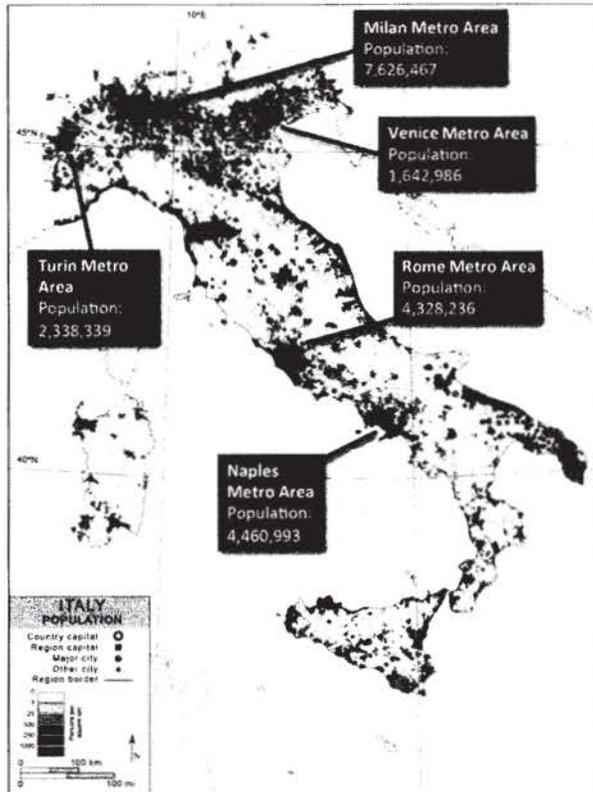


Italy

Exhibit 17: Urban Agglomeration in Italy



Source: Map © Copyright 2007 by World Trade Press. All Rights Reserved. Population data source: <http://bit.ly/UE7ZEf>

In Italy, 68.4% of the population lives in urban areas and 12.7% of the country lives in the Milan metro area—the country's largest urban agglomeration, with 7.6 million people (see Exhibit 17). This results in an Urban Agglomeration Index of 7.6, the second lowest among the G7 countries. The second-largest urban agglomeration in Italy is Naples, which is less than 120 miles away from Rome (the third-largest urban agglomeration in Italy). Seventy-seven miles to the west of the Milan metro area is the Turin metro area (the fourth-largest urban agglomeration in Italy). To the east of the Milan metro area is Venice (the fifth-largest urban agglomeration in Italy), just about 150 miles away.

The Po-Valley region, which stretches from Turin to Milan and Venice, is the economic heartland of Italy. In that region, the urban agglomerations account for almost 19% of the Italian population. To the south, the Rome and Naples urban agglomerations add up to 14% of the Italian population. Put these two narrow corridors together and a carrier could easily cover 33% of the Italian population.

United Kingdom

Exhibit 18: Urban Agglomeration in the UK



Source: Map © Copyright 2007 by World Trade Press. All Rights Reserved. Population data source: <http://bit.ly/1u4BUBV>

In the United Kingdom, 80% of the population lives in urban areas and 18% of the country lives in the London metro area—the country's largest urban agglomeration, with 13.7 million people (see Exhibit 18). This results in an Urban Agglomeration Index of 20.9. The second-largest urban agglomeration in the UK is the Liverpool Manchester metro area, which is less than 65 miles away from the Leeds-Bradford metro area (the fourth-largest urban agglomeration in the UK).

Eighty-one miles to the north of the Leeds-Bradford metro area is the Newcastle metro area (the fifth-largest urban agglomeration in the UK). The third largest urban agglomeration in the UK, Birmingham, lies midway between London (100 miles to the south) and Liverpool (less than 80 miles to the north).

In the relatively tight, but expanding London-Birmingham-Liverpool-Manchester-Leeds-Bradford corridor, the urban agglomerations add up to nearly 39% of the UK population. Add to that the Newcastle urban agglomeration just up the road, and a carrier could easily cover 41% of the UK population with just five markets.

Why this matters

While we cannot change where people live, the Urban Agglomeration Index explains the difficulties operators face in making an impact with their capital investments. It is simply easier to have a meaningful impact in a country like Japan (where 91.3% of the population live in urban areas and 32.2% of them live in Tokyo) than in the United States (where 82.4% live in urban areas but New York makes up only 7.9% of the urban population). Focusing capital expenditures in Tokyo delivers a much bigger bang for the buck than New York. Even ignoring the additional cost of providing service in a geographically larger country, operators in a country with a lower UAI have a harder time providing the same download speeds than countries with a higher UAI without significantly higher capital investments. It is even more difficult with fewer wide-channel allocations to take advantage of the economies of scale offered in more densely populated markets. A diverse mix of allocations that includes sufficient wide-channel allocations can make a difference to US consumers and the economy.

6. PRICING

The Differential Between 3G and 4G Pricing

In the US, carriers traditionally do not charge a premium for next generation wireless services. Just like when 3G came out, and again when 4G came out, the US carriers charge the same price. The reason for this is to drive the rapid adoption of new services. As a result, 4G adoption has grown quickly in the US, with the most 4G subscribers in the G7. In the other G7 countries, with the exception of Canada, the differential between 4G and 3G pricing can be significant. And, at the very least, it can be incredibly complex for a consumer to understand.

We researched carriers in the G7 and present our results here.

In the UK, there are four wireless network operators. All but one charges a premium for 4G access. When this operator decided not to charge a premium, its largest competitor charged it with "devaluing LTE." The largest player accused the smallest of undermining the value proposition of 4G by not charging a premium—something we take for granted here in the US.

In Italy, operators also charge a straight premium for 4G services. Operators price 4G between 50% and 67% more than 3G, which creates a significant hurdle for a consumer looking to move up to 4G.

