015 [Source: Census, Industry inputs, Vidooly.com, 2016]



The lack of relevant content is also indicated by the limited number of regional language TV channels (on a per-capita basis) which are available in India compared to other markets. A large amount of video consumption on mobile devices is driven by usage of online TV and OTT video, which partly depends on the availability of regional content on traditional media. As shown in Figure 2.10, availability of regional language content within traditional media in India (in terms of TV channels for regional language speaking population) is far lower than the global benchmarks.

Figure 2.10: Estimated TV channels available per million population for key regional languages in India and other markets, 2014 [Source: Industry reports, Analysys Mason, 2016]

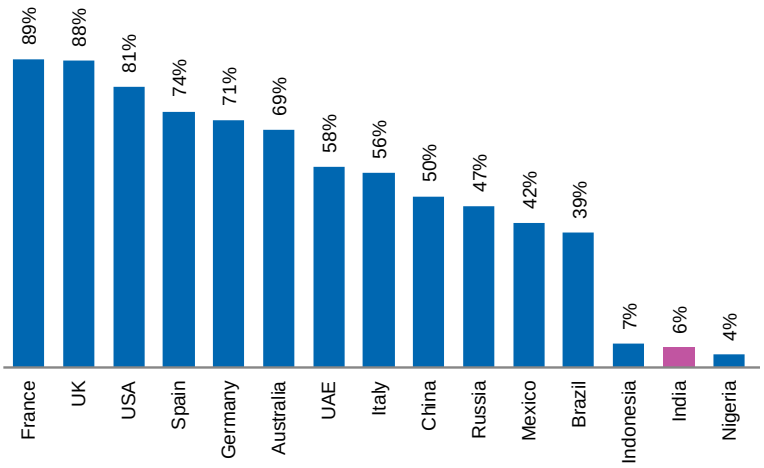


2.5. Other competing technologies and form factors

Both fixed broadband (FBB) and large-screen form factors have limitations, making MBB the primary platform for data usage

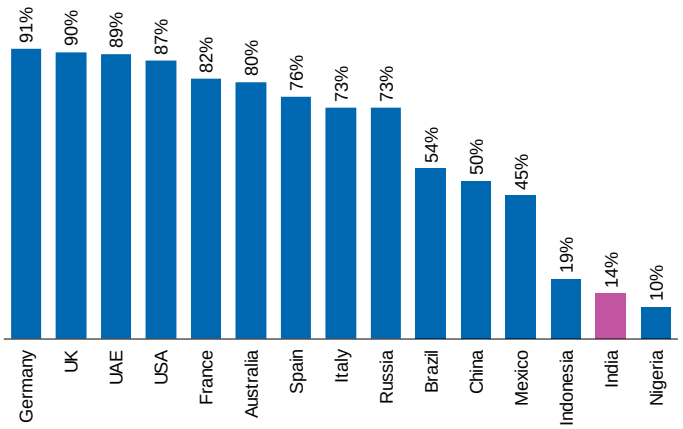
When benchmarked globally, penetration of FBB is significantly lower in India than in other developed markets. Figure 2.11 shows a comparison of FBB penetration in India and other markets. At 6%, India has one of the lowest FBB penetration, whereas its other BRIC (Brazil, Russia, India and China) peers have penetration rates of 40–50%. A direct consequence of low FBB penetration is that the Wi-Fi offload factor in India is currently at ~17%, which is far lower than the global benchmarks of 60–80%. While FBB penetration in India is expected to increase in the period to 2020, FBB adoption is still expected to remain limited to the top 50 cities of the country. Hence, Wi-Fi offload is not expected to increase dramatically in India, especially in the short to medium term.

Figure 2.11: Competing technologies: Household penetration of FBB, 2015 [Source: Analysys Mason, 2016]



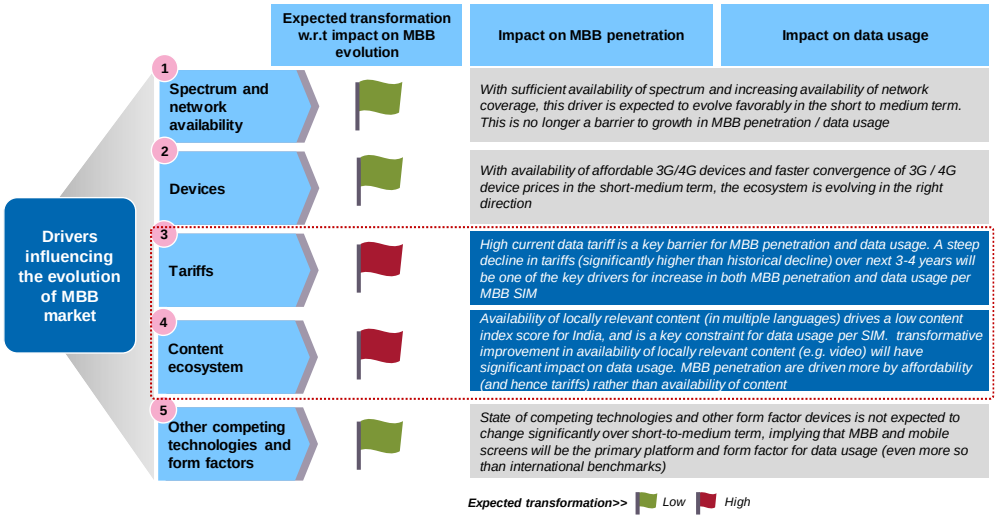
In terms of availability of form factors other than mobile, the situation is almost identical. As shown in Figure 2.12, PC penetration in India stands at 14% of households, compared to 50% in China, 54% in Brazil and 73% in Russia. The developed markets are at a further evolved state of PC penetration. PC penetration in India is not expected to increase significantly due to affordability constraints. Hence, mobile is expected to be the primary mode of accessing content in the Indian market.

Figure 2.12: Competing form factor devices: Household penetration of PCs, 2015 [Source: ITU World Telecommunication & ICT Database, 2016]



In summary, as shown in Figure 2.13, data tariffs and the content ecosystem are two drivers where maximum transformative change needs to happen – this change will have an exponential impact on the MBB market. A decline in data tariffs over the next three to four years will address the affordability constraint and spur the adoption of mobile broadband in India. Also, the decline in data tariffs is likely to incentivise usage of mobile data as consumers' real income increases. MBB data usage will be further spurred by transformation of the content ecosystem, both in terms of availability and local relevance.

Figure 2.13: Key drivers influencing the evolution of the MBB market [Source: Analysys Mason, 2016]



3. Potential evolution of the MBB market with a transformative change in key drivers

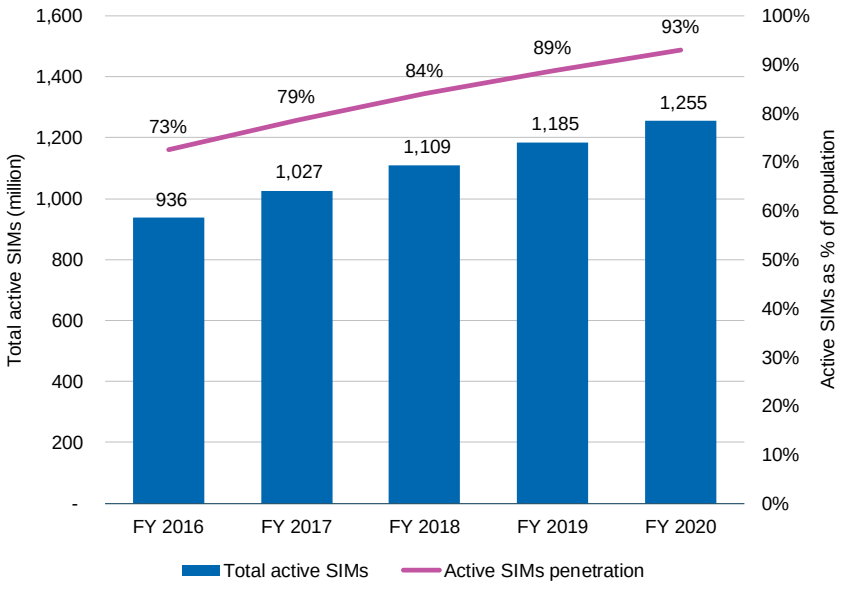
The objective of this section is to provide a perspective on the potential future evolution of the MBB market (data SIMs, monthly data usage per SIM, etc.) in India, assuming a transformative and unprecedented change in the drivers that were identified in the preceding section.

3.1. Evolution of the market for wireless active SIMs in India

The total number of active SIMs (the starting point for the MBB market forecast) in India is expected to grow to 1255 million by FY2020

In order to forecast the MBB market in India, we start by forecasting the total number of active SIMs in the country based on a benchmarking approach and driven by macro factors. We forecast the number of active SIMs in India to increase to 1255 million by FY2020, resulting in a SIM population penetration of 93%, as shown in Figure 3.1 below. Our forecast of active SIMs is based on the growth of mobile penetration across a set of countries which are in a similar stage of market maturity as the telecoms circles in the four categories – Metros, A, B and C. The results from our benchmarking approach have been further validated using a regression analysis of wireless penetration against GDP per capita on a set of developed and developing markets.

