The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

For more information, please visit the GSMA corporate website at www.gsma.com

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The North American mobile industry has been the strongest performing of any developed region for some time. The region has seen substantial subscriber growth, early adoption of new technologies (such as smartphones and 4G/LTE) and strong revenue trends. The region continues to lead innovation in all areas of the mobile ecosystem, including hardware, access technologies, operating systems and new apps and services that are scaling rapidly and changing how individuals live and work.

North America had more than 250 million unique subscribers as of the second quarter of 2015, equivalent to a penetration rate of 70%. North America continues to lead the world in adopting new mobile technologies, with 4G already accounting for just over half of the connections base in the region. Three-quarters of connections are already smartphones. By 2020, more than 80% of connections in North America will run on 4G networks.

These factors will continue to drive strong growth in mobile data traffic, which is set to grow at a 42% CAGR through to 2019 to nearly 11 GB per user per month. This compares to a global average growth rate of 24% and 2019 usage level of just 4 GB.

With limited opportunities for mergers and acquisitions or expansion in domestic markets within the mobile segment, operators in the US are looking to extend their influence into neighbouring regions. AT&T has acquired two of the smaller Mexican operators, while both T-Mobile and Sprint have announced unlimited roaming plans within the region. Operators are also increasingly pursuing convergent strategies, with AT&T now offering bundled satellite TV and mobile packages, and Verizon looking to offer video content to its mobile subscriber base.

Revenue growth in North America has been stronger than in other developed markets for some time. However, a combination of increased competition and market saturation has seen recurring (service) revenue growth turn negative in recent quarters, and the outlook remains subdued. Total revenues have been buoyed by the shift by the major operators away from handset subsidies and towards equipment instalment plans, although the difference between service and total revenue growth rates should largely disappear over the medium term.

The growth of equipment instalment plans has helped EBITDA margins remain healthy, especially for the market leaders, despite slow revenue growth and the market’s growing competitive intensity. This will support ongoing high levels of capital investment by the mobile operators as the industry looks to support the strong growth in data traffic. Total capex through to 2020 is set to total more than $200 billion.
In 2014 the mobile industry and its ecosystem contributed 3.5% of the gross domestic product (GDP) of the region, equivalent to about $670 billion. This figure captures the direct, indirect and productivity impacts of the mobile ecosystem on the economy, and is expected to increase further to around $750 billion by 2020. In addition, more than 1.1 million jobs are supported directly by the mobile ecosystem across the region, with another 1.1 million jobs generated indirectly. The mobile ecosystem directly contributed $75 billion to the funding of the public sector in 2014, a figure that excludes the impact of regulatory and spectrum fees. North America, and particularly the US and Silicon Valley, has for several decades been the epicentre of the technology industry and responsible for many of the innovations now taken for granted. Although the world is seeing a broader range of innovation hotspots emerge, the US is still dominant.

Despite a host of emerging challengers, operating systems originating in North America continue to dominate the global smartphone market, accounting for around 95% of global sales in 2014. The US remains by some distance the world’s largest app market in terms of revenues. The market has seen a number of new apps and services scale rapidly, both domestically and internationally. These include those based around the new ‘sharing economy’, such as Uber and Airbnb.

There are many reasons why the US continues to produce a disproportionate share of innovations, the most important of which is the diverse and rapidly evolving mobile ecosystem in the region, which is supported by a well-funded and highly developed venture-capital community. Major tech players in the region appear to be positioning themselves for a future in which virtual reality and augmented reality could become as important as voice is today, while others are exploring the potential of data analytics to address challenges in fields such as healthcare.

More than any other region, North America has embraced the connected living concept and the Internet of Things. The proportion of machine-to-machine connections in North America is higher than any other region of the world. Acquisitions of well-known connected-living brands, such as Nest (Google) and Smart Things (Samsung), as well as organic initiatives such as AT&T’s Digital Life, are creating an environment in which consumers increasingly expect seamless integration of the increasing number of connected devices available.

Digital commerce is now becoming increasingly mobile-centric in North America. The market has seen two significant launches in recent months (Apple Pay and Android Pay). With an increasing number of banks, card issuers and retailers supporting mobile payments, they are likely to become more mainstream in the coming years.

The Federal Communications Commission (FCC) issued a long-awaited ruling on net neutrality in February 2015, after widespread debate, reclassifying broadband access as a utility. The regulation will extend to mobile broadband services and explicitly enforce a number of “bright-line” rules that prohibit the practices of blocking, throttling and paid prioritisation of data.

There remains considerable uncertainty as to the impact that the ruling will have on the development of new services and applications, particularly in the area of the Internet of Things. Some services may require a degree of network prioritisation, such as healthcare monitoring or public safety, while some of the larger operators in the country have argued that the regulation will have an impact on future network investment.

With the outlook for more subdued service revenue growth, it is important that operators in the region continue to innovate, focus on quality of service, and collaborate realistically and effectively with the broader ecosystem. The success of the US mobile industry to date reflects high levels of investment and regulation that has historically leaned towards effectively protecting consumers and ensuring a level playing field as opposed to being unnecessarily burdensome. Ongoing collaboration between the mobile operators and new ecosystem entrants is vital if the full potential of the mobile industry is to be realised in the future.
MOBILE ECONOMY NORTH AMERICA

Unique subscribers and SIM connections

<table>
<thead>
<tr>
<th>Year</th>
<th>Connections*</th>
<th>Penetration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>252m</td>
<td>70%</td>
</tr>
<tr>
<td>2020</td>
<td>268m</td>
<td>71%</td>
</tr>
<tr>
<td>2014</td>
<td>359m</td>
<td>101%</td>
</tr>
<tr>
<td>2020</td>
<td>417m</td>
<td>111%</td>
</tr>
</tbody>
</table>

*Excluding M2M

Smartphones and 4G

- Smartphones over 70% of connections at end 2014
- 2014: 70%
- 4G nearly 50% of connections mid-2015

