

White Paper

Understanding today's smartphone user

An analysis of data-usage patterns in the world's most advanced 4G LTE markets



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Foreword

This brief discussion paper is an extension of two previous pieces of work published by Informa Telecoms & Media in partnership with Mobidia.

The overall objectives for this paper remain faithful to earlier work published in February and August 2012 to identify how smartphone usage behavior is evolving.

As with the previous papers in this series, all insights reported in this paper should always be interpreted with a clear sensitivity to and understanding of the methodology used in collating the data and the composition of the sample used. **All data, unless stated otherwise, has been sourced directly from the usage data shared on a strictly opt-in basis by the users of Mobidia's My Data Manager application.** Mobidia's application has millions of downloads globally with thousands of new downloads each day. More than 50% of active users choose to share data with Mobidia on an ongoing basis, providing a very large and global sample size. The overall sample analyzed in this paper consisted of more than 100,000 users in Japan, South Korea and the United States.

Readers should refer to previous papers for a more detailed discussion of the sample size, but we reiterate our belief that the insights derived from Mobidia's usage data are representative of a statistically significant and growing class of today's smartphone users.

As ever, we welcome all feedback and would be delighted to take up the discussion with any reader that may wish to obtain a more detailed overview of the methodology, exchange views on the insights elaborated or simply make suggestions for trends that could be explored in future papers.



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Introduction

LTE has enjoyed the most successful launch of any mobile network technology in history. Networks and devices have been launched in higher volumes and in faster times than for any previous generation of mobile technology. Today, more than 110 live LTE networks span an addressable market that covers close to half a billion people across 50 or more different countries all around the world. Given this scale of deployment of LTE, it is not surprising that the rate of adoption of LTE by consumers has reached the milestone of 50 million connections in record time.

While much has been written about the speed and size of uptake of LTE technology around the world, there has been very little commentary about the impact of LTE adoption on consumer usage behavior. This short paper seeks to address this information gap and to provide new insights to answer important questions such as the relationship between LTE and the usage of different types of popular consumer applications, the role of new types of mobile data tariffs and the impact of LTE on Wi-Fi usage by smartphone users.

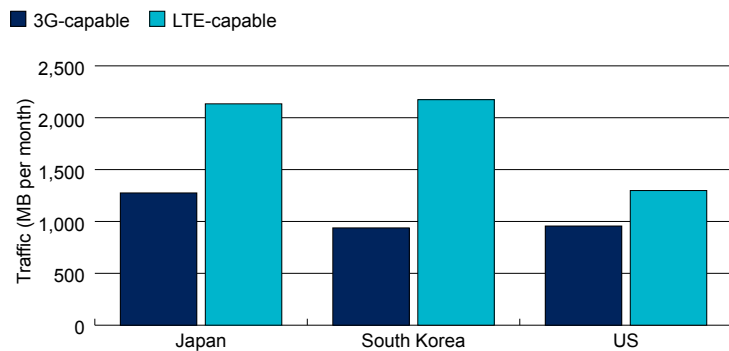
The analysis is focused on three key markets – Japan, South Korea and the US – which today account for more than 90% of the global LTE customer base of around 50 million connections. The leading operators in these markets boast customer bases that have rapidly grown into the millions and, importantly, are now moving quickly into the next phase of mass-market adoption (see fig. 1). For example, Verizon Wireless has already surpassed more than 15 million connections to its LTE network while LGU+ in South Korea is rapidly approaching the incredible milestone of converting more than 50% of its customer base to LTE.

Fig. 1. World's largest LTE operators by total LTE connections, 3Q12

Operator	Country	LTE connections (mil.)	% of total customer base
NTT DoCoMo	Japan	6.2	10
SK Telecom	South Korea	5.7	21
LGU+	South Korea	3.6	36
KT	South Korea	2.5	15
Verizon Wireless	US	14.9	13
AT&T	US	5.1	5

Source: Informa Telecoms & Media

Fig. 2: Average monthly Android smartphone-originated cellular data traffic, Sep-12



Source: Mobidia

It is not possible to eliminate all risk of sample bias, but, by concentrating this analysis on operators that are clearly far ahead in terms of reaching mass-market LTE adoption, it is certainly possible to analyze usage data with a significantly greater degree of confidence as to the relevance of the insights gained for other markets as they seek to move to similar phases in LTE adoption and usage.

