The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 300 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, Mobile World Congress Americas and the Mobile 360 Series of conferences.

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

Follow the GSMA on Twitter: @GSMA

GSMA Intelligence is the definitive source of global mobile operator data, analysis and forecasts, and publisher of authoritative industry reports and research. Our data covers every operator group, network and MVNO in every country worldwide – from Afghanistan to Zimbabwe. It is the most accurate and complete set of industry metrics available, comprising tens of millions of individual data points, updated daily. GSMA Intelligence is relied on by leading operators, vendors, regulators, financial institutions and third-party industry players, to support strategic decision-making and long-term investment planning. The data is used as an industry reference point and is frequently cited by the media and by the industry itself. Our team of analysts and experts produce regular thought-leading research reports across a range of industry topics.

www.gsmaintelligence.com

info@gsmaintelligence.com
Executive Summary

Smartphone and 4G adoption accelerating

Across Latin America and the Caribbean, smartphone adoption has accelerated to reach 59% of total connections by the first half of 2017. In the largest markets, adoption has grown particularly quickly; since the beginning of 2016, almost 85 million new smartphones are in use in the region, with Brazil adding more than 20 million and Mexico 18 million.

By 2020 the region will have an adoption rate of 71%, ahead of the global average of 66%. This translates into an additional 171 million new smartphone users across the region by the end of the decade.

Operators across the region have launched 108 LTE networks in 45 markets, as of June 2017. As a result, coverage has risen sharply in recent years, now reaching a critical mass of 70% of the population. 4G adoption rates are now accelerating, with the rate across the region more than doubling in 2016. By 2020, the region will largely close the gap on the rest of the world, reaching 42% of connections compared to the global average of 44%. Brazil in particular is seeing a strong 4G growth spurt.
Data usage growing, with data revenues powering a recovery in revenue growth

Driven by the increased mobile broadband and smartphone adoption, mobile data usage is growing strongly across the region. Overall mobile data usage grew 64% in Latin America in 2016. Going forward, Cisco projects 42% annual growth in data usage to about 5.5 GB per user (nearly six times the 2016 level) in 2021.

Operators are increasingly successful in monetising this data usage. Data revenue growth, combined with a positive elasticity response to intense price competition, less regulatory pressure and an improved economic environment, are driving the first positive ARPU growth this year since 2012, and the first year of positive revenue growth since 2014. Recurring revenues will grow at an annual rate of just over 4% through to 2020.

Operators continue to invest in 4G coverage and capacity expansion

Operators will continue to invest to expand coverage to close to 90% of population and to add the capacity required for higher data usage. Overall investment by operators in the region will total nearly $70 billion through to 2020. However, thanks to the revenue recovery, capex as a percentage of revenues will drop to 20% by 2020, down from over 23% in 2016.

5G to arrive in earnest in mid-2020s

Although the focus for both operators and consumers is currently 4G, 5G coverage will begin to expand rapidly by the middle of the next decade to reach just under 50% by 2025. Total 5G connections will exceed 50 million by 2025, nearly 5% of the global total. Adoption will expand once coverage reaches critical mass in key markets, led by Argentina and Mexico.
Mobile ecosystem is a major contributor to the regional economy

In 2016, mobile technologies and services generated 5% of GDP in Latin America, a contribution that amounted to $260 billion of economic value added. In the period to 2020, this will increase to $320 billion (5.6% of GDP), as the region experiences strong growth in productivity brought about by continued adoption of mobile internet.

The mobile ecosystem supported 1.7 million jobs in 2016. This includes workers directly employed by mobile operators and the ecosystem, and jobs that are indirectly supported in the rest of the economy by the activity generated by the sector. The sector also makes an important contribution to the funding of the public sector, with almost $35 billion raised in 2016 – mainly in the form of general taxation, including VAT, corporate taxes and employment taxes.

Mobile provides a large, scalable platform for innovation

Latin America boasts some of the most advanced mobile internet users globally. Three of the top 10 countries surveyed by We Are Social/Hootsuite on daily mobile internet usage are Latin American, with Brazil ranked second. Overall, South America has the second highest social media penetration, while Central America is a few places lower.