Figure 3.1: Forecast of total active SIMs [Source: TRAI, Analysys Mason, 2016]



Next, we set up a transformative future scenario across two key drivers (tariffs and content) – a steep decline in tariffs impacts MBB penetration and the level of usage per MBB SIM and while a transformative development in content availability has an impact on the usage per MBB SIM.

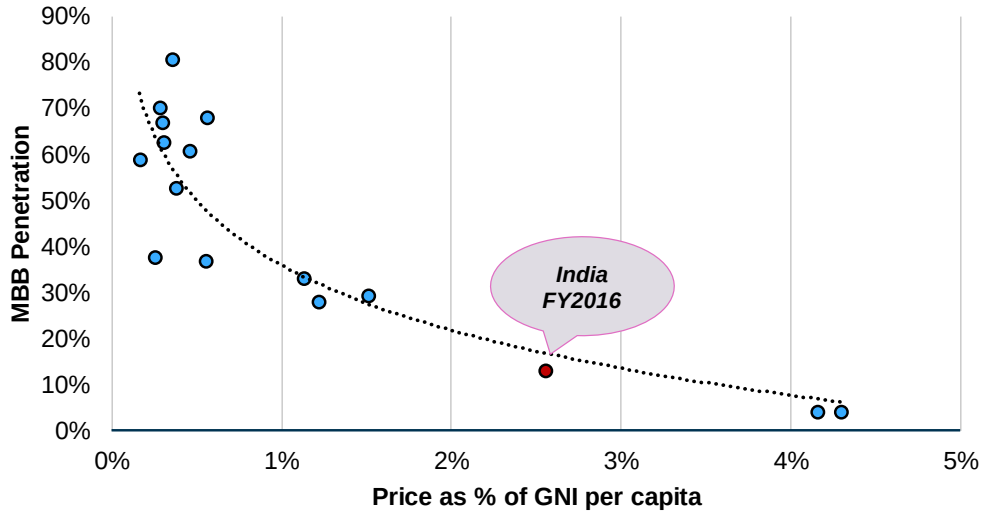
3.2. Evolution of MBB penetration in a transformative scenario

If data tariffs were to fall to a fourth of current levels, the MBB SIM base could reach 645–667 million by 2020, representing a 51–53% penetration.

Decline in data tariff is a key driver for accelerated adoption of MBB. We expect that devices will stop being a barrier to adoption of MBB in the short to medium term due to falling prices of 3G and 4G devices and the existing large user base of 3G-enabled device without 3G service subscriptions.

However, data tariffs will still need to drop from their current levels to developed market average (normalised for affordability) in order to accelerate the adoption of MBB in India. To quantify the impact of a steep tariff decline on MBB adoption, we estimated the correlation between MBB penetration and data tariffs as a percentage of GNI per capita in a number of developed and developing markets. Figure 3.2 shows the results of the regression analysis. As can been seen in the figure, a 75% decline in tariffs from their current levels could increase the MBB user base in India to 667 million by FY2020, representing a 53% MBB penetration.

Figure 3.2: Regression between data tariffs and MBB share of connections [Source: World Bank, Analysys Mason, GSMA Intelligence, 2016]



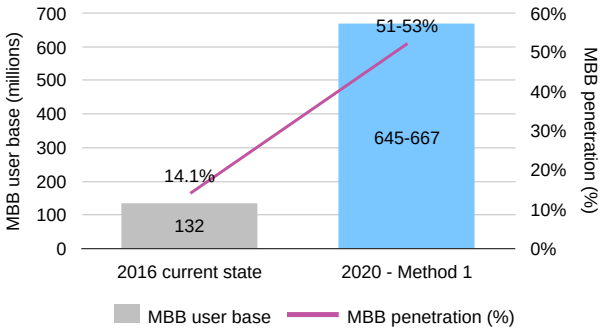
The results of our regression analysis have also been vetted by employing an approach from an independent study on impact of decline in data prices on adoption of mobile broadband. Basis a multivariate regression on MBB penetration as dependent variable and average mobile broadband price, GDP per capita, urbanization rate and mobile population coverage as key predictors, the study concludes that a decline in tariff of 1GB data pack by 1% results in an increase in MBB user adoption by 0.31%, ceteris paribus. A 75% price decline in the transformative case translates into a 55% price decline over the historical price decline trends by FY2020, which could lead to an additional increase in MBB penetration by 17% basis using

the approach in the study. This, in effect, means an MBB penetration of 51% by FY2020, reflecting a +17% penetration delta over the usual MBB penetration forecast.

Figure 3.3 shows the combined results of the above analyses.

Figure 3.3: MBB SIM forecast [Source: World Bank, Analysys Mason, 2016]

Parameter	2016 current state	2020 transformative case
Price per GB (INR)	228	57
Annualized tariff as % of GNI per capita	2.6%	0.42%



3.3. MBB data usage

Transformative change in data tariffs and simultaneous development of the content ecosystem (coupled with the limited nature of FBB penetration as well as other form factors for content consumption) have the potential to drive data usage of an average MBB user in India to as high as ~10GB per month by FY2020

Mobile data usage on 3G networks in India stood at 752MB per month[7] as of December 2015. Further, 3G traffic surpassed 2G in all circle categories in 2015 as 3G coverage continued to expand beyond Metros and Category A circles. The next wave of growth in mobile data usage will be ushered by the introduction of high-speed 4G networks in the country. On average, data usage per 4G subscriber is 1.6x higher than that for a 3G subscriber given the higher throughput of 4G networks (and hence better user experience for 4G subscribers).

In addition to the impact of faster throughput of 4G networks, transformative changes in both tariffs and content availability could have a significant impact on the growth of MBB data usage.

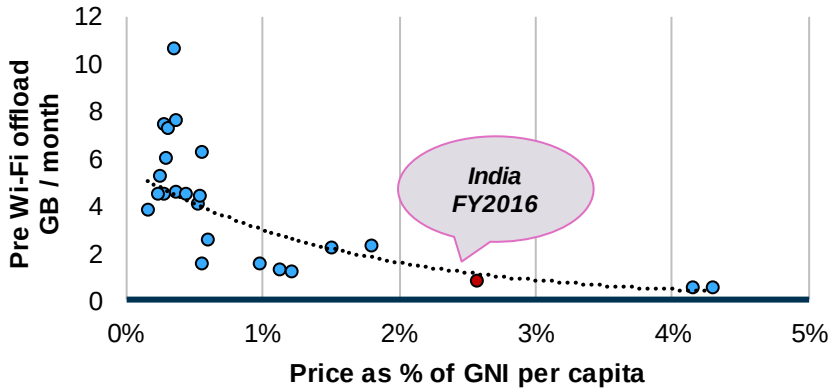
► *Tariffs*

From a data usage perspective, a 75% tariff decline alone could increase the level of monthly data usage per subscriber to 4.2–4.3GB.

[7] *Source: Nokia MBiT Index 2016*

At the current state of realised tariffs of INR228 per GB, pre-Wi-Fi offload data usage (i.e., total data usage on mobile devices on mobile and Wi-Fi networks combined) in India stands at around 900 MB per month. Figure 3.4 shows a regression analysis of data usage and realised tariffs as a percentage of GNI per capita. The red-dot on the regression line shows current data usage and tariff levels in India. The regression results highlight that a fall in real data tariffs is seen to lead to an increase in data usage across countries. A 75% decline in tariffs by FY2020 is expected to lead to an increase in data usage to 4.3GB per month (including the impact of higher throughput on LTE networks).

Figure 3.4: Regression analysis on data tariffs and Pre Wi-Fi offload usage per month [Source: World Bank, Analysys Mason, 2016]

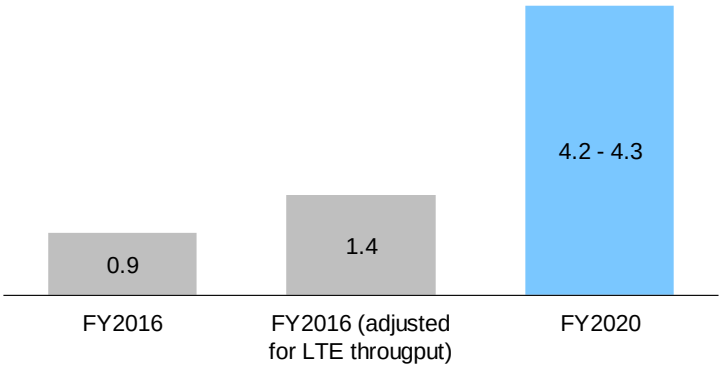


A supplementary analysis of price elasticity of data usage from 20 developed markets over a two-year timeframe (where broadband adoption and the content ecosystem remained unchanged over the entire period of observation) shows that the median price elasticity stood at 2.49. As a result, a 75% price decline could effectively lead data usage to grow to 4.2GB per month, provided content and user adoption remain unchanged.