The impact of LTE on average data consumption on cellular networks

In each of the world's most advanced 4G LTE markets, Mobidia's data provides clear evidence that users with 4G LTE devices consume more data on average than those with 3G devices (see fig. 2). However, while usage is

clearly up in each market, there are considerable differences in the rate of increase across geographies. The South Korean 4G LTE smartphone users demonstrate the greatest overall uplift in cellular network usage of the world's three leading 4G LTE markets, with the average LTE smartphone consuming almost 2.2GB of data per month compared with almost 1GB on 3G smartphones, representing an uplift of 132%. In the US, the increase in consumption of an LTE smartphone equates to 36% with average monthly data usage at 1.3GB on LTE versus 956MB on 3G.

Given major underlying differences in the inherent structure and characteristics of these mobile markets, it is difficult to come to a definitive conclusion as to why such strong differences in terms of usage exist, but it is possible to put forward a

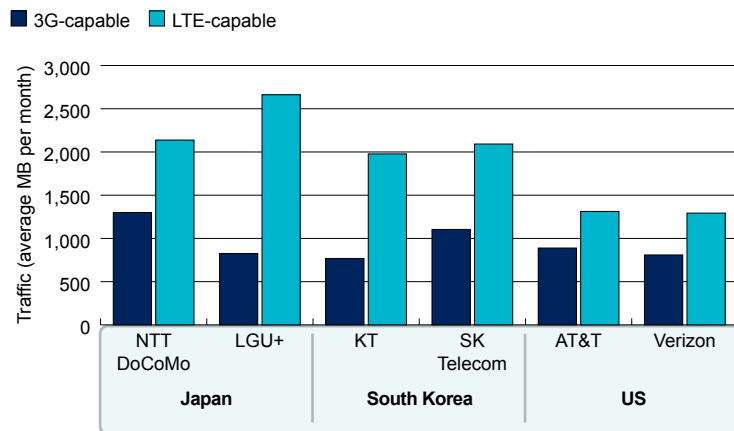
set of credible explanations. Take South Korea, where the extent of the 4G LTE coverage, where all three operators have rolled out LTE aggressively and quickly achieved close to 100% population coverage, the typically faster peak speeds on LTE networks relative to those of key US LTE operators (Verizon, MetroPCS) and, importantly, the structure and price of domestic LTE data tariffs are key factors driving 4G LTE usage at levels higher than those seen in other markets.

Looking at individual trends for the world's six largest 4G LTE operators by customer numbers (see fig. 3), the uplift in usage on 4G LTE smartphones can also be seen across the board. In the US, there is strong symmetry in the change in usage of Verizon and AT&T customers – a reflection of the fact that the two US mobile giants target similar segments and there is little to choose between them in terms of both tariff structures and device portfolios. What is perhaps most noteworthy is the fact that the technology differences at the 3G level (CDMA1x EV-DO vs. HSPA/HSPA+) between the two giant US operators appear to have had a minimal impact on average data consumption – a surprising fact given the large gaps in experience in terms of average downlink speeds between EV-DO Rev. A on Verizon's network and AT&T's HSPA+ network. In South Korea, in particular, it's interesting to note that average data usage on LTE at LGU+ has grown at a much faster rate relative to its two main competitors, a fact that owes much to its aggressive tariff strategy which, it seems, has attracted a pool of users with a heavier-than-average consumption profile relative to its competitors.

The effect of growing LTE usage on Wi-Fi

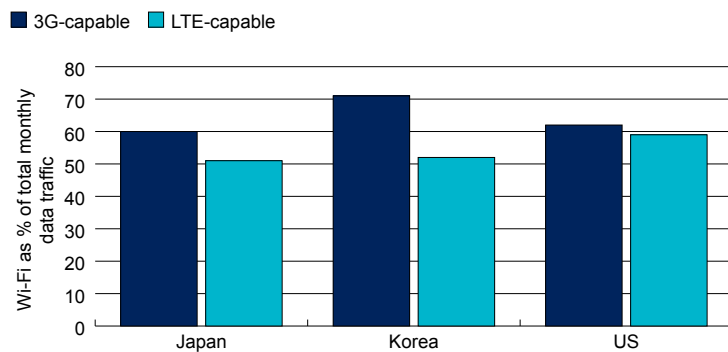
In addition to the above factors, the Mobidia data suggests that South

Fig. 3: Cellular data traffic on Android 3G and 4G LTE smartphones, by operator, Sep-12



Source: Mobidia

Fig. 4: Wi-Fi-originated data traffic as % of total Android smartphone-originated traffic, Sep-12



Source: Mobidia

Korean 4G LTE smartphone users are starting to rely less on Wi-Fi to fulfill their overall connectivity needs than the 3G smartphone users are. The distribution of traffic originating via Wi-Fi networks compared with cellular networks drops from 71% of the total average traffic among 3G smartphone users to 52% for 4G LTE smartphone users in South Korea (see fig. 4).