Combined with Latin America’s rising smartphone adoption and 4G usage, the mobile ecosystem provides a large, scalable platform for entrepreneurs and innovators. With nearly 350 million mobile internet subscribers currently, and 420 million by 2020, the Latin American market is larger than the US and in 2020 will rival the EU in size.

Investment in startups in the region is flourishing

Venture capital and private equity funding has been especially strong in 2017: according to CB Insights, the number of transactions – 453 – in the first half of 2017 has exceeded the number for all of 2016, which itself was a record year. The number of deals has been rising strongly each year since 2014.

Tecnolatinas identified more than 5,000 technology-based private companies in the region. Of these, 123 are worth more than $25 million and nine are ‘unicorns’ with a value of $1 billion or more. Of the ecosystem’s total value of $38 billion, nearly 60% were valued between $25 and $100 million.

Fintech is an especially ripe area for growth, as half of the region’s population is underserved by the formal banking system. Indeed, the number of fintech startups in the region had grown to more than 1,000 by December 2016, a significant share of the 5,000 private tech firms identified by Tecnolatinas.
Mobile's role in addressing social challenges

Despite progress made to date, still too many people across Latin America and the Caribbean are digitally excluded. By 2020, nearly 250 million will remain excluded; these are predominantly in rural areas, in lower income classes and more likely to be women. The mobile ecosystem must address challenges and perceptions around safety and security if it is to connect these people, as well as tackle a lack of digital skills and affordability challenges.

Designing policies fit for the digital ecosystem

The converging digital ecosystem is highly dynamic, fast-paced and modular. Rising consumer demand for data requires new technologies and significant investment. At the same time, the industry is moving forward to connect the unconnected and serve the nascent Internet of Things (IoT) sector. This all poses regulatory and policy challenges for both the current and future digital ecosystem. With that in mind, policymakers must seek to support and enable the digital ecosystem.
MOBILE ECONOMY
LATIN AMERICA
AND THE CARIBBEAN

Unique mobile subscribers

2016: 451 million
3.2% CAGR 2016–20
2020: 511 million

SIM connections

2016: 675 million
3.4% CAGR 2016–20
2020: 771 million

Accelerating moves to mobile broadband networks and smartphone adoption

Mobile broadband connections

2016: 62% 79%
2020: 79%

Smartphone adoption

2016: 55% 71%
2020: 71%

Data growth driving revenues and operator investments

Operator total revenues

2016: $74.0bn
4.0% CAGR 2016–20
2020: $86.7bn

Operator capex of up to $67.7 billion for the period 2017–20
Mobile internet penetration

2016 - 2020
51% - 63%
6.2% CAGR 2016-20

Cellular M2M connections

2016 - 2020
25m - 53m
20.4% CAGR 2016-20

Mobile money services

2016
33 SERVICES
live in 17 countries

Mobile industry contribution to GDP

2016 - 2020
$260bn - $320bn
5.0% GDP - 5.6% GDP

Public funding

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)

2016
$33.6bn

Employment

Jobs directly supported by the mobile ecosystem in 2016

2016
740,000

Indirect jobs supported

2016
980,000
Industry overview
North America

**Subscriber Penetration**
- 2016: 80%
- 2020: 84%

**Smartphone Adoption**
- 2016: 78%
- 2020: 81%

Global

**Subscriber Penetration**
- 2016: 66%
- 2020: 72%

**Smartphone Adoption**
- 2016: 51%
- 2020: 66%

Latin America and the Caribbean

**Subscriber Penetration**
- 2016: 70%
- 2020: 76%

**Smartphone Adoption**
- 2016: 55%
- 2020: 71%
1.1 Unique subscriber base will continue to grow to reach levels seen in developed regions

Compared to developed regions, Latin America and the Caribbean is still relatively underpenetrated, with unique subscriber penetration (which measures mobile usage on a per-person rather than per-SIM-card basis) of 70%, compared to more than 80% in North America and 85% in Europe. The region still has further growth to come before reaching saturation levels of 80% or more. By 2020, subscriber penetration will grow by 6 percentage points, to 76%, representing 3.2% annual growth over the remainder of the decade.

Connections will grow at a similar rate to unique subscribers as the SIM ratio remains stable at about 1.5 SIMs per unique subscriber. Excluding M2M, connections will grow at a 3.4% annual rate through to 2020.