In Germany, maximum download speeds are tied to the data allowance and therefore cost. Entry-level plans have data speeds up to 21 Mbps, with faster speeds tied to larger data allowances available at 50, 100, and 150 Mbps.

French carriers are taking cues from both British and German counterparts. One operator charges a straight premium like its British counterparts, whereas another carrier ties the 4G speeds to the size of different data packages like a German operator.

In Japan, the pricing is more granular in some cases, with certain carriers charging by the packet (128 bytes or 1/8 of a kilobyte) or kilobyte. Most large-bucket-rate 4G services are more expensive than their 3G counterparts. Only when customers exceed their bucket sizes, or use metered services, do 4G overages get charged at a lower rate than 3G overages.

By using the price differentiation of speed tiers to control the number of people who can access 4G, an operator has more control over the user experience and overall speed than when it prices 3G and 4G at parity, which encourages everyone to sign up for 4G. As a result, the more expensive 4G networks are less crowded and provide faster speeds for the subscribers who are willing to pay a premium to access them. The US model, which doesn't have this price tiering, provides more people a fast 4G network but at speed below those that a speed-tiered business model could achieve. The result is that the average speed may be lower, but the median speed is higher in the US.

Why this matters

When US carriers offer their customers a new service they provide it at the same price as the legacy service. This drives adoption because the new service is not an exclusive premium service and is one of the key reasons for the US subscriber leadership in LTE. In other countries, operators have pursued an exclusive premium strategy aiming at providing considerably faster service for a significant premium on an uncongested network with substantially fewer customers. As a result, the average speed in some of these countries is higher, but the median speed – the one most people get – is lower.

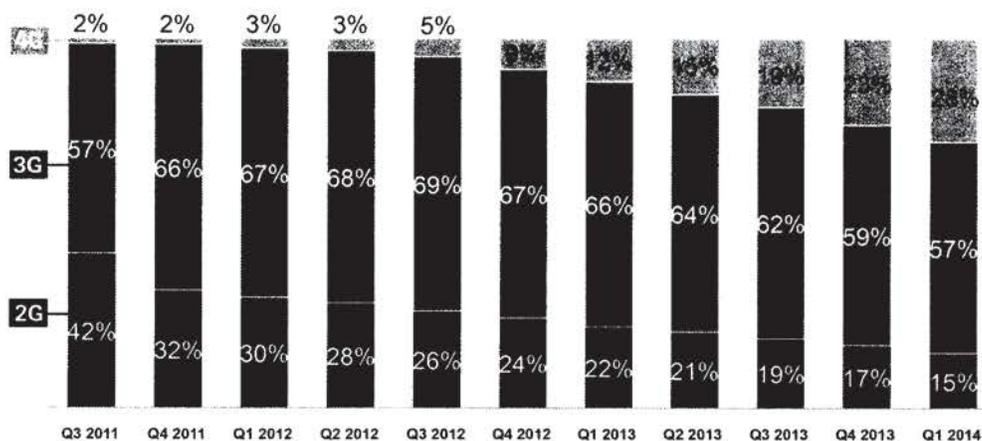
7. SATISFACTION

What makes a customer happy?

Wireless customer satisfaction is a complex creation: Some of the major drivers—network quality and devices—are discussed in this paper. As the new 4G LTE networks become available, customers need to purchase new devices to be able to take advantage of the network, as the old devices do not have the necessary parts in them to connect to the new network. Unsurprisingly, generally customers with a better network and newer device are happier customers, so to get a good view into satisfaction; it makes sense to start with an investigation into the penetration of 4G and the types of devices consumer use.

Penetration of 4G capable devices in G7 countries grew slowly from the third quarter of 2011 (see Exhibit 19). Growth was initially tepid due to the lack of 4G LTE networks around the globe. The United States was the only country with a robust nationwide 4G LTE network and mass consumer adoption. Over time, as more networks came online, device penetration followed.

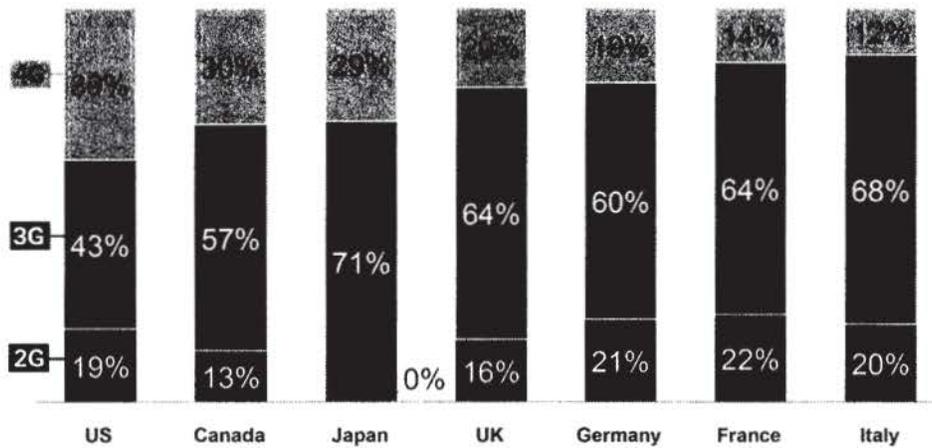
Exhibit 19: G7 Mobile Penetration by Network Capability of Phone Q3 2011 – Q1 2014



Source: comScore MobiLens. Quarterly data represented by 3-month average (with the exception of Canada – last month of quarter); *Data for Japan first available Q4 2011

The US leads all G7 countries in the level of 4G-capable devices; 39% of all phones are capable of accessing a 4G network (see Exhibit 20). Canada comes in second, with 30%, and Japan comes in third, with 29%. Lagging behind the top three are the UK, at 20%, Germany at 19%, France at 14%, and Italy at 12%.