Data traffic and revenue growth

- Mobile data traffic expected to grow at 42% CAGR per user over 2014-2019 to nearly 11 GB per month, compared to global average of 24% and 4 GB
- TOTAL REVENUE GROWTH FORECAST
  - 2014-20: 0.8% CAGR

(Source: Cisco)
North America at the centre of the mobile ecosystem

Operating systems from the region accounted for around 95% of sales globally in 2014

The proportion of machine-to-machine (M2M) connections as a percentage of total connections in North America is higher than any other region of the world

Cellular M2M connections totalled over 45 million in 2014 and will grow at a 25% CAGR to over 170 million in 2020

---

**Ecosystem contribution to GDP**

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$670bn</td>
</tr>
<tr>
<td>2020</td>
<td>$750bn</td>
</tr>
</tbody>
</table>

**Public funding**

Direct contribution to public funding

<table>
<thead>
<tr>
<th>Year</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$75bn</td>
</tr>
</tbody>
</table>

**Employment**

Directly and indirectly supported by mobile ecosystem

<table>
<thead>
<tr>
<th>Year</th>
<th>Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>2.3m</td>
</tr>
</tbody>
</table>
1 North America mobile market overview
1.1 Limited subscriber growth forecast

The North American region had more than 250 million unique subscribers as of the second quarter of 2015, equivalent to a penetration rate of 70%. This is still below the developed market average of 79%, which is closer to the level at which subscriber growth tends to stall in developed markets.

Penetration rates by region
Q2 2015

Source: GSMA Intelligence

Unique subscribers
Connections (excl M2M)
There is limited subscriber growth expected, with a CAGR of 1.1% per annum. This compares to the global average of 3.9%, but is closer to the developed world average of 0.9%. The total subscriber base in North America will reach nearly 270 million by the end of the decade, equivalent to a penetration rate of just over 71%.

There are clear differences in subscriber penetration rates and growth outlooks for the two markets of the US and Canada. The US is by far the largest market with 232 million unique mobile subscribers, a penetration rate of about 72%. In Canada the rate is still much lower at 56%, with a total of 20 million unique subscribers. The Canadian market will generate a quarter of the regional subscriber growth over the coming years.

Canada has greater room for subscriber growth than the US

Unique subscriber penetration

Source: GSMA Intelligence

<table>
<thead>
<tr>
<th></th>
<th>Canada</th>
<th>US</th>
<th>Developed average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>52%</td>
<td>76%</td>
<td>62%</td>
</tr>
<tr>
<td>2020</td>
<td>81%</td>
<td>72%</td>
<td>81%</td>
</tr>
</tbody>
</table>
1.2 LTE adoption is driving data growth

North America continues to lead the world in the adoption of advanced mobile technology, particularly in terms of the migration to 4G/LTE. This was helped in part by an early switchover from analogue to digital broadcasting, freeing up spectrum for 4G purposes. As of mid-2015, half of total connections in the region were 4G. This is well ahead of the developed market average of 34%, and Europe at around 17%. 4G already accounts for just over half of the connection base in the US, while Canada is expected to breach the 50% level in early 2016. By the end of the decade, 85% of connections in North America are forecast to be on 4G networks.

Similarly, North America continues to lead the world in smartphone adoption. Three-quarters of connections in the region are now smartphones, compared to the developed market average of 64%. Adoption rates in the region are now approaching saturation levels, in common with many developed markets. With limited incremental growth in the overall smartphone base going forward, the market is increasingly focused on device upgrades and retention strategies.
Both the high 4G population coverage (92% in Canada and 98% in the US) and high rates of smartphone adoption contribute to the highly advanced mobile data market in the region. Cisco forecasts that mobile data usage will grow at a 42% CAGR in North America through to 2019, reaching nearly 11 GB per user per month. This compares to a global average growth rate of 24% and a 2019 usage level of 4 GB. However, as with subscriber penetration and 4G adoption, there are significant differences between the countries, with usage in Canada growing at less than half the US rate through to 2019.\(^1\)

\(^1\) Source: Cisco VNI Mobile Forecast Highlights, 2014–2019
4G coverage almost ubiquitous

Source: GSMA Intelligence

Increasing data usage driven by 4G adoption

Data usage (GB) per user per month

Source: Cisco, GSMA Intelligence
A key driver of the growth in mobile data traffic is video. Cisco forecasts that total mobile traffic driven by video will grow ninefold between 2014 and 2019, or at a 54% CAGR. As a proportion of traffic, video will increase to 75% of total data in 2019, compared to 60% in 2014.  

Although most mobile data usage is currently driven by content from third-party sites/apps such as YouTube and Netflix, this may be set to change. Verizon has recently announced its intentions to launch a mobile-first video service and has signed a multi-year contract with Vice Media to provide content for the service. Part of Verizon’s strategy with its recent acquisition of AOL was to access its advertising technology. This is one way of monetising the growth in mobile data driven by new video services, along with increased spend on data itself. AT&T has also begun offering DirecTV video content over mobile to subscribers of some of its home pay-TV packages. Having completed the DirecTV acquisition only in late July 2015, further such offerings are likely to be announced in due course.  

High usage rates as well as generally less onerous regulation than in Europe and other developed markets have contributed to materially higher ARPU levels than the rest of the developed world, and these have remained quite stable over a long period. In the fourth quarter of 2014, ARPU per unique subscriber (excluding M2M) was over $72 per month in Canada and over $69 in the US. By comparison, the developed world average over the same timeframe was about $47, and in Europe only $28. ARPU levels in Canada have room to rise given the country’s relative underdevelopment, while US ARPU levels are likely to be held back by competitive pressures.  