**Unique subscriber growth**

<table>
<thead>
<tr>
<th>Unique subscribers (end-2016)</th>
<th>Subscriber growth (2016–2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>451 million unique subscribers</strong> (70% of population)</td>
<td><strong>60 million new subscribers</strong> (additional 6% of population)</td>
</tr>
<tr>
<td>Brazil 33%</td>
<td>Mexico 31%</td>
</tr>
<tr>
<td>Argentina 9%</td>
<td>Venezuela 4%</td>
</tr>
<tr>
<td>Mexico 20%</td>
<td>Peru 9%</td>
</tr>
<tr>
<td>Others 12%</td>
<td>Columbia 12%</td>
</tr>
<tr>
<td>Bolivia 2%</td>
<td>Argentina 3%</td>
</tr>
<tr>
<td>Guatemala 2%</td>
<td>Ecuador 4%</td>
</tr>
<tr>
<td>Ecuador 2%</td>
<td>Columbia 3%</td>
</tr>
<tr>
<td>Chile 4%</td>
<td>Venezuela 4%</td>
</tr>
<tr>
<td>Peru 5%</td>
<td>Bolivia 2%</td>
</tr>
<tr>
<td>Colombia 7%</td>
<td>Others 8%</td>
</tr>
<tr>
<td>Argentina 9%</td>
<td>Others 8%</td>
</tr>
<tr>
<td>Mexico 20%</td>
<td>Brazil 22%</td>
</tr>
</tbody>
</table>

Source: GSMA Intelligence
1.2
Wide variation in mobile market maturity across the region

Penetration is not uniform throughout the region. The southern cone countries (Argentina, Chile and Uruguay) are already fully saturated, with a unique subscriber penetration level above 90%. At the other end of the spectrum, Cuba, the Dominican Republic, Ecuador, Guatemala and Haiti have penetration rates below the regional average of 70% and well below saturation level; these will see significant growth through to 2020. Other large countries such as Brazil, Mexico and Colombia have penetration rates near the regional average but still have considerable room for growth; hence these countries will represent the majority of subscriber growth through to 2020.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Subscriber penetration</th>
<th>Connections penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2016</td>
<td>2020</td>
</tr>
<tr>
<td><strong>Latin America and the Caribbean</strong></td>
<td>70%</td>
<td>76%</td>
</tr>
<tr>
<td>Argentina</td>
<td>91%</td>
<td>92%</td>
</tr>
<tr>
<td>Bolivia</td>
<td>62%</td>
<td>67%</td>
</tr>
<tr>
<td>Brazil</td>
<td>70%</td>
<td>74%</td>
</tr>
<tr>
<td>Chile</td>
<td>91%</td>
<td>93%</td>
</tr>
<tr>
<td>Colombia</td>
<td>66%</td>
<td>79%</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>83%</td>
<td>82%</td>
</tr>
<tr>
<td>Cuba</td>
<td>30%</td>
<td>44%</td>
</tr>
<tr>
<td>Dominican Rep.</td>
<td>59%</td>
<td>62%</td>
</tr>
<tr>
<td>Ecuador</td>
<td>59%</td>
<td>70%</td>
</tr>
<tr>
<td>El Salvador</td>
<td>81%</td>
<td>83%</td>
</tr>
<tr>
<td>Guatemala</td>
<td>54%</td>
<td>55%</td>
</tr>
<tr>
<td>Haiti</td>
<td>43%</td>
<td>47%</td>
</tr>
<tr>
<td>Honduras</td>
<td>66%</td>
<td>72%</td>
</tr>
<tr>
<td>Mexico</td>
<td>70%</td>
<td>81%</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>79%</td>
<td>79%</td>
</tr>
<tr>
<td>Panama</td>
<td>82%</td>
<td>84%</td>
</tr>
<tr>
<td>Paraguay</td>
<td>75%</td>
<td>79%</td>
</tr>
<tr>
<td>Peru</td>
<td>71%</td>
<td>84%</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>86%</td>
<td>92%</td>
</tr>
<tr>
<td>Uruguay</td>
<td>92%</td>
<td>92%</td>
</tr>
<tr>
<td>Venezuela</td>
<td>62%</td>
<td>66%</td>
</tr>
</tbody>
</table>
The eight largest markets