In absolute terms, Mobidia's data highlights that average Wi-Fi usage actually declines marginally for South Korean 4G LTE smartphone users compared with 3G smartphone users (see fig. 5), although at less than 20MB, equivalent to a fall of around 1%, it is a decline that barely registers against the

average monthly Wi-Fi consumption of 2.3GB per month per smartphone user.

Despite this material drop in Wi-Fi as a share of total smartphone-originated traffic for South Korean users, it must be noted that Wi-Fi continues to account for more than half of all smartphone-originated traffic and is, for the time being, still the primary form of data connectivity to these users. The key implications of these trends in the South Korean market is that LTE is clearly helping to stimulate higher overall demand from users and that it is the LTE-enabled cellular networks that form the principal beneficiary of this incremental data usage. If trends in South Korea continue in this fashion, it is likely that the market will

Fig. 5: Average monthly Wi-Fi consumption by Android smartphones users in Japan, South Korea and US, Sep-12

	3G-capable			LTE-capable			
	Average cellular MB per month	Average Wi-Fi MB per month	Wi-Fi as % of total traffic	Average cellular MB per month	Average Wi-Fi MB per month	Wi-Fi as % of total traffic	% change in average Wi-Fi MB per month
Japan	1,275	1,910	60	2,134	2,186	51	14
South Korea	938	2,330	71	2,174	2,313	52	-1
US	956	1,580	62	1,298	1,880	59	19

Source: Mobidia

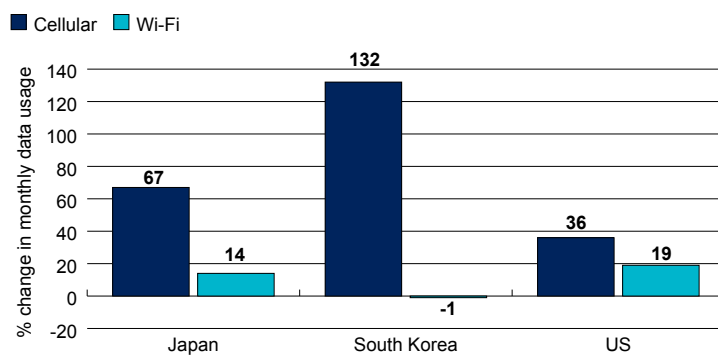
reach an important inflexion point where local smartphone users rely more on LTE-based cellular networks than Wi-Fi and LTE establishes itself as the primary form of wireless connectivity, representing an attractive monetization opportunity for mobile operators.

In the Japanese and US markets, there is similar evidence to suggest that LTE smartphone users are relying on cellular networks for a greater share of their connectivity requirements, although the trend is less pronounced, with the share of Wi-Fi traffic falling from 60% to 51% of total smartphone-originated traffic in Japan and a more modest drop from 62% to 59% in the US.

Importantly, there is also one major distinction between South Korean smartphone users and those in Japan and the US. While Mobidia’s data highlights a marginal decline in Wi-Fi usage for South Korean 4G LTE smartphone users, in the US and Japan absolute Wi-Fi usage volumes increases for 4G LTE smartphone users, even if it is at a significantly lesser rate of growth than for cellular-originated traffic witnessed by 4G LTE versus 3G smartphones users in those markets (see fig. 6). This suggests that there is an elasticity-of-demand effect in play in these markets with incremental usage generated across both cellular and Wi-Fi networks.

There is also evidence to suggest that there is a saturation point for the absolute volume of data that can

Fig. 6: Change in average monthly data usage on cellular vs. Wi-Fi networks for 4G LTE Android smartphone users vs. 3G Android smartphone users, Sep-12



Source: Mobidia

be consumed by a user across both cellular and Wi-Fi networks given the capability of the devices and applications available to them. In Japan and South Korea, this saturation point appears to be reached at around 4.5GB per month, a level that is significantly higher than the US saturation point, which is at around 3.2GB per month. The size of the saturation point is likely to vary not only across markets, but also within different customer segments in an individual market. Aside from the factors discussed in this paper, additional aspects that would have an impact on the overall consumption levels on smartphones of different user groups would include the availability and usage of fixed broadband, the penetration and usage levels of other connected Internet-enabled devices (e.g., tablets, laptops, games consoles) as well as other “softer” factors, such the extent of personal Internet consumption at work or the overall culture of “connectedness” within a given market.