Further consolidation between mobile operators in the US market looks to be off the agenda, at least for the time being. The composition of the board of the FCC may change following the November 2016 elections, but this is some way off and inherently uncertain. In the near term ‘convergent’ consolidation is more likely, such as the recently announced talks between satellite broadcaster Dish (which also owns significant amounts of mobile spectrum) and T-Mobile. Transactions between cable operators and mobile operators are also possible. Cable operators continue to explore a range of options to offer some form of mobile service to their existing customer bases.

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2. Source: Cisco VNI Mobile Forecast Highlights, 2014–2019
Technological change and competitive forces are ever-constant

Aside from business combinations, technological change is also continuing to alter the competitive landscape in North America. Regional cable operator Cablevision, which covers most New York metro suburban areas but notably has no residential broadband in Manhattan, launched a Wi-Fi-only mobile offering starting from $10 per month. The regional nature of the plan, lack of major commercial/business centre coverage, and lack of fall-back to MVNO coverage are all factors that are likely to limit the attractiveness of the plan. Nevertheless, this is an example of how broadband scale, albeit on a regional basis in this case, can be leveraged to expand into mobile services at very limited marginal cost.

Similarly, the chairman of Liberty Media, John Malone, said recently that Liberty-backed Charter (which is acquiring Time Warner Cable) could launch a Wi-Fi mobile service, and that the combined company could introduce a Wi-Fi-based wireless service to compete with AT&T and Verizon:

“The concept that Comcast, a greatly enlarged Charter and Cox could together offer a Wi-Fi-optimized connectivity service with a default to a Verizon MVNO is interesting.”

A recent market entrant that has received much media attention though had little actual impact to date is Google’s Project Fi. Uptake has so far been limited, reflecting in part the lack of devices supported. Google itself also requires potential subscribers to request an invitation to the service.

Project Fi offers several innovations in both service and pricing that could potentially have an impact on the market. On the service side, the phone will access a network of over 1 million free Wi-Fi hotspots. If Wi-Fi is not available, it will revert to Google’s MVNO with both Sprint and T-Mobile. The service claims to be able to switch seamlessly between Wi-Fi and whichever of the two carriers has the strongest signal at the user’s current location. In terms of pricing, basic unlimited voice and texts are $20 per month with no contract and data is $10 per GB (excluding Wi-Fi). The innovation in pricing that has received most attention is that users are credited for any unused data. Data roaming is also included at no additional cost in 120 countries, but speed is restricted to 256 kbps.

With limited opportunities for M&A or expansion in their domestic markets within the mobile segment, operators in the US are looking to extend their influence into neighbouring Mexico. AT&T has acquired two of the smaller Mexican operators, Iusacell and Nextel. The company plans to invest in the merged networks to initially extend coverage to two-thirds of the population of Mexico, or approximately 75 million people. The target is then to cover 100 million people with 4G by the end of 2018. AT&T plans to take advantage of this dual-nation coverage and the large and growing Mexican-American population by offering AT&T customers free roaming between the two nations. T-Mobile reacted to these plans by launching its Mobile Without Borders offering, which gives T-Mobile subscribers borderless service between the US, Mexico and Canada. Sprint has followed suit, offering an unlimited roaming service between the three nations.
1.4 Complicated but vital US 600 MHz auction due to begin in March 2016

The ongoing strong growth in data traffic in the US requires ever-greater investment in network capacity and spectrum. The AWS-3 spectrum auction in 2014/2015 in the US raised a total of $44.9 billion, more than twice the previously most expensive auction. While there may be some degree of “auction fatigue” after this record-breaking spectrum auction, the FCC is pressing ahead with auctions of valuable 600 MHz coverage spectrum due in 2016. Lower-frequency or coverage spectrum (below 1 GHz) is particularly useful in suburban and rural environments as the range of each base station is greater and therefore more economical for expanding coverage geographically. Furthermore, in urban areas, lower-frequency spectrum is less affected by walls and other structural impediments; it can therefore enhance an operator’s indoor urban coverage too.

These auctions will be unusual in that they are structured as “incentive” auctions, which take place in two stages:

• firstly, broadcasters participate in a “reverse” auction, where the price at which they are willing to give up this spectrum falls in each round, until reaching the minimum level at which they agree to sell

• secondly, a traditional “forward” auction will take place, with mobile operators bidding for the spectrum until a maximum equilibrium price has been reached.

T-Mobile, which has relatively little coverage spectrum, had been pressing for restrictions on the auction. These included giving smaller players a preference in the process to enable them to expand their coverage, particularly in rural areas, and to prevent larger players bidding excessively to inflict unnecessary pain on the smaller players. However, the FCC, in its final decision, declined to set aside T-Mobile’s requested 40 MHz for smaller players but reaffirmed its commitment to set aside 30 MHz.
1.5 Net neutrality: uncertain impact

The FCC issued a long-awaited ruling on net neutrality in February 2015, after widespread debate, reclassifying broadband access as a utility. The regulation will explicitly enforce a number of “bright-line” rules that prohibit the blocking, throttling and paid prioritisation of data.

The GSMA and most broadband providers (fixed or mobile) believe that the utility designation will lead to network congestion due to providers’ inability to actively and effectively manage network traffic. For mobile operators, faced with strict capacity limitations of their networks due to finite spectrum allocations, this could be a particularly acute problem. Most broadband providers find the FCC rules to be an unreasonably burdensome regulation, which is a disincentive to invest in maintaining or upgrading their networks. Mobile internet penetration in the US already exceeds PC-based broadband penetration by some margin, meaning more of the regulatory burden will fall on mobile operators than fixed broadband providers.

The rules came into effect on 12 June 2015, but legal challenges may yet reverse or limit their impact. Additionally, some lawmakers in Washington have proposed legislation to either clarify that the statutes regulating utilities do not apply to broadband providers or to explicitly prohibit the FCC from implementing its regulation. The change of executive administration in January 2017 could also lead to a different composition of the FCC, depending on the outcome of the 2016 election.