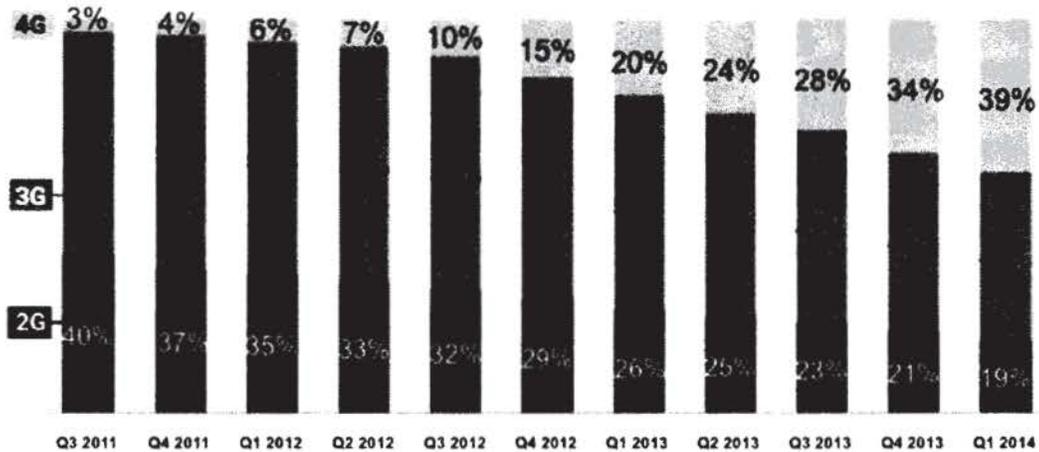
Exhibit 20: Mobile Penetration by Network Capability of Phone, Q1 2014⁶



Source: comScore MobiLens. Quarterly data represented by 3-month average (with the exception of Canada – last month of quarter)

After the introduction of 4G in the US in late 2011, it took several quarters to gain traction, but, similar to the overall G7 trend, it started to move quickly in the fourth quarter of 2012 to its current G7 lead position at 39% in the first quarter of 2014 (see Exhibit 21). The reason for this is the greater maturity of 4G LTE in the United States (accounting for factors such as broader buildout and greater handset availability) and the faster handset replacement cycle. It's a fact borne out by previous Recon Analytics research that Americans get new phones more frequently than customers in other countries.

Exhibit 21: Mobile Penetration in the US by Network Capability of Phone, Q3 2011 – Q1 2014

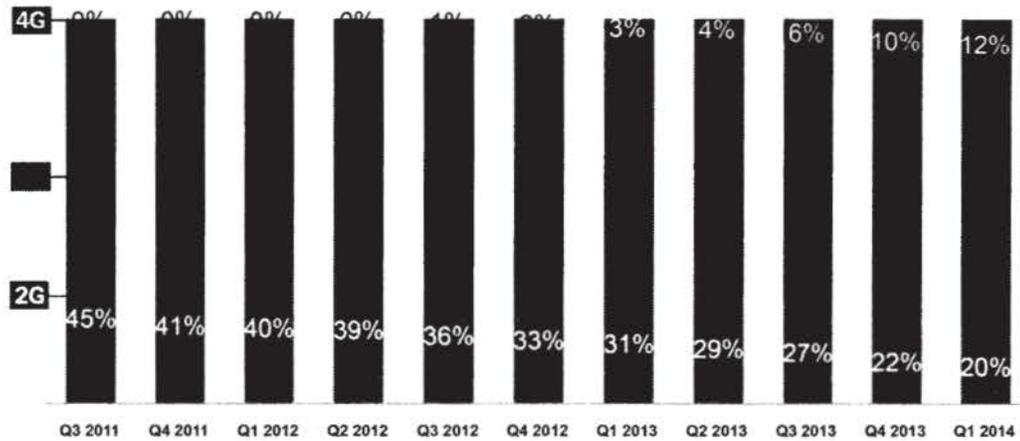


Source: comScore MobiLens. Quarterly data represented by 3-month average

⁶ In the US, 97% of 4G is LTE. The remaining 3% is WiMax. Similarly, in Canada and Italy, 99.8% of 4G is LTE, while 0.2% is WiMax. In France, Germany and the UK, the ratio is 99.9% LTE to 0.1% WiMax. In Japan, 91.6% of 4G is LTE, 4.1% is WiMax, and 4.3% is AXGP.

In contrast to the gangbusters early growth in the US, Italy didn't have its first 4G LTE network launched until November 2012, with coverage only available in Rome, Milan, Turin and Naples. The country then languished at less than 10% until the fourth quarter of 2013 as more places in Italy were covered and more operators launched their networks, until finally inching up to 12% in the first quarter of 2014 (see Exhibit 22).