Figure 3.5 shows the combined results of the above analyses. In conclusion, we expect the MBB user base to increase to 645–667 million in FY2020 with a transformative change in tariffs (leading to a 75% cut in ARGB).

Figure 3.5: Impact of price decline on data usage (GB / month) [Source: Analysys Mason, 2016]

Parameter	2016 current state	2020 transformative case
Price per GB (INR)	228	57
Annualized price as % of GNI per capita	2.6%	0.42%

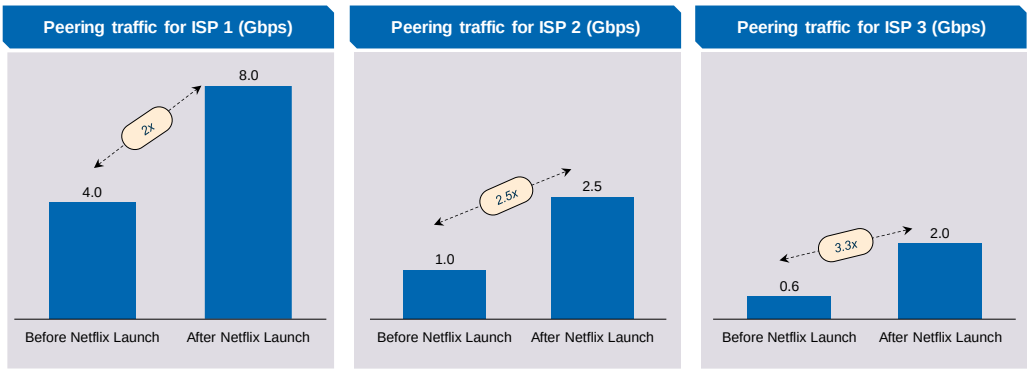


► *Content ecosystem*

MBB data usage could further jump to 6.5–9.5GB (pre-Wi-Fi offload) with transformative changes in the content ecosystem.

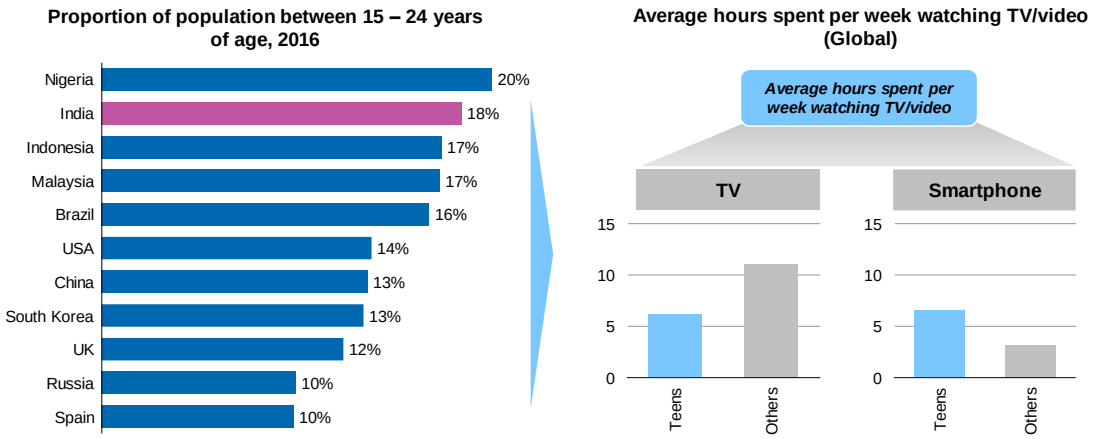
Along with decline in tariffs, availability of relevant content will be a key driver of increase in mobile broadband data usage. In Australia, for example, the recent launch of Netflix has led to a significant increase in data traffic, which shows that there is a high correlation between data usage and the availability of relevant content. Figure 3.6 shows the trends in data traffic in Australia before and after the Netflix launch in 2015. As can be seen in the figure, network traffic could drastically increase (2–3.3x) as a result of making relevant content available to the end-consumers. We expect that the impact of the launch of relevant content (especially in the form of videos) could be significantly higher in India considering the current limited availability of relevant content.

Figure 3.6: Peering traffic[8] observed in Australian Internet service providers (ISPs) – before and after the launch of Netflix [Source: IX Australia, 2016]



High sensitivity (of data usage) to content availability will also be driven by India's demographic dividend, with the youth segment driving higher usage on smartphones. As seen in Figure 3.7, the proportion of India's population aged between 15and 24 years is higher than in other developing and developed countries. It is this segment of the population that has been found to spend more time on their smartphones watching TV and videos than on traditional media consumption channels such as TV.[9]

Figure 3.7: Proportion of population aged 15–24 years and their content consumption patterns [Source: US Census Bureau, International Database, Ericsson Mobility Report, 2016]



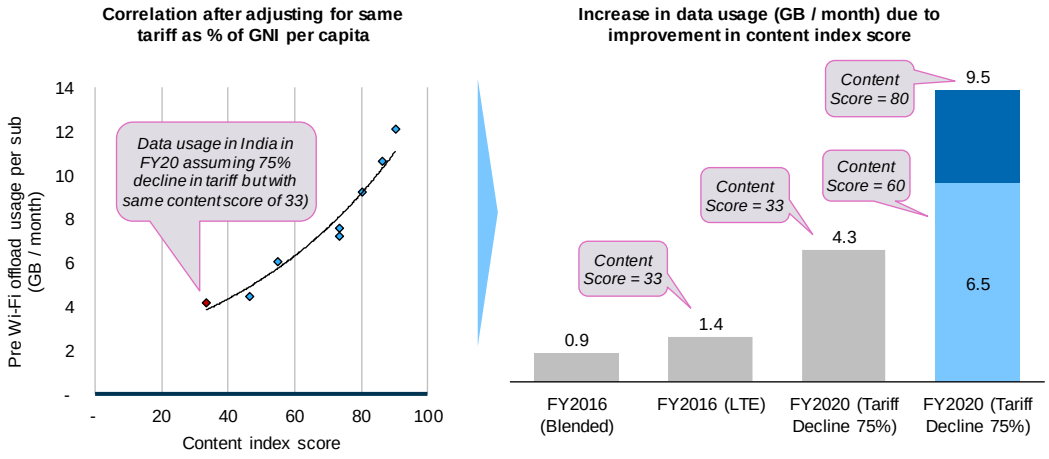
In order to quantitatively assess the impact of an improvement in the content ecosystem on data usage, we regressed data usage in a set of selected countries (whose price as % of GNI per capita currently stands at where India is expected to reach with 75% cut in tariffs in FY20, so as to isolate the impact of content from that of tariff cuts) against content score as depicted in GSMA Mobile Connectivity Index. This approach, as mentioned previously, helps to isolate for the impact of content improvement on data usage. Figure 3.8 shows the results of this

[8] *Refers to the traffic exchanged between networks like Netflix and an ISP or between an ISP and another ISP*

[9] *Source: Ericsson Mobility Report, 2016*

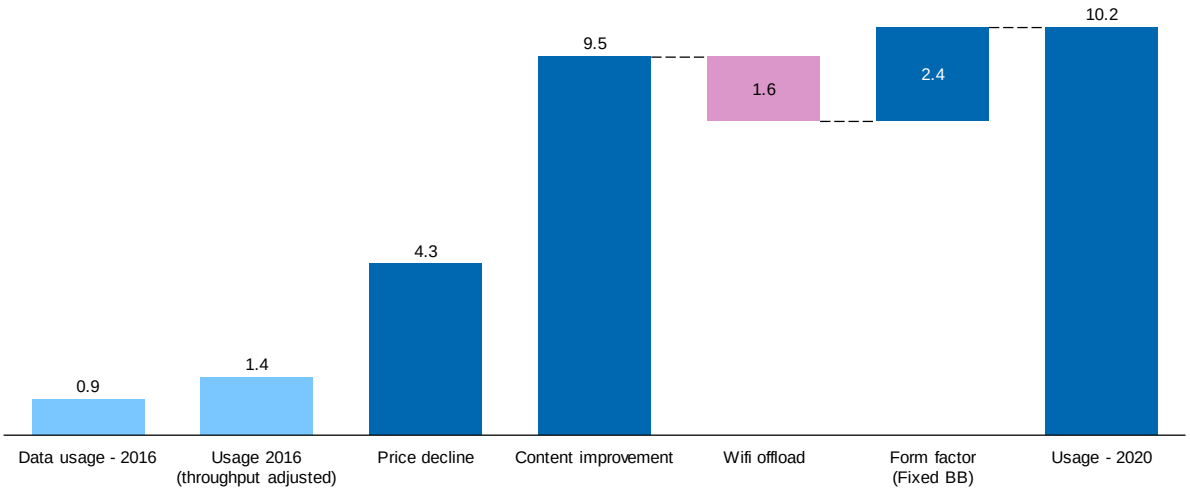
regression. Basis the regression, pre-Wi-Fi offload data usage per user in India could grow up to 6.5 GB if content index score improves to 60 and to 9.5GB if the score improves to 80.