There remains considerable uncertainty as to the impact that the ruling will have on the development of new services and applications, particularly in the area of the Internet of Things. Some new service areas may require a degree of network prioritisation, such as healthcare monitoring or public safety, while some of the larger operators in the country have argued that the regulation will impact future network investment.

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1. GSMA Positions: Net Neutrality

Revenue growth in North America has been stronger than other developed markets for some time. This has been driven by higher usage of both traditional voice and messaging services, as well as, more recently, higher levels of data usage. Along with less onerous regulation and a more favourable market structure, these factors have contributed to high ARPU levels and overall robust revenue trends.

However, service revenue growth in the US has markedly slowed over the last 18 months and turned slightly negative in the fourth quarter of 2014, a trend that continued in the first quarter of 2015.

Total revenues, however, have been buoyed by the shift among the major operators away from handset subsidies and towards equipment instalment plans. This leads to a more distinct separation for both the consumer and operator between service revenues and equipment revenues. For example, during 2014, total revenues in the US mobile sector grew by 4.9%, while service revenues were essentially flat (+0.1%) for the year. This continued into 2015; in the second quarter, among the top four operators, total revenues grew by 4.3%. Service revenues were marginally stronger at +0.4% year-on-year, but the substantial gap remains.
The differential between total and recurring service revenue growth will eventually equalise as a greater percentage of the base moves to instalment or SIM-only plans. The advantages to operators of this arrangement are lower handset subsidies and therefore higher operating margins, while consumers often have shorter, more flexible contracts - or even no contract at all.

T-Mobile, with its Uncarrier marketing and promotions, remains the most disruptive of the four US operators. This is reflected in the company’s recent top-line financial performance. T-Mobile also benefited from the reverse acquisition of the smaller, prepaid and low-end market-oriented operator MetroPCS in 2013. The performance of the MetroPCS assets has turned around considerably under the T-Mobile management and brand.

The two largest players, however, have not been as significantly affected by T-Mobile’s disruptive tactics as Sprint has. Sprint’s recurring revenue growth has been by far the lowest over the past year, reaching a trough of –8.6% in Q1 2015 before recovering in Q2. Both Verizon and AT&T appear to have taken a strategic decision not to compete too aggressively for market share of connections, reflecting the relative maturity of the market. Both companies have been withdrawing subsidies from most handsets and encouraging subscribers to upgrade with equipment instalment plans. This reflects what appears to be a conscious choice to focus on maintaining cash flows and a stable operating performance (and reducing churn), rather than risk a further deterioration in the competitive environment.

**Differential between total and recurring revenue growth will disappear**

(Year-on-year growth)
1.6.1 Canadian revenue growth has been helped by lower penetration and less competition

Canada’s financial performance has exceeded the US for the past few years, helped by the fact that it has three dominant players alongside a handful of much smaller operators. There is also a less dramatic difference between the main operators, with Rogers consistently underperforming in terms of revenue growth in recent years, but Bell and Telus performing quite similarly.

1.6.2 US margins vary significantly between top two and others

The maturity of the US market, including its level of 4G adoption and data usage, leads naturally to a market exhibiting slowing revenue growth and much slower growth than Canada, where unique subscriber penetration has further to grow before reaching saturation. However, although the US is becoming a low-growth market, it is highly profitable and cash-generative.

The growth of equipment instalment plans has helped EBITDA margins remain healthy, especially for the market leaders, despite slow revenue growth and the market’s growing competitive intensity. Even T-Mobile, which has offered inducements to gain market share such as paying early termination fees for those porting, has managed to slightly grow operating margins over the past year or so. Although Sprint’s margins remain among the lowest in the sector, they have improved in recent quarters too.

By contrast in Canada, given the lower level of competition and greater emphasis on new subscribers (rather than competing for churn), margins have been stable at a high level and show little variation between the three main operators.
1.6.3 Capex growth to slow following heavy 4G network rollout costs

Capital expenditure in the region has been high over recent years, totalling nearly $35 billion per year and standing at just over 14% of revenues. The rapid rollout of 4G has been a key driver of these investment levels. However, the ongoing growth in data usage and resultant need for capacity is likely to keep capex at approximately the same level in absolute terms through to the end of the decade.

Particularly in congested urban areas, operators are increasingly looking to ‘densify’ their networks by deploying small cells and distributed antennae, and fewer macro cells than have been launched in the past. Overall, capex for North America over the period is likely to grow slowly, slightly below the rate of revenue growth, at an annual average rate of 0.5% per year between 2014 and 2020.
Mobile’s contribution to economic growth in the region
### 2.1 Direct economic contribution of the mobile ecosystem

The mobile sector makes a significant contribution to the economy of North America. In 2014, the mobile sector contributed 3.5% to the GDP of the region. This total impact includes a direct economic contribution of mobile operators and the rest of the mobile ecosystem of $217 billion (1.1% of GDP), an indirect impact on the rest of the economy of $130 billion (0.7% of GDP), and a productivity impact of $324 billion (1.7% of GDP) brought about by the use of mobile technology by businesses and workers in the region.

The direct impact is measured as the difference between the sales made by the mobile ecosystem and the direct cost of making those sales. In this definition, the mobile ecosystem includes infrastructure service providers, retailers and distributors of mobile products and services, handset manufacturers and mobile content, application and service providers. Any sales and value generated through mobile commerce are explicitly excluded.