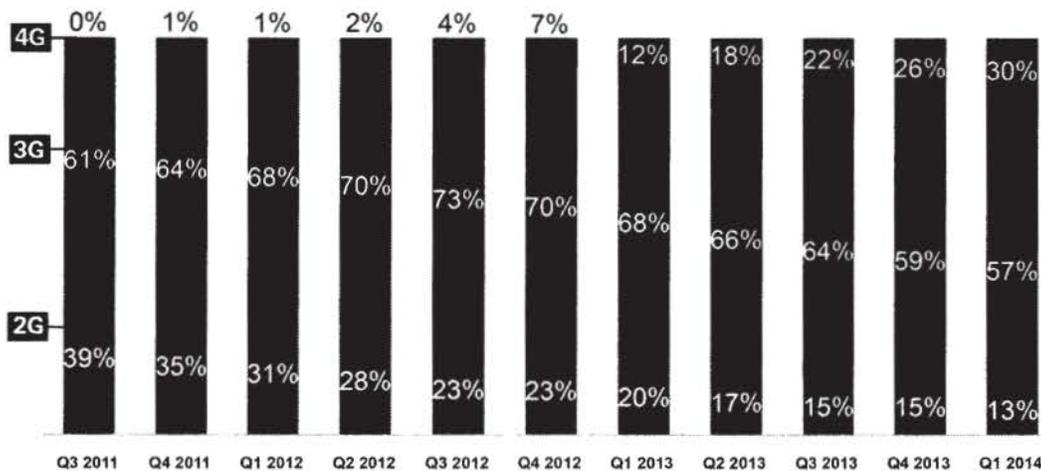
Exhibit 22: Mobile Penetration in Italy by Network Capability of Phone, Q3 2011 – Q1 2014



Source: comScore MobiLens. Quarterly data represented by 3-month average

In Canada, 4G adoption started in Q4 2011, but didn't see double digits until Q1 2013 (see Exhibit 23).

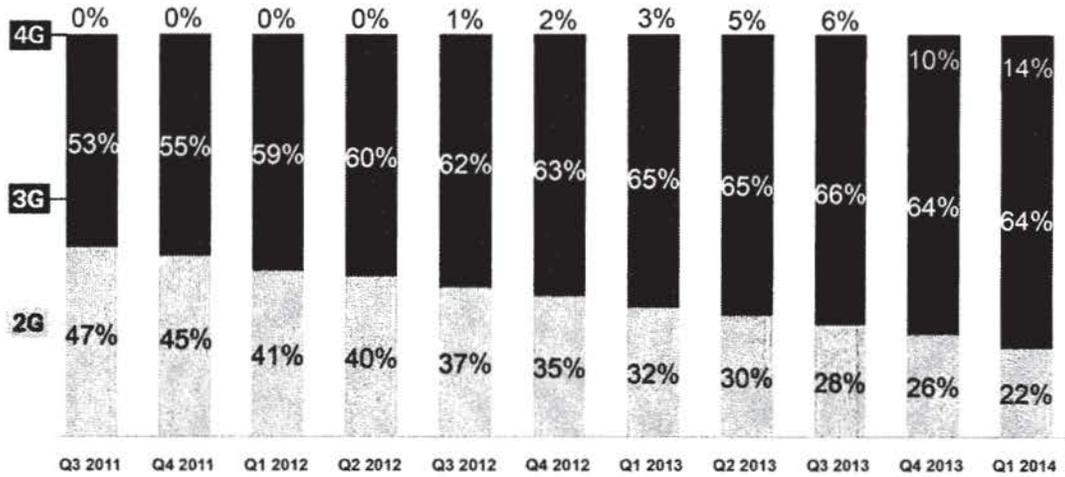
Exhibit 23: Mobile Penetration in Canada by Network Capability of Phone, Q3 2011 – Q1 2014



Source: comScore MobiLens. Quarterly data represented by 3-month average

Adoption of 4G in France has been slow to gain traction—only reaching double digits in the fourth quarter of 2013 (see Exhibit 24).

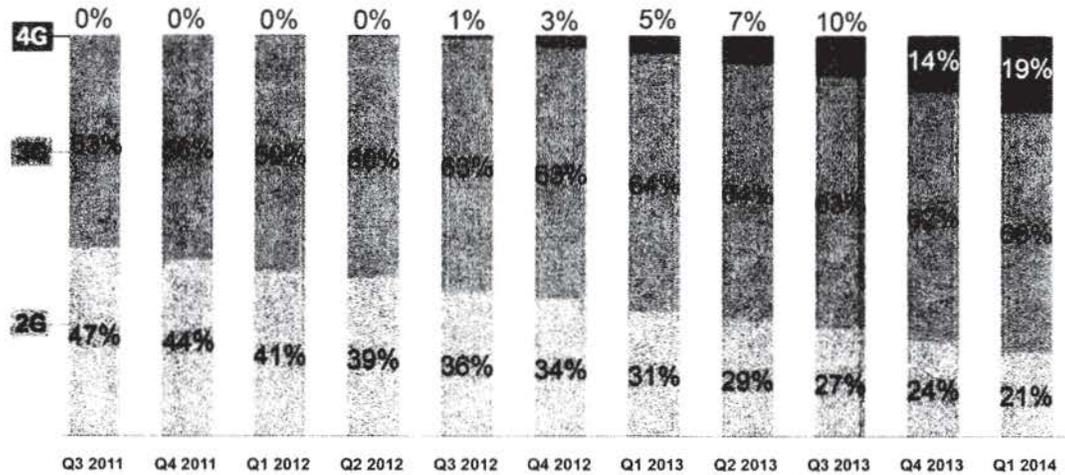
Exhibit 24: Mobile Penetration in France by Network Capability of Phone, Q3 2011 – Q1 2014



Source: comScore MobiLens. Quarterly data represented by 3-month average

Germany has seen only slightly faster 4G adoption than France; it reached double digits in the third quarter of 2013 (see Exhibit 25).