Figure 3.8: Impact of improvement in content ecosystem on Pre Wi-Fi offload data usage (GB / month) [Source: GSMA Mobile Connectivity Index, Analysys Mason, 2016]



In summary, as shown in Figure 3.9, post adjusting for Wi-Fi offload and limitation of other (than mobile) form factors, data usage in India has the potential to grow to ~10.2 GB if tariff and content reach current global levels. This is comparable to the pre-Wi-Fi data usage in developed markets such as US and UK. Wi-Fi offload in India is localised to top 30 cities and is expected to remain highly concentrated. Hence, Wi-Fi offload percentage has been assumed to remain constant at 17% in 2020. As mobile is expected to be the primary content consumption device in India for a large proportion of MBB users in contrast to 2-3 devices for a broadband user abroad, a form-factor adjustment multiple of 1.3 has been applied on data usage post Wi-Fi-offload.

Figure 3.9: Data usage growth by 2020 (GB/month) [Source: Analysys Mason, 2016]



4. Potential evolution of the voice market resulting from an increase in MBB penetration

In this section we assess the impact that an increase in OTT adoption may have on the voice market in India (in terms of contribution in total revenue), and how operators could potentially respond to offset the expected decline in voice revenues in the short to medium term.

Increasing smartphone penetration and adoption of data services and OTT applications have resulted in substitution of legacy voice calls with IP-based messaging and calling. This emerging trend is leading to a decline in operators' voice revenues, which have historically accounted for the majority of their service revenues. Operators in various developed and developing markets where adoption of OTT applications has grown significantly have already started witnessing a decline in their voice revenues, while in India the impact is not yet significant due to limited smartphone / OTT penetration. However, operators in India are expected to face a similar situation in the future due to the rapid increase in smartphone and MBB user base, and hence they need to develop strategies to minimise the impact of a significant decline in their voice revenues.

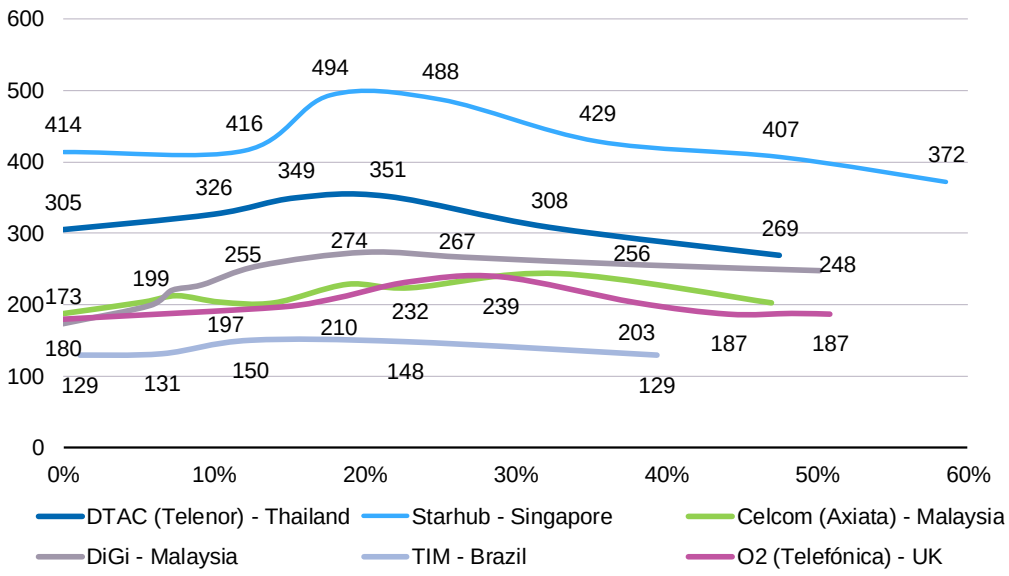
In order to assess the future evolution of the voice market, we first analyse the global trends around the impact of a higher adoption of OTT applications on voice traffic and revenues and compare it with the current situation in India. Further, we conduct a high-level assessment of different strategies that have been adopted by various operators globally to address the cannibalisation of their voice revenues. Finally, we assess the possible future evolution of voice services in India with respect to their contribution to operators' overall revenue.

4.1. Global trends and current state of India regarding the impact of VoIP on legacy voice services

Global trends suggest a decline in traditional voice usage after smartphone penetration in the network typically reaches 20–35%, due to VoIP substitution

A detailed analysis of historical trends of legacy voice usage per subscriber and growth in smartphone penetration suggests that typically post 20–35% smartphone penetration levels, voice usage per subscriber and hence voice ARPUs start declining. Further, this trend is not just limited to developed markets, but it is also observed in emerging markets such as Malaysia and Thailand, as shown in Figure 4.1. With growing smartphone penetration and MBB adoption, this trend is likely to occur soon in other developing markets as well.

Figure 4.1: Voice minutes per user per month (minutes) [Source: Analysys Mason, Operators' annual reports, 2016]



This decline in voice usage, coupled with increasing smartphone penetration, is primarily driven by substitution of legacy voice with data-driven OTT / IM applications. Though adoption of IM has had a greater impact across different categories of legacy voice usage, VoIP has also been increasingly driving substitution of legacy national and international voice usage, as shown in Figure 4.2.

Figure 4.2: Impact of VoIP and IM on legacy voice and SMS usage [Source: Analysys Mason, 2016]

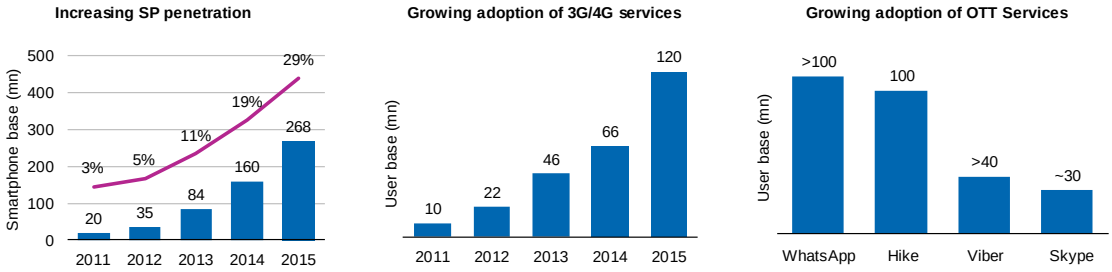
Services	Substitution by		
	VoIP	SMSoIP / Email	Social Networks
Voice - National	◕	◕	◑
Voice – International	●	◕	◑
Voice - Intl roaming	◔	◕	◕
Voice - Roaming Visitors	◔	◕	◕
SMS	○	●	◑

In India as well, with growing smartphone, data, and OTT penetration, a similar trend could take shape; the trend already evident in Metro and Category A circles.

In India, the cannibalisation of voice revenues is not yet significant due to limited smartphone and OTT penetration. However, the key drivers behind this trend – smartphone penetration, adoption of 3G/4G services and adoption of OTT services – have been evolving rapidly (as

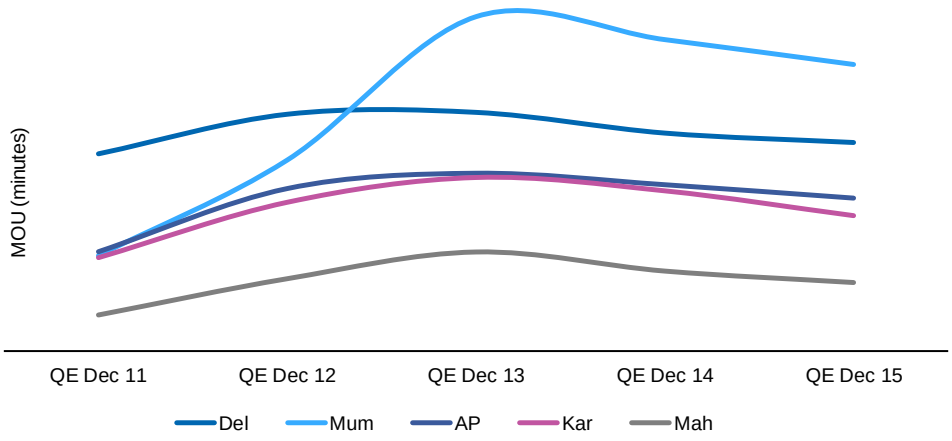
shown in Figure 4.3) and are expected to result in a decline in voice revenues for operators in the country.

Figure 4.3: Evolution of key drivers of voice usage cannibalisation in India [Source: Analysys Mason, 2016]



The impact of the evolution of the above-mentioned key drivers on voice usage is already visible in Metros and Category A circles where smartphone and MBB user penetration has increased beyond 30–35%, as shown in Figure 4.4.