This thesis of changing saturation levels is supported by the fact that, for the average user and for mature applications such as YouTube or Google Maps, there is a theoretical constraint on monthly usage imposed by the fact that a user can only consume a certain amount of video or can only initiate so many searches or browsing sessions. This is not to say that the saturation point cannot change, but that it is likely to require changes both to underlying use case and/or to changes in the average MB consumed per session, for example, through change in device screen resolution or the introduction of higher-quality video codecs.

Understanding application usage in the context of LTE, 3G and different data plans

An important element of most LTE operators’ strategy has been to use the transition to 4G as an opportunity to reset pricing models for mobile data services.

Fig. 7: South Korea, distribution of Android smartphone users by data-plan type, Sep-12

Distribution of smartphone users (%)	LGU+		KT		SK Telecom	
	3G-capable	LTE-capable	3G-capable	LTE-capable	3G-capable	LTE-capable
<2GB per month	80	34	79	35	66	31
>2GB per month	7	58	5	58	10	62
Unlimited	13	8	16	7	24	7

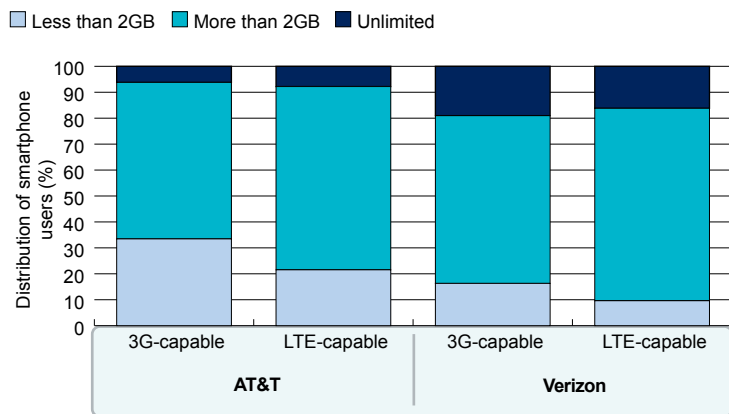
Note: Please note that this chart is populated using data inputted by users themselves directly into Mobidia's My Data Manager application.
Source: Mobidia

Verizon Wireless is perhaps the most notable example. The US operator used the launch of its LTE network in December 2010 to signal the end of unlimited data tariffs for any customers signing up to one of its new tariffs and wishing to receive a heavily-subsidized LTE device as part of the bundle. The impact of strategic moves like this can be assessed by analyzing data collected by Mobidia from its users about the smartphone usage behavior of customers using different types of data plans.

According to this data, there is clear evidence that the transition to 4G LTE is helping operators to convert users away from unlimited data plans and is creating a rapid adoption of usage-based plans with higher inclusive data volumes than for users of older-generation (i.e., 3G) devices. For example, the share of users on unlimited data plans at SK Telecom falls from 24% of total users on 3G-capable Android smartphones to just 7% on 4G LTE smartphones (see fig. 7).

Similar patterns can be witnessed in the US, where AT&T and Verizon's 4G LTE smartphone users are more likely to have larger-sized volume-limited data plans. Interestingly, AT&T still has a similar-sized proportion of its 4G LTE smartphone users as 3G on unlimited plans (see fig. 8), which implies that, despite its very successful efforts to transition to usage-based plans since its initial move away from unlimited plans in June 2010, there is still a material volume of users that have taken advantage of the possibility to

Fig. 8: US, distribution of Android smartphone users by data-plan type on 3G and 4G LTE devices, Sep-12



Note: Please note that this chart is populated using data inputted by users themselves directly into Mobidia's My Data Manager application.
Source: Mobidia

“grandfather” legacy data plans for their 4G LTE devices, equivalent to just under 10% of its Android smartphone base. The implication appears to be that users are prepared to compromise on other benefits offered by AT&T (e.g., subsidized devices, shared data plans) in order to retain their highly-prized unlimited data tariff (see fig. 8). At Verizon, by comparison, although the percentage of users on unlimited plans is still double the rate of its rival, it has at least been able to reduce this percentage, seeing it drop in the sample from 19% on 3G to 16% on 4G LTE.

What is the impact of this change in tariffs on usage behavior? Interestingly, Mobidia's data implies that it is not the migration to 4G LTE itself that most influences changes in customer behavior, rather it is the parallel transition of users to tariffs with significantly larger inclusive monthly

data volumes that plays a larger role in changing the way users consume applications on their smartphones.