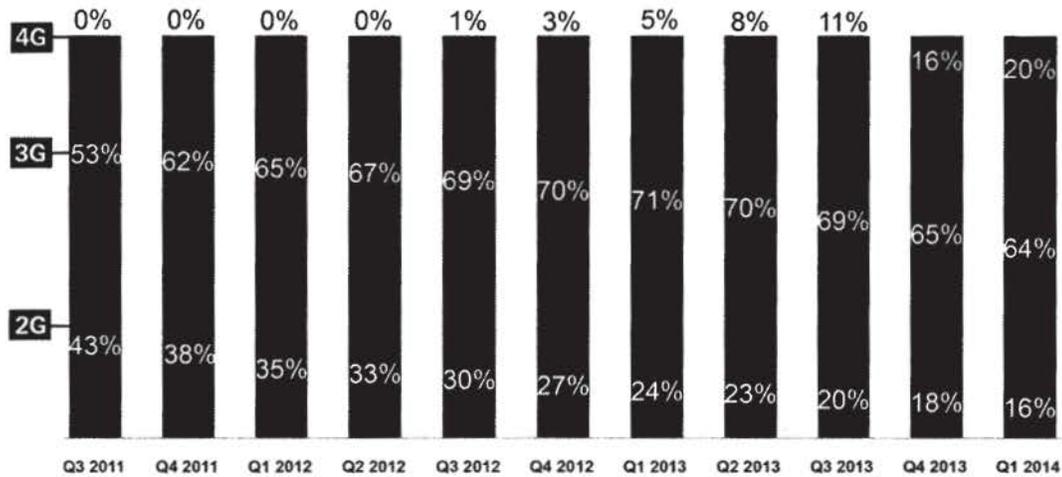
Exhibit 25: Mobile Penetration in Germany by Network Capability of Phone, Q3 2011 – Q1 2014



Source: comScore MobiLens. Quarterly data represented by 3-month average

In the UK, 4G adoption started in the third quarter of 2012, but it only reached double digits in the third quarter of 2013 (see Exhibit 26).

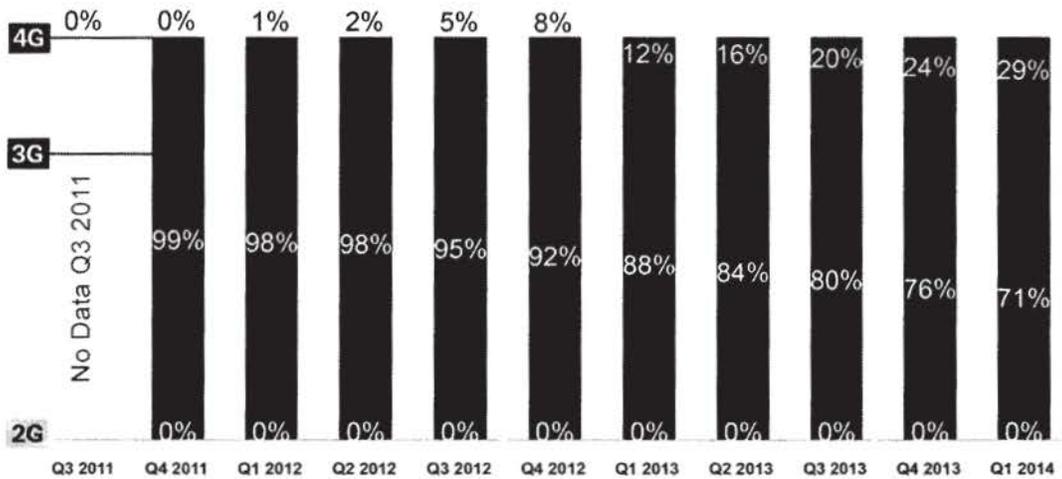
Exhibit 26: Mobile Penetration in the UK by Network Capability of Phone, Q3 2011 – Q1 2014



Source: comScore MobiLens, Quarterly data represented by 3-month average

In Japan, 4G penetration has been slightly faster than other G7 countries (with the exception of the US). After seeing initial movement in the first quarter of 2012, Japan reached double digits in the first quarter of 2013 (see Exhibit 27).

Exhibit 27: Mobile Penetration in Japan by Network Capability of Phone, Q4 2011 – Q1 2014

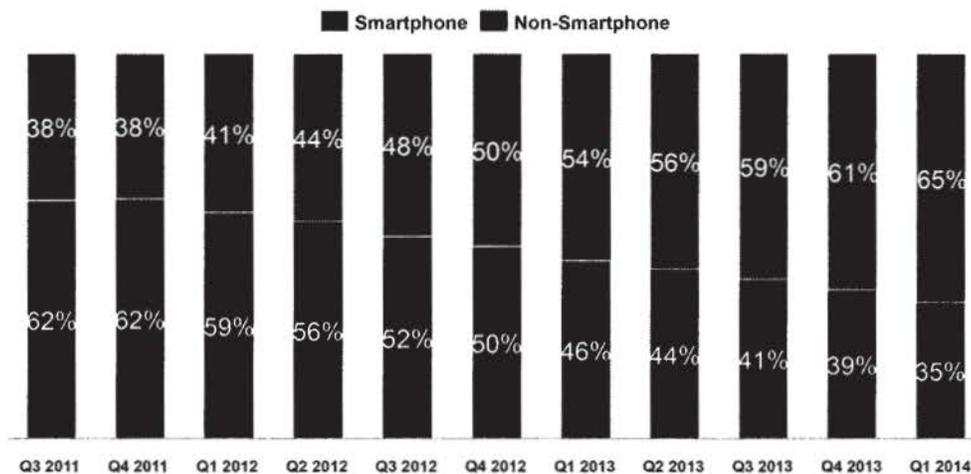


Source: comScore MobiLens, Quarterly data represented by 3-month average

While other G7 countries did not launch 4G service until several years after the US, it is fair to ask whether their adoption or conversion rate will soon accelerate beyond that of the US. Notably, hand in hand with the launch of 4G LTE networks, G7 smartphone penetration has been growing steadily since the third quarter of 2011 as feature phones waned in popularity. Increases in smartphone utility and capabilities, combined with a decrease in price, have made them the natural choice for most people who get a new phone, especially since LTE is becoming increasingly a standard feature on smartphones. In the third quarter of 2011, 38% of phones were smartphones, while 62% were non-smartphones. Since then, the ratio has been turned on its head. In the first quarter of 2014, 65% of phones in the G7 countries are smartphones and 35% are non-smartphones (see Exhibit 28).