Figure 4.4: GSM MoU trends in Metros and Category A circles [Source: TRAI, 2016]



4.2. Operators' strategies to address the impact on their legacy voice business

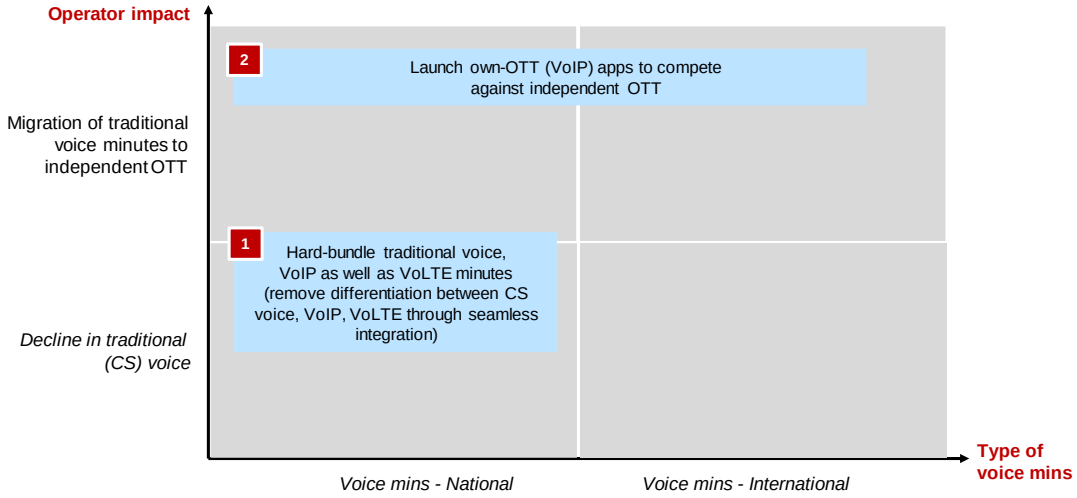
To offset this decline in traditional voice revenues as well as participate in the VoIP market, operators have adopted multiple strategies, ranging from offering voice bundled with data to launching their own OTT applications.

Operators in mature markets where traditional voice has started witnessing a steep decline have been adopting multiple strategies to minimise the impact on their voice revenues. Two key strategies that have been adopted by various operators globally are:

- hard-bundle traditional voice with data pack
- launch their own OTT applications to compete against independent OTT offerings.

Adoption of either of the two strategies mentioned above depends on the operators' objectives around the target user segment (e.g. national vs. international) and the potential impact on revenues (e.g. addressing the decline in traditional voice revenues vs. addressing the migration of traditional voice traffic to independent OTT applications). While the first strategy works primarily for national voice users and for addressing the decline in traditional voice revenues, launching its own OTT application allows an operator to target both national and international voice users and address the migration of traditional voice traffic to independent OTT applications, as illustrated in Figure 4.5 below.

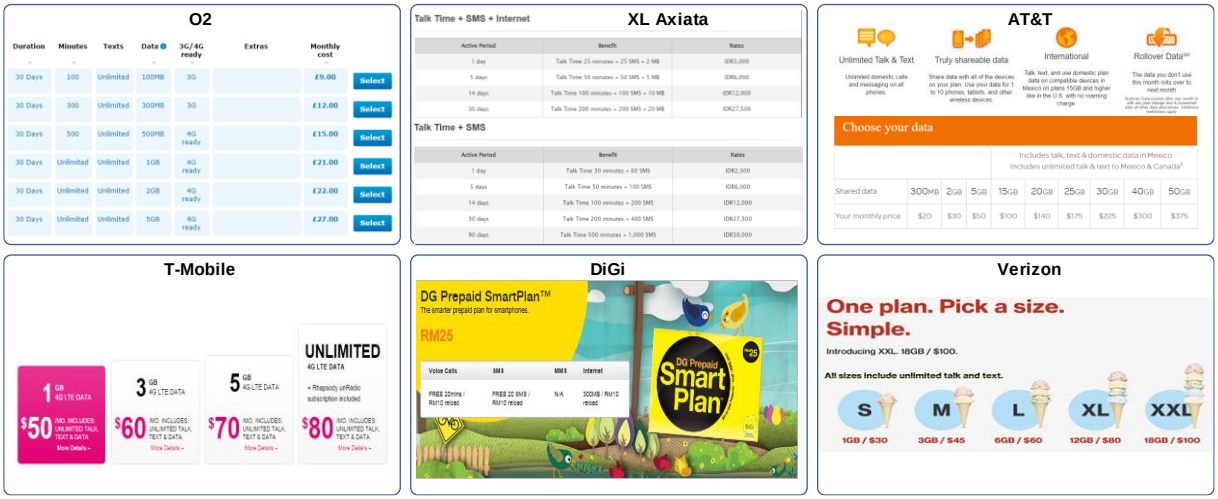
Figure 4.5: Operators' strategies on traditional voice and VoIP [Source: Analysys Mason, 2016]



► *Hard-bundle traditional voice with data pack*

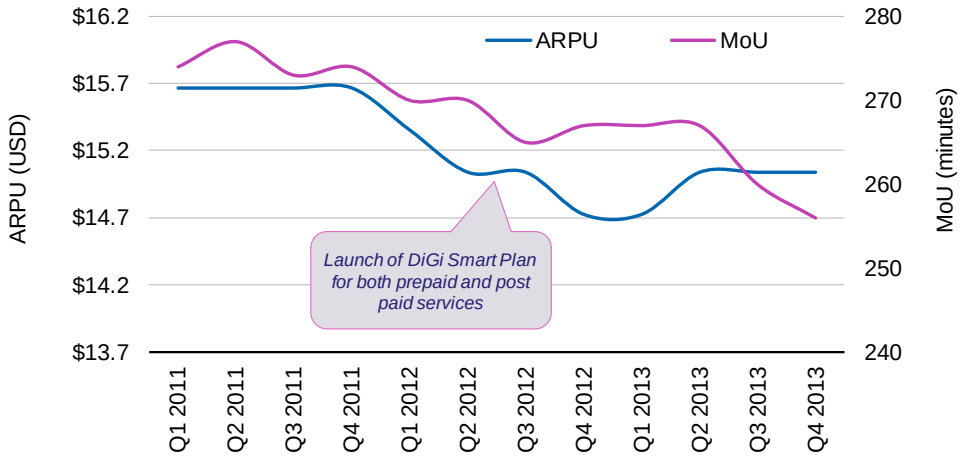
Hard-bundle is defined as a fixed amount of data, voice and SMS being offered as a bundled service offering for a fixed price. Hard-bundling voice with a data pack has been one of the most used strategies adopted by operators across markets in order to offset the decline in traditional voice revenue and hence to try to maintain ARPU levels. Operators in developed markets, such as the USA and Europe, have already established hard bundles as their core pricing proposition, while operators in developing markets have started to move towards bundles. Figure 4.6 illustrates examples of operators offering voice bundled as part of the data packs in different markets.

Figure 4.6: Examples of hard-bundles offered by operators globally [Source: Operators' websites, Analysys Mason, 2016]



Such hard-bundling of voice minutes has helped operators to maintain ARPU levels despite witnessing a decline in their voice MoU per subscriber. For example, DiGi in Malaysia launched multiple hard-bundles in Q2 and Q3 2012 specifically targeted at smartphone users. These hard bundles have helped DiGi to maintain its ARPU levels despite a continuous decline in MoU, as shown in Figure 4.7. However, the effective implementation of hard-bundles requires adoption of a detailed customer segmentation approach to identify different customer segments based on historical voice and data usage trends, and thereafter work out the most optimal / value accretive hard bundle for each customer segment that will drive adoption.

Figure 4.7: DiGi case study: Increasing ARPU despite reducing MoU [Source: Operator reports, 2016]



► *Launch of own OTT app*

Launch of a proprietary OTT application is another strategy that has been adopted by various operators in different markets. Though this strategy does not allow to minimise the decline in

voice revenues, it allows operators to maintain customer ownership and address revenue erosion to independent OTT service providers. Figure 4.8 provides a sample list of operators which have launched their proprietary OTT application and a high-level assessment of the impact these applications have had on operators' business.