To put it simply, it's not what data you give them (i.e., 3G or LTE), but how much you give them (i.e., inclusive data volumes) that has the greatest impact on customer behavior.

Analyzing YouTube adoption and usage among LTE and 3G smartphone users

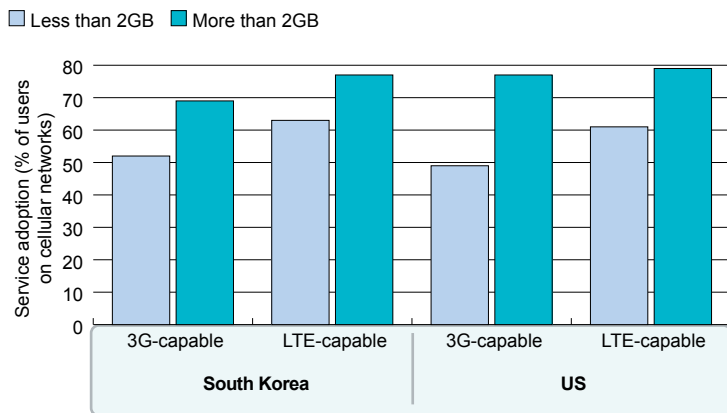
An analysis of YouTube adoption and usage in South Korea and the US provides a clear example of the impact that LTE and new types of data tariffs are having on consumer behavior. The adoption of YouTube by 4G LTE smartphone users is noticeably higher when comparing users on similar types of data plans: Among those US Android smartphone

users on data plans with less than 2GB of monthly data allowance, YouTube is actively used on the cellular network by 49% of 3G-capable smartphone owners, but by 61% of users that own a 4G LTE-capable smartphone. In South Korea, the comparable figures are 52% for 3G and 63% for 4G LTE (see fig. 9). Perhaps of even more interest to note is the fact that there is a materially higher adoption of YouTube amongst users on 3G data plans with high inclusive monthly data volumes than for 4G LTE users on plans with lower inclusive volumes.

This trend is not just underlined by the relative adoption levels of services among users, but also by the consumption patterns of active users. Looking again at YouTube monthly usage in absolute MB per month terms, there is evidence both of the uplift in 3G usage relative to 4G LTE usage for users on similar types of data plans, and also of the fact that average consumption of users with bigger buckets on 3G outstrips those on smaller plans on 4G LTE.

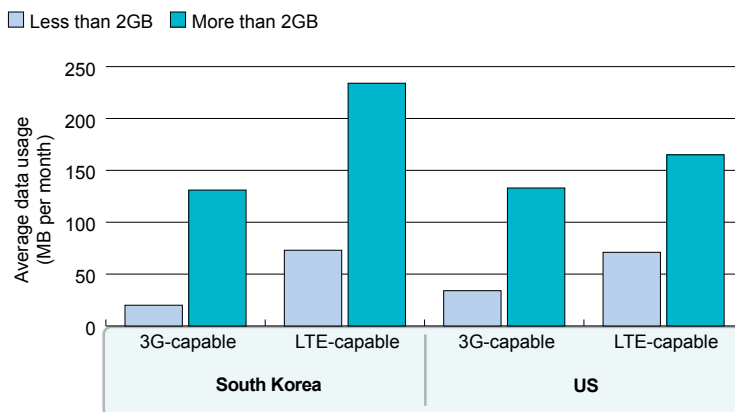
In the US, for example, there is a clear uplift in average usage of YouTube by LTE smartphone users with plans of less than 2GB of data per month, up to 71MB per month from 34MB for users on similar-sized data plans on 3G devices. But this spike in usage is dwarfed if you look at the usage of users on larger data plans. According to Mobidia's data, the 3G smartphone users on the US operators' larger usage-limited data plans (more than 2GB per month) consume 133MB per month, or almost double the amount of LTE smartphone users on smaller plans (less than 2GB per month). Although there is again a demonstrable uplift in the 4G LTE smartphone base of 2GB+ data plan users at 165MB per month versus 133MB on 3G, this spike is much less dramatic than the change in usage that occurs when taking a tariff-centric view. These patterns in

Fig. 9: US and South Korea, YouTube adoption (% of users) on 3G and 4G LTE Android smartphones, Sep-12



Source: Mobidia

Fig. 10: US and South Korea, YouTube cellular data usage on 3G and 4G LTE Android smartphones, Sep-12



Source: Mobidia

usage behavior are similarly visible in the South Korean usage data, although a more marked growth in LTE usage is clearly highlighted in the South Korean numbers (see fig. 10).