Exhibit 28: Since Q3 2011, Smartphone Penetration has Grown from 38% to 65%

G7 Smartphone Penetration Q3 2011 – Q1 2014

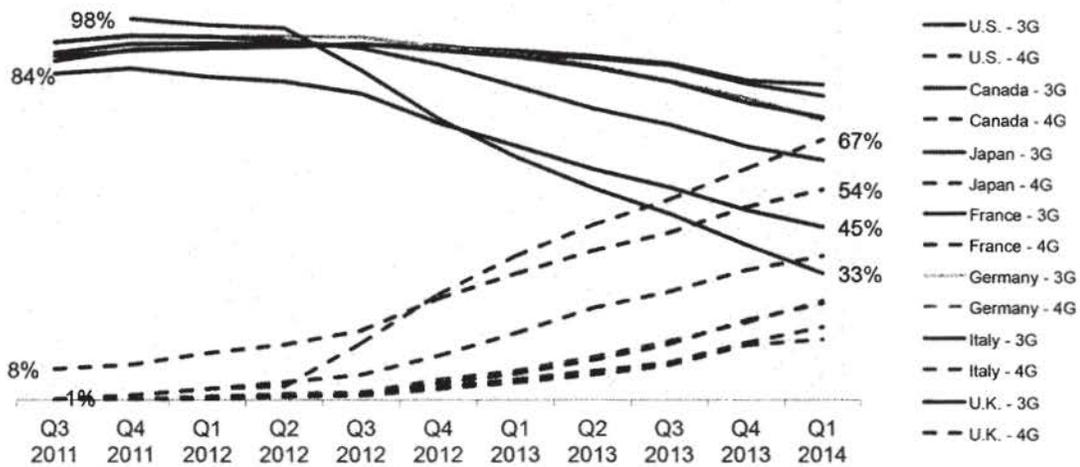


Source: comScore MobiLens, Quarterly data represented by 3-month average (with the exception of Canada – last month of quarter); *Data for Japan first available Q4 2011

Making the shift to 4G takes investment and a commitment on the part of the wireless industry to encourage subscribers to make the move. Part of that involves inspiring a consumer's confidence that their calls won't be dropped and their data connections will be pristine and blazing fast. Looking at smartphone subscribers across the G7, the US and Japan are alone in having more 4G than 3G smartphone subscribers (see Exhibit 29). Canada, the UK, Germany, Italy and France all lag well behind.

Exhibit 29: Data Network Subscribership Among G7 Smartphone Owners

Both the U.S. and Japan now have more 4G than 3G smartphone subscribers



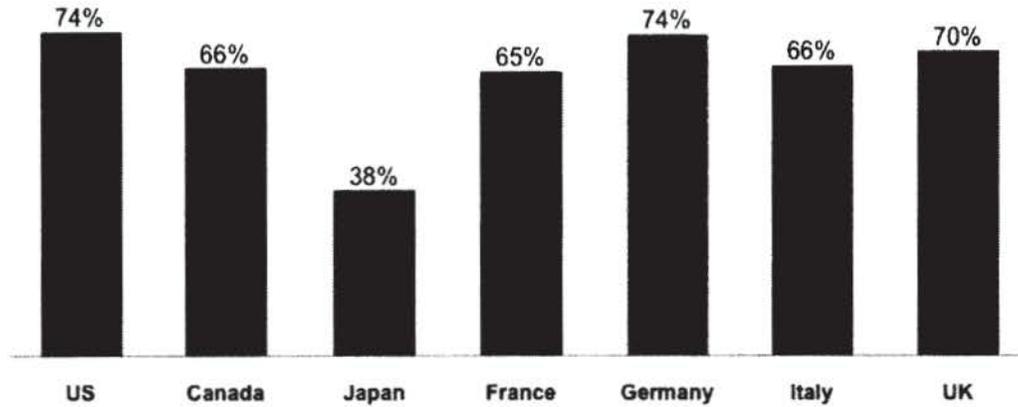
Source: comScore MobiLens. Quarterly data represented by 3-month average (with the exception of Canada – last month of quarter); *Data for Japan first available Q4 2011

Smartphones have swept across the landscape due to improved utility but also driven by broad availability of 4G LTE networks. The network and devices take perfect advantage of each other. One without the other just wouldn't feel right. But, despite the inexorable connection between the fast network and the new devices that take full advantage of the speed, it doesn't mean customers in all of the G7 countries are necessarily happy with those devices.

Here in the US, though, smartphone users are the most satisfied, with 74% of customers saying they are happy with their smartphone (tied with Germany). Meanwhile, the UK (70%), Italy (66%), Canada (66%) and France (65%) lag behind (see Exhibit 30). And off in the distance is Japan, a country in which carriers have invested countless billions, at a surprisingly low 38%.