Figure 4.8: Examples of proprietary OTT applications launched by operators in different markets [Source: Analysys Mason, 2016]

Operator (country)	Service	Details	Features	Impact (reasons for success / failure)	Standards supported
Telefonica	**Tu Go**	• Launched in March 2013 on O2 • Tu Go's success prompted Telefonica to move away from Tu Me	• Association of phone number to Tu Go account for device agnostic use • Customized voicemail • Visual voicemail	• Differentiated offering • Making phone number indispensable • Large user base	***Proprietary***
LG U+	**UWA**	• Fully LTE service offered by LG U+ • 3.7 million UWA subscribers as of Aug 2014	• Screen sharing, music sharing, location sharing • Sketching, camera sharing, gaming • Multi-tasking – use 3rd party surfing and gaming apps during voice call	• Enhanced functionality through multitasking while calling • Innovative offering, never-before seen features	***IMS – based***
Orange	**Libon**	• Launched in May 2012 • Standard feature cell is free; premium version offers ad-free 1 hour of free international calls	• VoIP - On-net & off-net calling, IP and SMS messaging, group chat, file sharing • Visual voicemail, sync and backup of contacts, message transcription • Chat feature where with non Libon users	• Differentiated offering ensured success of the service • Monetization of premium services • Integration with RCS allowing interoperability	***Proprietary, RCS***
SK telecom	**Joyn**	• Introduced VoLTE services in 2012 • Integrated many add-on RCS features in 2012-13	• RCS enables next generation messaging – integrated within SMS and HD Voice. • Available as app as well as embedded in phones	• Upgrades to Joyn to offer richer services • Expanded device support for RCS to include PCs & tablets	***RCS***

However, for an operator-owned OTT app to be successful, it is very important to offer a clearly unique and monetisable value proposition which goes beyond its competing OTT providers, as illustrated by the assessment of the Libon OTT application by Orange in Figure 4.9.

Figure 4.9: Libon (Orange) case study [Source: Analysys Mason, 2016]

Feature	Competition	Advantages
VoIP calling	Skype, Viber Media, fring, Google Voice	Ability to integrate with customers' calling plans for off-net calls; strong HD voice implementation
Rich messaging	WhatsApp Messenger, LINE, Skype, Facebook,	Integrated approach, including ability to handle SMS on Android
Single timeline communication history	Apple, Facebook, Google	Cross-platform presence; potential to interoperate in messaging; voicemail capabilities
Customisable visual voicemail	HulloMail, YouMail, also a feature of iOS	Strong feature set, particularly in the free iOS version; transcription available as standard

How Libon created value for Orange!

Increase in Revenues	• AUPU 250 minutes • 68% gross margin • Increase in international-inbound by 21%
New customer acquisition	• 25% of SOSH paid subscribers are new to Orange
Increased customer life span	• Decline in usage of competitor apps • Increased user life span on Orange network

Difference in user base within 2 months of Libon launch

Skype	↓ 10%	***Tango***	↓ 56%
FaceTime	↓ 22%	***Viber***	↓ 79%

4.3. Evolution of voice with increasing MBB penetration

In summary, whether through bundling or through launch of own OTT applications, voice is getting commoditised and its share of revenues has declined to ~25% in some markets

A high-level assessment of the contribution of voice to overall service revenues for a number of operators in developed markets suggests that despite offering voice hard-bundles or their own OTT applications, voice revenues as a share of total service revenues have declined to up to 25% in some markets, as shown in Figure 4.10.

Figure 4.10: Voice revenues as share of total service revenues in representative markets (2015) [Source: Analysys Mason, Industry Reports, 2016]

The contribution of voice could further decline in future, especially with the increased adoption of VoIP / OTT applications. Consequently, in our analysis, for voice we have set up a transformative scenario for India where voice potentially remains only 10% of ARPU in FY2020 (in conjunction with the accelerated evolution of the MBB market given future state scenarios for key drivers).

5. Consumer affordability and industry structure in an evolved MBB and voice market

The objective of this section is to assess consumer affordability and the MNO industry structure in India if a paradigm shift occurs in the MBB and voice markets.

The consumer affordability analysis primarily includes an assessment of a potential ARPU range in a significantly evolved MBB market, and analysis of how those ARPUs map onto the MBB user base's affordability levels. From the supply side (MNO) perspective, the evolution of the MBB market could have a significant impact on the MNO industry structure, especially with regard to operators' affordability levels to make necessary investments in spectrum acquisition and network expansion and sustain on a financially healthy basis.

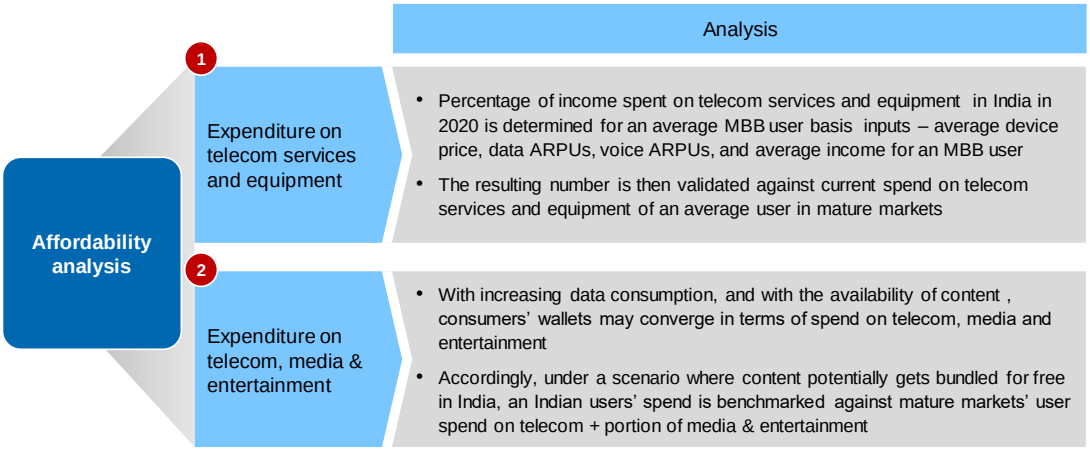
5.1. Consumer affordability analysis

In the transformative case, consumer expenditure on telecoms services as % of their annual income in India would become similar to that in other mature markets, driven by availability of affordable services and compelling content bundled with services, which in turn could lead to convergence of wallet spend between telecoms and media & entertainment

An affordability analysis has been undertaken to validate the consumer's ability to pay resulting ARPU if transformative changes occurred on MBB drivers and voice. For that, we have primarily used two methodologies as shown in Figure 5.1 based on:

- **Expenditure on telecom services and equipment** in which we estimate the resulting % of income spent on telecom services and equipment (as per the forecasted device price and data / voice ARPU) and validate it against current expenditure on telecom services and equipment in mature markets
- **Expenditure on telecom, media and entertainment** in which we assess the potential convergence of consumers' wallets in terms of expenditure on telecom, media and entertainment

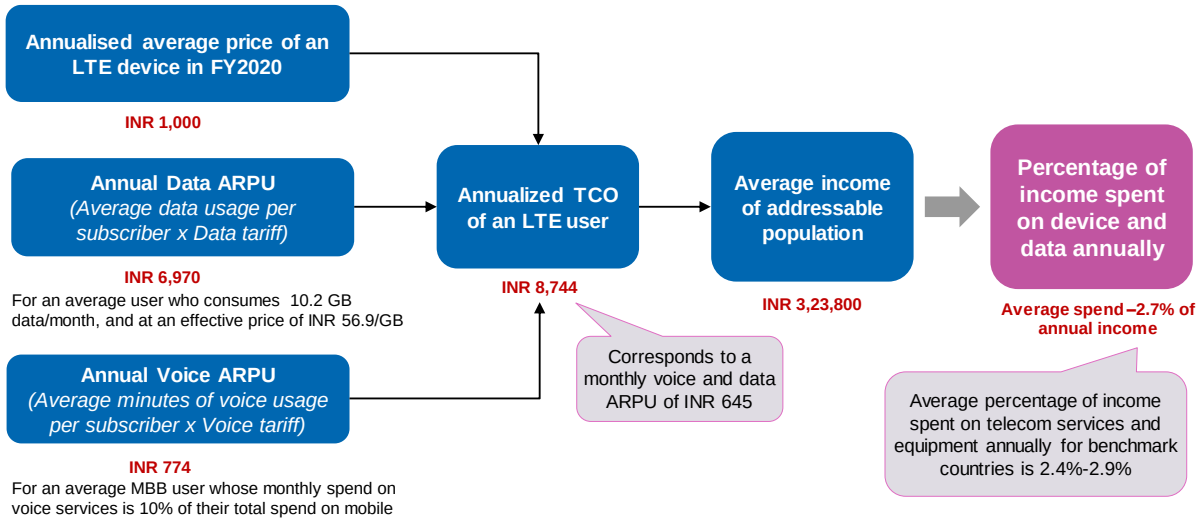
Figure 5.1: Methodology used in affordability analysis [Source: Analysys Mason, 2016]



► *Expenditure on telecom services and equipment*

Affordability analysis for an average MBB user in FY20 in transformative case suggests % income spent on telecoms is 2.7%, which is in the range of international benchmarks as shown in Figure 5.2

Figure 5.2: Affordability analysis for an average user in transformative case (FY2020) [Source: Analysys Mason, 2016]



The total expenditure of an MBB user on telecoms comprises expenditure on mobile device and data and voice services. With the evolution of 3G/4G device ecosystem, we forecast the annualized amortization of device price of an average 3G / 4G enabled device to be ~INR1,000 in FY20. In addition, at an average monthly data usage of ~10.2GB at significantly discounted tariffs of ~INR57 per GB, an average MBB user would spend ~INR6,970 per annum on data services. Further, with higher adoption of data services and hence OTT applications going forward, in a transformative scenario, we assume average spend on legacy voice services to be ~INR774 per annum (~10% of an average user's total ARPU). Combining the expenditure

on all three components, an average MBB user needs to spend ~INR8,744 per annum on telecoms which would form ~2.7% of their annual income by FY2020 which is in line with the range of mature markets benchmarks of 2.4% - 2.9%.