<table>
<thead>
<tr>
<th>Source: GSMA Intelligence</th>
</tr>
</thead>
</table>

#### North America: direct GDP contribution of the mobile ecosystem

($ billion, percentage of 2014 GDP)

<table>
<thead>
<tr>
<th>Infrastructure providers</th>
<th>Network operators</th>
<th>Handset manufacturers</th>
<th>Distributors and retailers</th>
<th>Content, applications and other services</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 7</td>
<td>$ 152</td>
<td>$ 12</td>
<td>$ 8</td>
<td>$ 38</td>
</tr>
<tr>
<td>0.04%</td>
<td>0.79%</td>
<td>0.06%</td>
<td>0.04%</td>
<td>0.20%</td>
</tr>
</tbody>
</table>

5. This value added to the economy is also equivalent to the payment of wages, tax contributions and business profits by the industry.
Broader economic impact of the mobile ecosystem

The economic activity directly generated by the mobile ecosystem has a multiplier effect on the rest of the economy, generating sales and value added in other sectors and industries. This is because some of the income generated by the mobile ecosystem in the form of wages, taxes or profits is then spent across other parts of the economy. This means that other sectors also benefit indirectly from the value added created by the mobile ecosystem. In North America, the demand and value added generated by other technology industries – for example the semiconductors sector – is intrinsically linked with the activity of the mobile ecosystem. Other economic sectors, such as real estate and professional services, are also to a significant degree dependent on the activity of the ecosystem. This indirect impact resulted in additional economic activity of $130 billion (0.7% of GDP) in North America in 2014.

In addition to the direct and indirect contribution to GDP by mobile network operators and the mobile ecosystem, an estimated 1.7% in GDP is generated across all economic sectors through the increased productivity brought about by the widespread use of mobile technology. This productivity impact from mobile technology is estimated to have generated a $324 billion contribution to GDP in 2014 in the region. Mobile services, including the mobile internet, allow more efficient ways for workers and businesses to communicate and access information, for example by reducing unproductive travel time, allowing more effective decision-making, and facilitating improved logistics for businesses and workers. A survey by the US International Trade Commission found that a large proportion of US firms across all economic sectors continues to experience large productivity improvements from the increased digitisation of their industries, and mobile technology constitutes an increasingly central part of this. Overall, the mobile industry generated a total GDP impact of $670 billion or 3.5% of North America’s GDP in 2014.

Source: GSMA Intelligence

North America: total (direct, indirect and productivity) contribution to GDP
($ billion, percentage of 2014 GDP)

<table>
<thead>
<tr>
<th></th>
<th>Mobile operators</th>
<th>Related industries</th>
<th>Indirect</th>
<th>Productivity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>152</td>
<td>65</td>
<td>0.3%</td>
<td>0.7%</td>
<td>1.7%</td>
</tr>
<tr>
<td></td>
<td>0.8%</td>
<td>0.3%</td>
<td></td>
<td></td>
<td>0.3%</td>
</tr>
</tbody>
</table>

2.3 Employment and public funding contribution

In 2014 the mobile ecosystem directly supported more than 1.1 million jobs in North America. The largest employment contribution came from mobile operators, with approximately 550,000 direct employees. A significant number of direct jobs were also supported in the rest of the mobile ecosystem, which includes infrastructure and support services, content providers, distributors and handset manufacturers.

In addition to the jobs that are generated directly by the mobile ecosystem, further jobs in the rest of the economy were indirectly supported by the activity of the sector. A large number of these additional jobs were generated in the direct supply chain of the ecosystem, as the industry also relies on services and products from outside the industry. In 2014 more than 1.1 million jobs were indirectly supported across all sectors in this way, bringing the total impact of the mobile industry to nearly 2.3 million jobs.

Employment impact
Jobs (thousands)

Source: GSMA Intelligence
The mobile ecosystem also contributes significantly to public funding in North America, even without considering the significant revenues that the sector generates to the public sector from spectrum auctions and other regulatory fees. Payments come from a range of areas including sales and other indirect taxes, corporation tax, income tax and social security contributions. The overall contribution in 2014 was around $75 billion.

Mobile operators also made further contributions to the public finances of North American governments in terms of spectrum licence fees and other regulatory charges (e.g. universal service funds). For example, in the AWS-3 auctions of 2015, mobile operators paid approximately $45 billion in the US, and in excess of $2 billion in Canada.
2.4 Economic impact out to 2020

Going forward, the mobile industry will continue to increase its contribution to economic activity in North America. By 2020, the mobile ecosystem will contribute $750 billion to North America’s economy. This is a conservative forecast, as it assumes a very limited growth in productivity improvements in the broader economy. There is significant upside to these projections, especially if the process of digitisation of the economy accelerates during this period, for example through an increased reliance on mobile internet applications to generate cost savings and efficiencies across industries in the region.

**Mobile industry contribution to North America economy: outlook to 2020**

($ billion)

<table>
<thead>
<tr>
<th>Year</th>
<th>Mobile Industry Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>670</td>
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<tr>
<td>2015</td>
<td>693</td>
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<td>713</td>
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<tr>
<td>2019</td>
<td>745</td>
</tr>
<tr>
<td>2020</td>
<td>750</td>
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</tbody>
</table>
North America’s rapidly evolving mobile ecosystem
3.1 US remains the dominant source of technology innovation and disruption

North America, in particular the US and Silicon Valley, has for several decades been the epicentre of the technology industry and responsible for many of the innovations now taken for granted. Although the world is seeing a broader range of innovation hotspots emerge, the US is still dominant. In the majority of cases, innovations such as new devices and mobile apps are designed (if rarely manufactured) in North America.

Despite a host of new emerging challengers, operating systems originating in North America continue to dominate the global smartphone market, accounting for around 95% of global sales in 2014. Despite the explosive growth of markets such as China, the US remains the world’s largest app market in terms of revenues. The US market has seen a number of new apps and services scale rapidly, both domestically and internationally, particularly those based on the new ‘sharing economy’, such as Uber and Lyft.

There are many reasons why the US continues to produce a disproportionate share of innovations. These include top-ranked universities such as Silicon Valley’s own Stanford, and network effects that lead to greater opportunities for start-ups in areas such as recruitment and sales. However, most important is a well-funded and highly developed venture-capital community. Market conditions over the past few years have been highly favourable for the backing of new ventures as well as follow-on funding for established enterprises. There is every reason to expect a continued brisk pace of new innovations, including mobile devices, access technologies and services, functions and apps, and telecommunications and tech more broadly, to flow from the region for the foreseeable future.