It should also be highlighted that the impact on average monthly data usage of a user migrating to 4G LTE is most strongly demonstrated outside the top-spending and highest-value segments of the market. In other words, a user on a lower value data plan (less than 2GB of data per month) on LTE shows a much higher average consumption relative to 3G users on similar plans than the difference in usage between 3G and 4G users on more expensive plans (greater

than 2GB of data per month). The data also implies that 4G LTE smartphone users are demonstrating higher levels of usage than 3G users of their inclusive data bundle.

It is clear that the inherent psychological "comfort blanket" of a larger data plan plays an incredibly important role in encouraging and stimulating adoption of heavier bandwidth applications. Mobidia's data provides evidence of higher adoption levels of bandwidth-intensive applications on 4G LTE smartphones relative to 3G smartphone users and demonstrates that the penetration of these applications among LTE

Fig. 11: US, Google Maps service adoption and usage on Android smartphones, Sep-12

	3G-capable		LTE-capable	
	Google Maps adoption (%)	Google Maps usage (MB per month)	Google Maps adoption (%)	Google Maps usage (MB per month)
Less than 2GB	83	5.9	87	9.2
More than 2GB	93	11.6	95	16.4
Unlimited	92	15.6	96	24.4

Source: Mobidia

users is not only materially higher, the average monthly consumption of those particular applications is also significantly increased. Interestingly, the transition to 4G LTE delivers a much less dramatic uplift effect in terms of service adoption on those applications that consumers either perceive to have a lower impact on their data plans or those that could be classed as “must-have” services and as a consequence rely upon in large numbers irrespective of the type of connectivity available or the size and type of their monthly data plan.

Taking Google Maps as an example of a “must-use” service in mobile situations on cellular networks, the spike in service penetration in the US is equal to just a few percentage points (2-4ppt, depending on tariff plan) between 3G and 4G LTE smartphone users (see fig. 11), whereas for services with a greater impact on the network, such as YouTube, the jump in adoption is equal to double-digit growth on lower-value plans. What is observable, though, is a much stronger uptake in the level of monthly usage demonstrating that the transition to LTE also drives users towards higher consumption of the “must-use/have” services.

Conclusions

- The extent of LTE usage is shown to be affected by a variety of factors specific to the deployment and go-to-market strategies adopted by any given operator in their domestic market. In South Korea – where all three of the local operators quickly and aggressively deployed LTE to blanket virtually the entire population, where pricing competition around LTE has been intense and where operators committed early to launching a very broad range of devices – there is a noticeably larger spike in LTE usage relative to other leading LTE markets.
- Early signs from the world’s top three markets for LTE show that the migration to LTE is increasing the users’ reliance on cellular networks and helping to start to reposition cellular networks as the primary form of data connectivity for users in terms of the share of total smartphone-originated data traffic that is consumed over cellular networks.
- Importantly, there is also compelling evidence to suggest that it is the “comfort blanket” of larger data plans that typically come with a user’s transition to a 4G LTE device that has the greatest influence on customer

usage behavior. It appears that the inclusion of a less restrictive monthly data allowance serves to remove self-imposed “handcuffs” on usage and encourages not only greater adoption of more bandwidth-intensive applications such as YouTube, but also higher levels of usage of those services.

- Mobidia’s data suggests that smartphone usage demand, while elastic, is not unlimited. There is evidence that, even in advanced markets like Japan and South Korea, users will reach a saturation point of monthly consumption given the current range of applications available to them, the existing use cases of those services and the capabilities of the devices and networks upon which they are consumed. This saturation point is unlikely to be static, however. Changes in use cases of existing applications, the emergence of new types of applications and advances in technology – such as higher screen resolutions, larger smartphone screens or simply the broader deployment of even faster LTE networks – could all help to increase the saturation level of an average user’s monthly data consumption.

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Mobidia develops and delivers intelligent, client-based solutions for enhancing wireless data with leading mobile operators around the world. Mobidia's popular My Data Manager application has been downloaded over 1.4 million times by subscribers around the world looking to better manage their mobile data usage and data plans. Mobidia offers a white-labeled version of the application to mobile operators for customizing to increase subscriber satisfaction and decrease care costs, to increase the efficiency of up selling and cross-selling promotions, and to develop a unique view of usage trends across cellular, roaming, and Wi-Fi networks. A cloud-based architecture allows for integration with back end billing and analytics systems.

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