% income spent on telecom services in India currently being lower than international benchmarks could be potentially explained by lack of compelling service proposition, as adjusting historical Indian ARPU's for GDP and inflationary increases would itself get us to a current year ARPU level of ~INR 500 or more per month.

In the transformative scenario when service tariffs become affordable and a compelling content and application ecosystem exists, consumers' expenditure on telecoms as % of their annual income could rise and become similar to the current levels in mature markets.

► *Expenditure on telecom, media and entertainment*

The affordability analysis looks even more compelling if we assume FY2020 telecom ARPU to include some convergence of wallet from media and entertainment expenditure, given bundling of content with data services.

Based on global benchmarks, an average user spends 1.0-1.1% of its annual income on media and entertainment services[10]. Combining this with telecom expenditure of 2.4-2.9% of annual income, the total % of income spent on average on telecom, media and entertainment is 3.4-4.0% in mature markets.

In the transformative case, with a significant decline in data tariffs and much more relevant content potentially being bundled with the service, there could be a convergence of consumers' wallets in terms of expenditure on telecom, and expenditure on media & entertainment services. As a result, a 2.7% expenditure of annual income on telecoms and a portion of media and entertainment for an average MBB user in India looks relatively affordable.

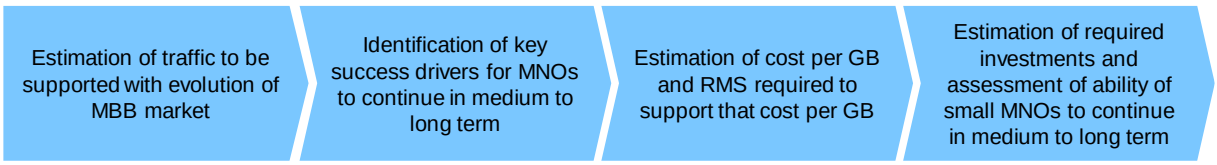
5.2. MNO industry structure analysis

A detailed industry structure analysis suggests that it might make sense for only four to five large operators to continue operating in the evolved MBB market in India in the medium to long term

The analysis around MNO industry structure in India focusses on both demand- and supply-side drivers of the industry in the evolved MBB market, as shown in Figure 5.3 below.

[10] *Estimated basis inputs from McKinsey Global Media Report, 2015*

Figure 5.3: Approach to assess operators' ability to support the necessary investments [Source: Analysys Mason, 2016]



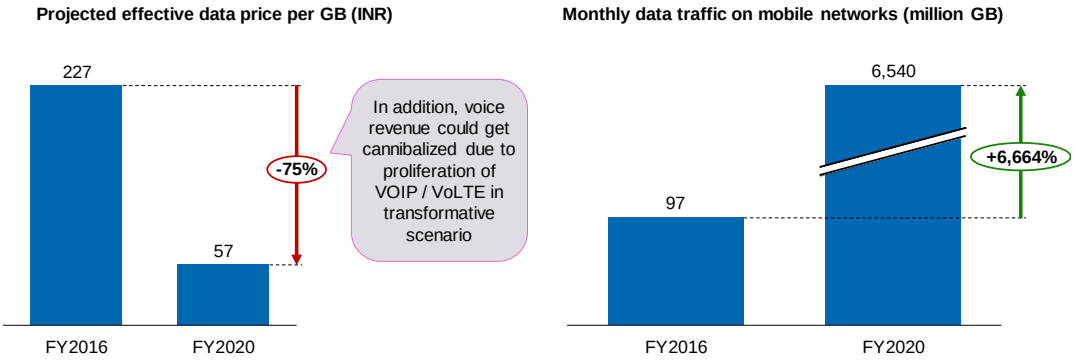
From the demand side, we estimate the total data traffic that would be generated on mobile networks in the evolved MBB market based on the forecast mobile broadband user base and data usage per MBB SIM.

From the supply side, we first identify key drivers for MNOs to succeed in the rapidly evolving MBB market in India. Then we estimate the market share an operator would need in order to keep its cost per GB of data lower than the revenue its gets on a per-GB basis. Subsequently, we estimate the capital expenditure required for an MNO in terms of spectrum costs and network roll-out costs in order to capture the target market share. Finally, we assess the ability of a relatively smaller MNO in the industry to make such investments in terms of key financial metrics such as annualised capex expenditure and interest coverage ratio.

► *Estimation of traffic to be supported with the evolution of the MBB market*

In the transformative case, traffic is expected to increase exponentially due to a steep decline in data tariffs, as shown in Figure 5.4.

Figure 5.4 Projected effective data price per GB (INR) and monthly data traffic on mobile networks (million GB) in a transformative case (INR) [Source: Analysys Mason, 2016]



The exponential increase in data traffic will result in a significant increase in network capex and opex in terms of deploying a large number of capacity sites as well as deploying a fibre network to support the backhaul. In order to support that, an operator would need significant resources to operate on a standalone basis in the medium to long term.

► *Identification of key success drivers for MNOs to continue in the medium to long term*

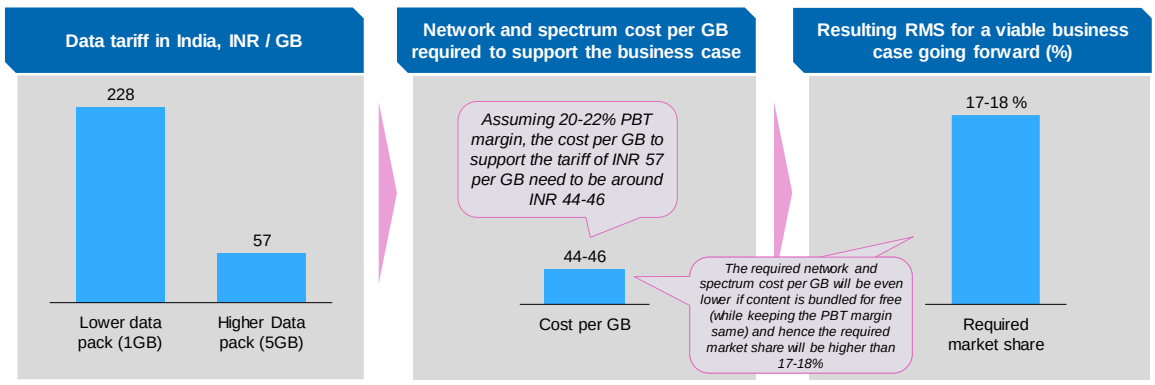
As a first step in the supply-side assessment, we have identified three primary drivers that could drive success of MNOs in the medium to long term, especially in the evolved MBB market:

- **Spectrum holdings:** In the transformative case, an exponential increase in data traffic will result in the requirement of multiple blocks of spectrum with a mix of low-frequency and high-frequency bands. Currently, some of the more established operators including incumbents and the new entrant have built a strong LTE spectrum holding across circles, leaving little room for relatively smaller players in the industry to match their spectrum holdings without incurring significant investments.
- **Network coverage:** In addition to spectrum, operators will need to invest in the launch and expansion of their 4G networks (particularly in the context of exponential growth in data traffic), which in turn will require significant capex and opex investment.
- **Revenue Market Share (RMS) to defend and/or differentiated offering to challenge:** On the one hand, established operators having high RMS have a valuable subscriber base to defend. On the other, a new and aggressive entrant could challenge with a potentially differentiated offering. In such an aggressive competitive scenario, and with lack of significant spectrum and/or network investments, a smaller operator could find it difficult to compete.

► *Estimation of cost per GB and RMS required to support that cost per GB*

In the transformative case, data tariffs are expected to decline to INR57 per GB by FY2020. In order for an MNO to maintain a healthy Profit Before Tax (PBT) margin of 20–22%, the cost per GB of data of the MNO should be INR44–46. Further, it is estimated that for an MNO to bring down its cost per GB to INR44–46, it would need to capture a minimum RMS of 17–18% especially with the high costs associated with network deployment including fibre-based backhaul, as shown in Figure 5.5.