Spotting the innovations that will gain most traction is difficult to predict, as is the nature of the enterprise that will back them. However, a number of focus areas are emerging as likely future drivers of innovation. These areas have been receiving a disproportionate amount of investment and attention from investors – both venture capitalists and corporates.
3.1.1 Consumer engagement and analysis of data increasing in value

Tech players have long recognised the value of data gleaned from their interactions and engagement with consumers. Google is perhaps the earliest example of a company monetising data it collects from its users, mostly by allowing advertisers to more effectively target potential customers. Facebook has similarly recognised the value of consumer engagement and data on their preferences. It has equally been prescient in recognising the increasing value of mobility offerings. In the first half of 2015, 72% of Facebook’s revenues came from its suite of mobile apps, many of which it has acquired in order to deepen and solidify its engagement with particular market segments. This includes focusing on specific content offerings such as photo sharing focused Instagram and messaging-focused WhatsApp.

Many start-ups in the healthcare sector are recognising the monetary – but also medical – value of the exploding amount of data that can be collected thanks to the increasing reality of the Internet of Things (IoT). Data can be stored and saved in real-time via cloud-based solutions, then analysed for any clinically valuable patterns in both large and discrete datasets.

Major tech players in the region appear to be positioning themselves for a future in which virtual reality (VR) and augmented reality (AR) could become as important as voice is today, if not more so. Certainly from a user engagement perspective, VR/AR have the potential to spur a dramatic increase in engagement, as well as the data collected and analysed during these engagements. Acquisitions and investments in the VR/AR space include Google’s investment in Magic Leap; Microsoft’s organically developed HoloLens; and Facebook’s $2 billion acquisition of virtual-reality gaming headset developer Oculus Rift. Facebook founder and CEO Mark Zuckerberg highlighted the future potential beyond gaming of VR/AR by commenting after the acquisition:

“Every 10–15 years a new major computing platform arrives, and we think virtual and augmented reality are important parts of this upcoming next platform.”

3.1.2 Innovation in access will continue across the region

Following the rapid deployment and uptake of LTE networks, operators in the region continue to invest heavily and play an active role in delivering innovation in network access. Operators in both the US and Canada are in the process of launching LTE-A (Advanced), which offers faster speeds for users and is achieved through carrier aggregation. Bell Canada recently claimed to be the first North American operator to offer tri-band LTE-A services. The service is already available to more than 40 communities across the country. Operators in the US have also launched voice over LTE (VoLTE) and new IP-based Rich Communications Services (RCS).

Venture capitalists and other ecosystem players are focusing on and funding innovative and potentially disruptive access technologies such as drones and satellites. Although these technologies will not replace the central role of mobile networks, they may offer alternatives or new use cases in specific scenarios. The venture-capital analysis firm CB Insights has identified drone firms 3D Robotics and Airware and, in satellites, Planet Labs, as potential new ‘unicorns’ (private firms valued at more than $1 billion).
3.2 The Internet of Things is already transforming North American homes and cars

More than any other region, North America has embraced the connected living concept and broader potential of the Internet of Things (IoT). Although still a nascent market, the proportion of machine-to-machine (M2M) connections as a percentage of total connections in North America is higher than any other region of the world. Acquisitions of well-known connected-living brands, such as Nest (Google) and Smart Things (Samsung), as well as organic initiatives such as AT&T’s Digital Life, are creating an environment in which consumers increasingly expect the seamless integration of the growing number of connected devices.

Although many devices are likely to be connected via Wi-Fi, Bluetooth or other non-cellular short-range technologies, they will nevertheless build awareness of the connected lifestyle and foster greater growth throughout the ecosystem. Mobile will continue to play a key role in many cases as an enabling technology for IoT, acting as an aggregator or hub to connect a range of devices, and offering wide-area connectivity.

Among the US operators, AT&T and Verizon are the leaders in the M2M space. In the first half of 2015, 72% of AT&T’s wireless net additions were connected devices. Overall, connected devices now comprise almost one-fifth of AT&T’s base of wireless connections. Verizon also saw a 135% increase in 4G IoT connections during 2014, leading to a 45% jump in IoT revenues.
### 3.2.1 Strong medium-term outlook for cellular M2M connections

The outlook for cellular M2M connections in the region is strong. Average annual growth of nearly 25% is expected for the rest of the decade. North America is also leading the world in the adoption of 4G M2M connections, with higher connectivity speeds allowing a broader range of services.

Many more devices, particularly home or indoor devices, utilise Wi-Fi, Bluetooth or other short-range connections, rather than cellular networks. Although this total M2M segment is already very large, Machina forecasts this segment will grow at a robust CAGR of 22% through to 2020, by which time it will total more than 3.5 billion connections in North America.
Vehicles are becoming increasingly automated

North American consumers are increasingly expecting new cars and vehicles to offer on-board connectivity. AT&T has partnerships with a number of manufacturers including General Motors, Nissan, Audi, BMW, Subaru, Ford, Volvo and Tesla. AT&T has nearly 5 million connected cars as of 30 June 2015, which is more than 20% of its connected devices base; cars alone accounted for just under half of total wireless net additions in the second quarter. AT&T has said that it expects to take at least 50% market share of new connected cars in 2015 and to have a base of more than 10 million by the end of 2017.7

Sprint is also notable in the connected cars space with its Velocity automotive solution, which counts Chrysler among its customers. The addressable market in the US, consisting of nearly 240 million vehicles8, and increasing annual car sales as the financial crisis has eased, suggest scope for many years of significant growth in this segment before saturation is reached.