Exhibit 30: US Smartphone Users Are Most Satisfied with Smartphones

Satisfaction with current smartphone (aggregated high satisfaction ratings of 8, 9, or 10 on a 10 point scale), Q1 2014

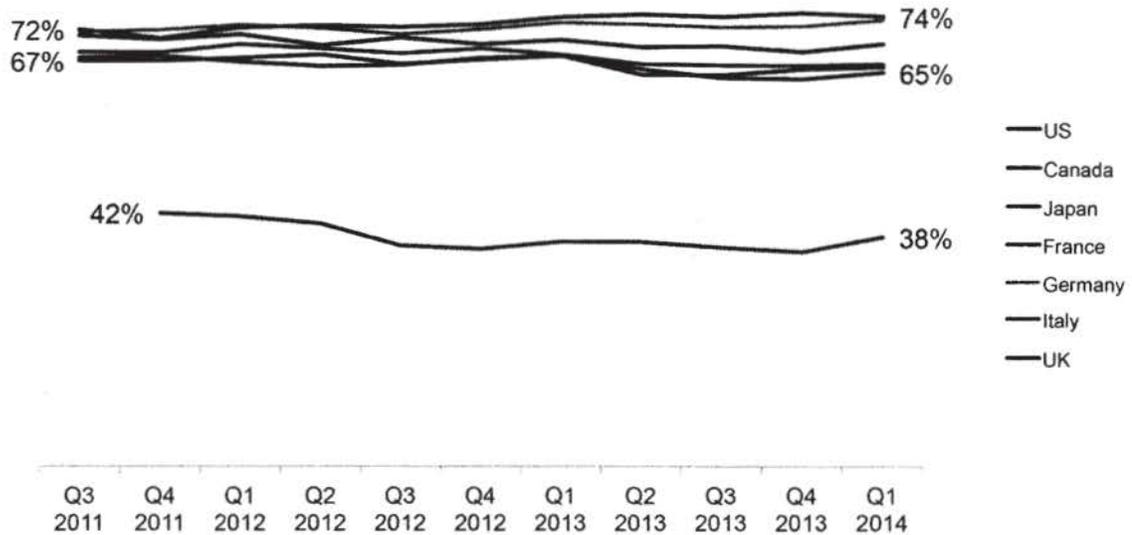


Source: comScore MobiLens, Quarterly data represented by 3-month average (with the exception of Canada – last month of quarter)

The low satisfaction of Japanese smartphone owners is not a recent phenomenon. The trend line is dismal from the third quarter of 2011, when it sat at 42%, while the US was at or near the top for the entire time (see Exhibit 31).

Exhibit 31: Japanese Smartphone Owners Are Consistently Less Satisfied

Satisfaction with current Smartphone (Aggregated high satisfaction ratings of 8, 9, or 10 on a 10 point scale), Q3 2011 – Q1 2014

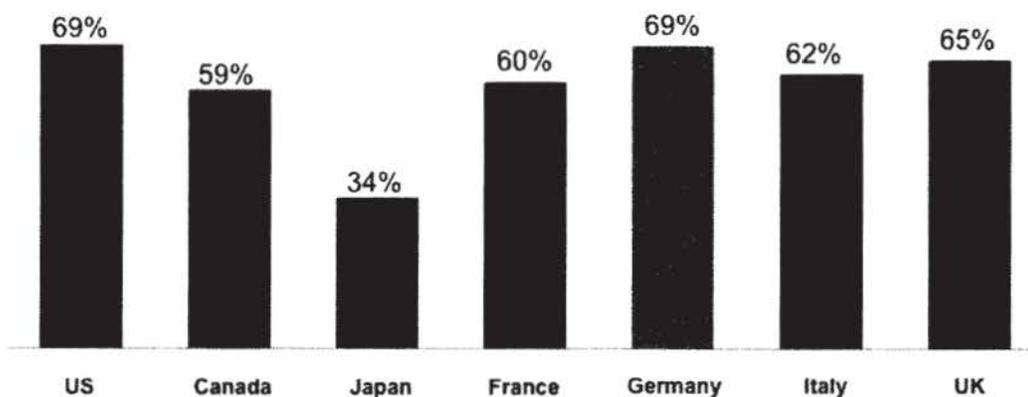


Source: comScore MobiLens. Quarterly data represented by 3-month average (with the exception of Canada – last month of quarter); *Data for Japan first available Q4 2011

The level of consumer satisfaction with their smartphone is fairly well reflected in the level of satisfaction with operators, with only a 5% drop for the US carriers (69%) and similar drops for the other members of the G7 (see Exhibit 32). Startlingly, the dissatisfaction of Japanese consumers continues with the way they feel about their operators; only 34% of Japanese consumers are satisfied with their operator.

Exhibit 32: US Smartphone Owners Are Most Satisfied with Operators

Satisfaction with Current Operator (Aggregated high satisfaction ratings of 8, 9, or 10 on a 10 point scale), Q1 2014

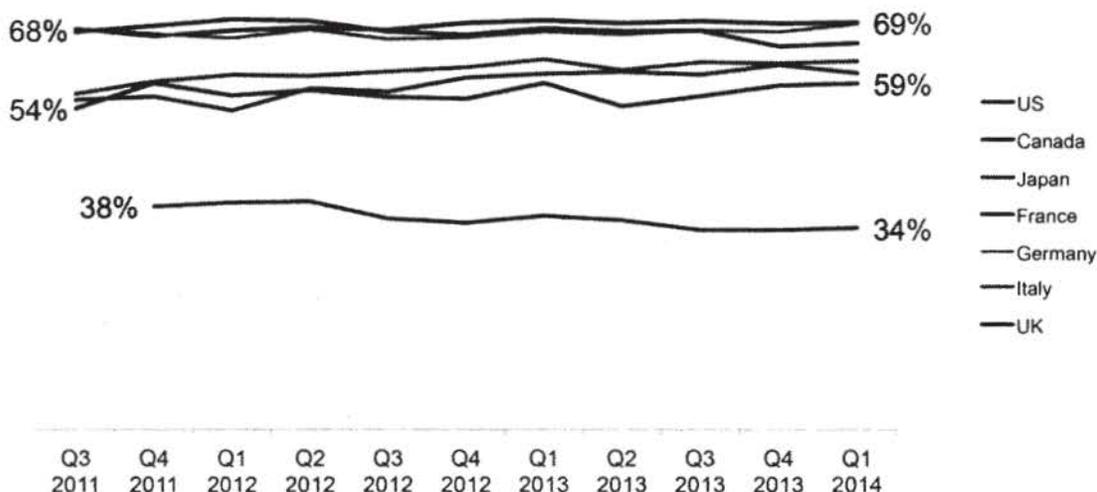


Source: comScore MobiLens. Quarterly data represented by 3-month average (with the exception of Canada – last month of quarter)