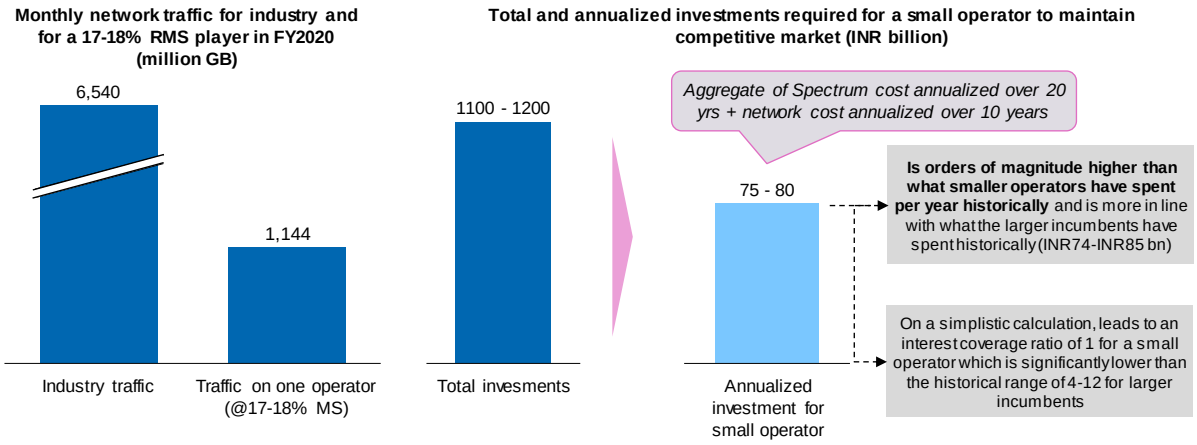
Figure 5.5: Supply-side analysis of industry cost structure (INR per GB) and required RMS for MNOs in the transformative case [Source: Analysys Mason, 2016]



► *Estimation of required investments and assessment of the ability of smaller MNOs to continue operating in the medium to long term*

Capturing a healthy RMS of 17–18% in order to lower its cost per GB to INR44-46 could require significant investments to the order of ~INR1,100-1,200 billion (INR 75-80 billion on an annualized basis[11]), as shown in Figure 5.6. This includes investments related to the acquisition of LTE spectrum bands inclusive of a cost-effective low-frequency band, and roll-out of approximately 150,000 LTE sites on a Pan-India level. Moreover, if the cost of acquisition of 700MHz spectrum and the costs of procurement of relevant content are considered, the costs could be even higher.

Figure 5.6: Monthly data traffic (million GB) estimated for an operator with healthy PBT, and total and annualised investments (INR billion) required for a small operator to maintain competitive in the market in a transformative case [Source: Analysys Mason, Company annual reports, 2016]



The aforementioned required investments are orders of magnitude higher than what some smaller operators have spent per year historically, and are more in line with what the more established operators have spent over last the few years (INR74-85 billion per annum). In addition, the interest coverage ratio for a small operator with 17–18% RMS and INR78 billion annual investments is estimated to be approximately 1, which is significantly lower than an interest coverage ratio of 4–12, as seen in the case of larger operators historically.

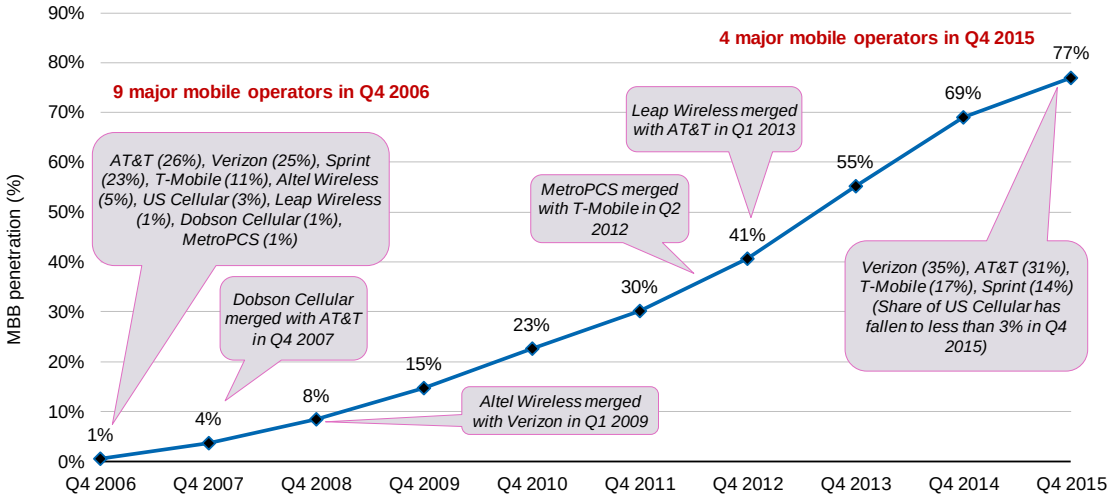
In summary, for an MNO to sustain 17–18% RMS in the medium-to-long term, the operator would need large investments in spectrum, network and operations which only the largest four to five players in the industry can sustain.

International examples such as the USA moving from 9 MNOs in 2006 to 4 MNOs in 2015 further the point of consolidated industry structure with the evolution of the MBB market. As observed in Figure 5.7, the wireless industry in the USA has consolidated significantly over the last decade. The number of major mobile operators (MNOs with more than 1 million connections) has reduced from 9 in 2006 (when 3G was launched in the country) to just 4 in

[11] *Basis the spectrum amortization period of 20 years, and the network cost amortization period of 10 years*

2015 (when MBB penetration reached close to 80%). Also, as observed globally especially in some developed markets, the top 2 MNO's together are often seen to have market share in excess of 50%.

Figure 5.7: Evolution of US wireless industry structure with the evolution of MBB market over the last decade [Source: Company Annual Reports, Analysys Mason, 2016]



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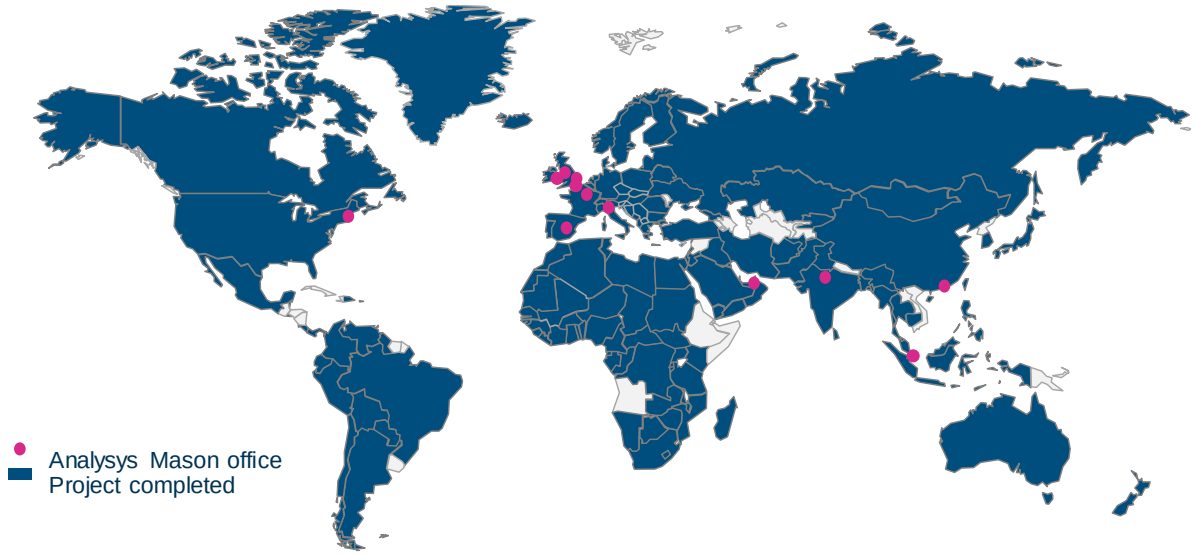

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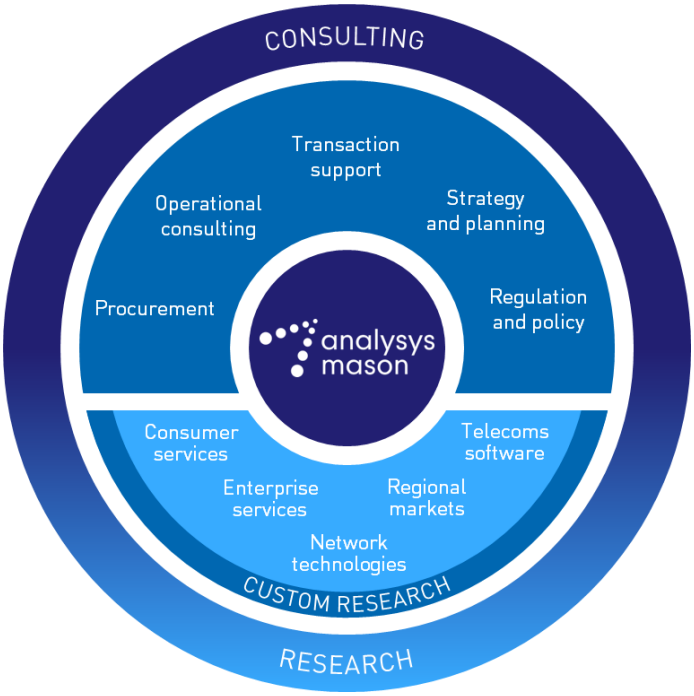
- We have developed rigorous methodologies that deliver tangible results for clients around the world.



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