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7. Source: SEC 8-K Filing, 30 September 2014
8. Source: OICA, 2013
3.2.3 Healthcare: mobility offers convenience but also better, more affordable care

There are signs that opportunities for IoT services in the healthcare sector are now being realised. According to World Bank data, the US spent 17.1% of its GDP on healthcare in 2013 while Canada spent 10.9%. In comparison, the UK spent 9.1%, Germany 11.3% and Japan 10.3%. The US is a clear outlier in healthcare costs and although there are just as many potential cures as there are causes, IoT can provide part of the solution.

A recent venture with potential for long-term savings through better diagnoses as well as better health outcomes was announced in April 2015 between Apple and IBM Watson Health. IBM Watson will anonymise and store data from iPhone and Apple Watch HealthKit users who opt in. This data will be stored in a secure cloud system that can be accessed and shared by researchers in the future. IBM claims this “will enable doctors and researchers to draw on real-time insights from consumer health and behavioural data at a scale never before possible”.

Flatiron Health is a venture-capital-funded healthcare technology company whose investors include Google Ventures and Box founder Aaron Levie. Similar to the Apple-IBM alliance, Flatiron aims to use cloud-based data analysis, obtained by doctor input and IoT-based monitoring devices, and ‘decision support’ software but it focuses solely on oncology patients and care. It has formed an alliance with Varian Medical Systems, a manufacturer of medical devices and software also focused on cancer treatment, with the goal to expand and enhance their existing software platforms and provide better integrated medical and radiation oncology data analytics.

Wearable fitness devices such as Fitbit are increasingly popular. However, there is a requirement to monitor statistics far more complicated and specialised than heart rates, for example. Proteus Digital Health manufactures swallowable medical devices, made from edible ingredients, that can monitor a patient’s use of medication and its effectiveness. This then allows the doctor to potentially alter the patient’s medication by simply sending an updated prescription to their pharmacy, or request a consultation if further diagnostics are required. This is more efficient and practical than a typical regularly timed medication review with each patient.

There are also many start-ups aiming to be the “Uber for healthcare” by offering an on-demand and often on-location service. Some of these, most utilising a mobile app, are more about convenience for the patient, who is often well-off and pays out of their own pocket for the convenience of the service. However, mobile technology is being used in many ways for more than pure convenience. One such example is Colorado’s largest hospital system, Centura Health. Centura is partnering with True North Health Navigation, a Denver-based start-up that provides care to 911 (emergency services) callers as an alternative to more expensive and often unnecessary ambulance rides to hospital emergency rooms. The company estimates its own services typically cost several hundred dollars, compared to typical ambulance ride costs of $800–1,000 (for the transport and EMT care alone) plus an additional $2,000–2,400 for hospital emergency room care.

An area where IoT has the potential for change that simply could not be achieved fully without advanced technology is in the reduction of medical errors. One example is the use of wireless radio-frequency identification (RFID) tags equipped with near-field communication (NFC) technology to track medication and medical devices. Once each healthcare service accessed by a patient has a unique ID, it will allow each healthcare provider to check for allergies, contraindications, side effects and treatment effectiveness.

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9. Source: Health expenditure, total (% of GDP), The World Bank
3.3 Digital commerce is increasingly mobile-centric

After a period of two decades in which retail and commerce have moved online, digital commerce itself is now becoming increasingly mobile-centric. Most major retailers and indeed a significant percentage of smaller retailers have developed proprietary mobile apps that allow them to not only make sales directly from the app but also tailor in-store advertisements or offers to app users via location-based beacons.

Advertising is following consumers from PC-based digital commerce to mobile. Having nearly doubled in 2014, North American mobile advertising spending will grow robustly over the next few years, at a 33% CAGR through to 2018, according to digital advertising research firm eMarketer. Moreover, mobile will account for more than two-thirds of all digital advertising spend globally by 2018.

Mobile advertising spend
($ billion)

Source: eMarketer
The launch of Apple Pay, coinciding with the iPhone 6 and 6 Plus in October 2014, brought new momentum to the mobile payments business, which has struggled to gain traction in the US beyond a niche market. For example, retailers such as Starbucks have had much success with their own mobile payment apps, but more broadly based mobile payment providers have struggled to gain traction. Apple Pay is currently only available in the US (not Canada) with debit or credit cards issued by the vast majority of issuers (427 in total as of 9 August 2015). It is accepted at 71 retailers and for payments via 38 apps.

In May 2015, Google announced a competing offering, Android Pay. Google is working with three US operators at launch – AT&T, T-Mobile and Verizon – to pre-install the Android Pay software on phones, ensuring growth in user availability if not usage. All major card issuers are participating and the service can be used to pay where either the Android Pay or contactless payment icons are displayed, meaning that it can be used with 700,000 merchant partners as well as for in-app purchases via 1,000 apps at launch.

There is limited data to date on the adoption of these new mobile payment services. However, with an increasing number of banks, card issuers and retailers supporting mobile payments, they are likely to become more mainstream in the coming years.

Mobile payment growth to be boosted by Apple Pay and Android Pay launches
3.4 Venture-capital funding: a key driver of mobile innovation in North America

The US has traditionally been the heart of technology and telecommunications innovation, helped in no small part by venture-capital-funded start-up ventures, predominantly in Silicon Valley. Although recently funding has globally been more broadly based, Silicon Valley continues to benefit from benign market conditions that have brought significant funding to innovative new ventures and buoyed the valuations of established start-ups.

Market conditions since the trough of the financial crisis have been accommodative to the formation and funding of start-up businesses, helped by huge liquidity in debt and equity markets and funding readily available from a growing array of sources, including the developing crowdfunding sector. According to CB Insights, funds invested by venture-capital and private equity firms into privately held enterprises increased by 65% year-on-year in 2014 to more than $200 billion globally.

The net result of these conditions is that there is potential for greater innovation as well as disruption in the future, given the amount of venture-capital funding already committed to start-ups.