Like the low satisfaction of Japanese smartphone owners, the dissatisfaction Japanese consumers have with their operators is something that's been around for some time. But unlike the trend for smartphones, which starts to show a slight uptick in the last quarter, Japanese consumer satisfaction with their operator remains flat at 34%, less than half that of the US and Germany (see Exhibit 33).

Exhibit 33: Japanese Are Least Satisfied with Current Operator

Satisfaction with Current Operator (Aggregated high satisfaction ratings of 8, 9, or 10 on a 10 point scale), Q3 2011 – Q1 2014



Source: comScore MobiLens, Quarterly data represented by 3-month average (with the exception of Canada – last month of quarter); *Data for Japan first available Q4 2011

Why this matters

US wireless customer satisfaction shows that speed is not everything. Customers of US carriers are happy with the services they receive and they like the many things they can do on the network. Indeed, adoption of services that require a high-speed connection and satisfaction levels in the US lead the world. So it is clear that the speed of US wireless networks, which has recently been exceeded by those in some other countries, is not impeding consumers. However, with such high adoption and satisfaction, and the prospects for continued adoption of 4G LTE service (and heavier usage) among the sizable population in the US, it is important to give thought to the future. Smartphone, tablet, and traffic growth projections from Cisco, Ericsson, and other companies underscore the importance of preparing for that imminent future.

CONCLUSION

The United States pioneered bringing 4G LTE to a mass audience while continuously increasing average download speeds. Now, however, it has seen three of its G7 compatriots surpass its lead in download speeds. What is at the root of this loss of leadership? How can the US improve its data speeds and improve its results in comparison to other countries?

With great pride and good reason, the US declares itself as the home of the smartphone revolution. Smartphones are now the most popular mobile device and the United States has led the charge. Smartphones began in the United States and, as a result, nobody has higher smartphone ownership than the US among the G7 countries.

Smartphones work better when they're on a faster network, so consumers are increasingly choosing smartphones that have 4G LTE connectivity. This trend is especially strong in Japan and the United States. In addition, Americans are using their smartphones more intensively and have integrated them more into their lives than any other people among the G7 countries. This drives device usage and results in significantly more data usage. In the US, that is especially true because it is one of the few countries that does not charge a premium for 4G access. While this decreases the average speed, at the same time it offers the highest median speed.

This means that data usage in the US is higher than anywhere else with a constraint amount of spectrum. In fact, the US has the least amount of spectrum available per LTE capable device—with only 0.65 Hz/LTE capable device. The next lowest country is Japan, with 2.58 Hz/LTE, which is four times more than the US. Canada provides its citizens with 37 times as much spectrum per person as the United States. Although 4G subscribers and usage have increased rapidly in the US, the availability of spectrum for 4G has been comparatively slow compared to the other G7 countries.

In short, other G7 countries have made significantly more spectrum available for 4G than the United States. The influx of new spectrum, combined with fewer 4G subscribers, has resulted in data speeds skyrocketing in several countries. The only thing that has prevented the US from falling even further behind is the massive capital investments made by the US wireless industry, which are the largest in totality and second largest per person among the G7 countries.

Nothing can be done to undo the effects of agglomeration we described in this report, which makes things more difficult in the US. The considerably less concentrated population in the US (when compared to other G7 countries) makes it more expensive for US carriers to deploy faster networks, and achieve the economies and efficiencies that may be attained in more densely-populated countries.

In spite of these challenges, overall, American smartphone owners, together with German smartphone owners, are the most satisfied, even though neither one of them have the fastest download speeds. Quizzically, at the same time, Japanese smartphone owners, with faster download speeds than Germans or Americans, and despite a large lead in per-capita capital expenditures by carriers, are by far the least satisfied.

Our international comparison shows that more spectrum, especially with wider channels, results in faster download speeds. Faced with the convergence of limited spectrum, dispersed population, and high usage US operators are continuously and consistently pumping massive capital investments into their infrastructures to provide Americans with the best possible networks. As a result, we are seeing data speeds increase. At the same time, other countries have accelerated their download speeds substantially faster because they have considerably more spectrum available and deployed for 4G.

Despite all of this, and as we have previously documented in our report in 2012 (*The Wireless Industry: The Essential Engine of US Economic Growth*), the US wireless operators generate billions of GDP, millions of jobs, and hundreds of millions in tax revenue. The figures we uncovered in that report in 2012 are just as valid today and underscore the importance of the US wireless industry:

- The US wireless industry is responsible for 3.8 million jobs, directly and indirectly.
- The wireless industry retained \$146.2 billion in GDP in the US (and generated \$195.5 billion in economic activity globally) in the 12 months from July 2010 to June 2011.
- At \$195.5 billion, the wireless broadband industry would rank as the 46th largest economy in the world, as measured by GDP.
- The consumer surplus, the difference between what end users are willing to pay and what they have to pay for services, was \$502.7 billion in 2010.

It's clear that the economic and social benefits from wireless technology and services are beyond anything we could have predicted even 20 years ago. If the United States quickly allocated more spectrum to wireless operators, in larger contiguous blocks, download speeds would increase more rapidly.