North America has started strongly in 2015, particularly in the first quarter. Despite recent market turbulence, most start-ups have taken full advantage of the ‘cheap money’ available in recent years and can sustain themselves for some time even if further funding is not available; moreover, many likely have sufficient capital to be self-sustaining enterprises. Therefore, although some adjustment of business plans is likely in the event of a prolonged market downturn, it is highly likely that both established and recently funded start-ups will continue to provide innovations and disruptions to the mobile and broader technology and telecoms sectors for the foreseeable future.

Source: CB Insights

Mobile and telecoms venture-capital funding
($ million)
3.5 Summary of GSMA Programme activities

The GSMA has identified four key growth areas that present significant opportunities and benefits for consumers, and provide clear opportunities for mobile operators to collaborate and play an active role in delivering these future opportunities and benefits.
CONNECTION LIVING

The GSMA, through its Connected Living Programme, aims to further develop the IoT market, both within the North American region and at the global industry level. The initial focus of the Connected Living programme is to accelerate the delivery of new connected devices and services in the M2M market through industry collaboration, appropriate regulation, optimising networks and developing key enablers to support the growth of M2M in the immediate future. The ultimate aim is to enable the IoT, a world in which consumers and businesses enjoy rich new services, connected by an intelligent and secure mobile network.

Working with its partners across the ecosystem and key verticals, the GSMA is active in a number of areas to drive forward this initiative:

- **Remote SIM provisioning for M2M:** The GSMA’s vision is to unite all stakeholders behind a single, common and interoperable global embedded SIM specification to help accelerate the growing M2M market.

- **IoT business enablers:** The GSMA is working to create a sustainable M2M regulatory and policy environment that enables operators to unlock the consumer and business benefits of the IoT.

- **Secure IoT networks:** The GSMA is working to establish security requirements for how machines should communicate via the mobile network in the most secure way.

- **Mobile IoT:** The GSMA is working with mobile operators and ecosystem partners to assess solutions for low-power, wide area connections to enable further scaling of the IoT.
The GSMA’s Network 2020 programme is designed to help mobile network operators in the move to an all-IP world and help them deliver global interconnected all-IP communications services to consumers such as voice over LTE, video over LTE (ViLTE), voice over Wi-Fi (VoWi-Fi) and RCS. Operators are in a unique position to offer secure, ubiquitous all-IP solutions with reach, reliability and richness. The transition will allow them to deliver an enhanced customer user experience that when interconnected with other operators offers truly global reach and scale. The programme is already helping operators from around the world to migrate from circuit-switched technology to an all-IP infrastructure while helping them to maintain service continuity.

The first phase of the programme focuses on helping networks deploy VoLTE and conversational video calls over LTE, VoWi-Fi and encouraging the RCS ecosystem to help operators prepare for and launch RCS-based interoperable solutions and VoLTE roaming architectures for their customers around the world.

Additionally, the Network 2020 programme will work with operators to determine the technical and commercial specifications for operator-to-operator quality of service (QoS) for IP services, and encourage them to incorporate the QoS philosophy into their customer solutions. The Network 2020 programme also aims to help catalyse commercial implementations for IP Interconnect solutions between operators and service/content providers.

Finally, until such time as the industry requirements and definition of 5G have stabilised, the GSMA will focus on improving the overall sustainability of the mobile telecoms sector, allowing more networks to achieve greater connection numbers by enhancing the business model for expanded coverage and offering connectivity to those in the world that currently have no connectivity at all.
DIGITAL COMMERCE

Working with mobile operators, regulators, banks, retailers, transport operators and other service providers both in North America and across the globe, the GSMA’s Digital Commerce programme is active in driving the mass adoption of SIM-secured digital commerce services globally.

The GSMA engages regularly with key government and regulatory bodies, providing advice and guidance on how to harness the potential benefits of SIM-based services in transport, retail and other sectors of the economy, and developing industry positions on aspects of policy, highlighting the impact of regulation and informing regulators’ decision-making processes.

As the number of commercial mobile commerce services around the world rises, the GSMA continues to promote the use of common standards to enable the global interoperability of services and generate economies of scale, liaising with other relevant stakeholders to ensure the consistency of the overall set of specifications involved in mobile commerce deployments. Covering many topics, these specifications set out a common framework of requirements to ensure interoperability and an efficient and consistent development and deployment of mobile commerce services.

Two areas of focus for the Digital Commerce initiative are as follows:

- **Tokenisation**: the Digital Commerce programme is working with operators from around the world to provide a tokenisation-based framework that will allow banks to put their payments cards in non-Apple phones, with a bank on-boarding model that includes the SIM playing a role as the secure element.

- **Remote payments**: the GSMA is working with operators and industry partners to improve the user experience when using mobile devices for remote payments. In addition to being technically secure, solutions need to be simple and widely distributed.
PERSONAL DATA

The GSMA’s Personal Data programme is working with mobile operators that have launched identity services across the globe. The mobile industry needs to deliver common and consistent interfaces to a range of digital service providers, which at the same time need to offer seamless and convenient solutions to consumers.

The use of standards and interoperability are therefore key, in particular the need to create a common, industry-wide set of identity-related application programming interfaces (APIs). The GSMA is working closely with operators to establish a uniform set of APIs to underpin key mobile identity services.

Mobile Connect is a fast, secure login system that enables people to access their online accounts with just one click or less, and provides different levels of security from low-level website access to highly secure bank-grade authentication. People subscribed to a participating operator know that when they click on a website’s Mobile Connect button they can log in to any service or activity without the need to remember complicated username and password combinations.

The GSMA recently announced that Mobile Connect trials are now underway in all regions of the world, with 17 mobile operators in 13 countries having launched the service. There are plans for additional launches and beta trials over the course of the current year. In the US, the GSMA has been awarded a grant by the National Institute of Standards and Technology (NIST) as part of the US government initiative the National Strategy for Trusted Identities in Cyberspace (NSTIC) to fund a technology proof of concept pilot of a mobile-based identity service.
To download the Mobile Economy North America 2015 report please visit the GSMA website at www.gsmamobileeconomy.com