1. by population as of 2016

Source: GSMA Intelligence

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**THE MOBILE ECONOMY LATIN AMERICA AND THE CARIBBEAN 2017**
1.3 Smartphone adoption accelerating in key markets

Figure 2  
Source: GSMA Intelligence

Smartphone adoption

Across the region, smartphone adoption accelerated in 2016. Adoption rose by 9 percentage points during the year to 55% of connections, and has added a further 4 points in the first half of 2017 to reach 59%. In the largest markets, adoption has grown even more quickly: since the beginning of 2016, almost 85 million new smartphones are in use in the region, with Brazil adding more than 20 million and Mexico 18 million. Brazil now boasts a smartphone adoption rate of 72% (versus 81% in North America).

By 2020 the region will have an adoption rate of 71%, ahead of the global average of 66%. This translates into an additional 171 million new smartphone users across the region by the end of this decade.
As 4G coverage reaches critical mass, the technology hits the mainstream

Operators across Latin America and the Caribbean have launched 108 LTE networks in 45 markets as of June 2017. As a result, coverage has risen sharply in recent years, now reaching a critical mass of 70% of the population. As operators continue to invest heavily in 4G networks, coverage across the region will reach 84% in 2020.

4G adoption rates are now accelerating, with the rate across the region more than doubling in 2016. Brazil in particular is seeing a strong 4G growth spurt. From only 10% of connections at the start of 2016, take-up has grown to 34% and will reach 57% by 2020 – the first country in the region to reach more than half of total connections on 4G.

By 2020, the region will largely close the gap on the rest of the world, reaching 42% compared to the global average of 44%.

Brazil in particular is seeing a strong 4G growth spurt. From only 10% of connections at the start of 2016, take-up has grown to 34% and will reach 57% by 2020 – the first country in the region to reach more than half of total connections on 4G.
5G will arrive in earnest in the mid-2020s

While countries such as South Korea and the US will be the earliest 5G adopters, Latin American countries will launch 5G in the early 2020s, with 4G still operators’ primary focus, including the launch of LTE-Advanced networks. 5G coverage will begin to rapidly expand by the middle of the decade to reach just under 50% by 2025.

Adoption will expand once coverage reaches critical mass in key markets, reaching 6% by 2025. Total 5G connections will exceed 50 million by 2025, nearly 5% of the global total. Among the major markets, Argentina will see the fastest take-up of the new technology, with 15 million connections on 5G by 2025 (over 20% adoption), followed by Mexico with over 17 million connections (nearly 15%).

América Móvil has been the clearest about its intentions, with 5G to be launched in Mexico by 2020. In Brazil, Telefónica Vivo does not expect to launch 5G before 2022 as it continues to focus on its 4G as well as fibre broadband investments.

![Graph showing 5G take-up](image-url)
1.6 Smartphone and mobile broadband adoption spurring increase in mobile data usage

Driven by the increased mobile broadband and smartphone adoption, mobile data usage is growing strongly across the region. Overall mobile data usage grew 64% in Latin America in 2016, with particularly strong growth in Mexico and Argentina – more than 70% on a per-user basis.\(^5\) Data consumption has been fuelled not only by the increased adoption of 4G smartphones but also the launch of 15 LTE-Advanced networks in 2016, in 13 countries, including two in Brazil as well as in Argentina, Chile and Peru.

Cisco projects 42% annual growth in data usage or nearly 6 times the 2016 level, to about 5.5 GB per user in 2021. Mexico will grow faster than the other countries in the region, with a 44% CAGR through to 2021.

Operators are increasingly successful in monetising this growing data traffic. In Brazil, Telefónica Vivo reported a 144% year-on-year increase in data traffic in Q2 2017, which it credited to improving 4G coverage and strong adoption and consumption trends. It led to a 31% year-on-year increase in data ARPU, more than offsetting the decline in voice ARPU. América Móvil’s Mexican unit similarly reported strong trends in Q2, with mobile data revenues up 23% year-on-year, powering a small rise in overall service revenues.

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\(^5\) Cisco Mobile VNI, 2016 and 2017
1.7
Data growth has fuelled a turnaround in revenues

Figure 7

Recurrent revenues ($ billion)

Year-on-year change

Driven by recovery in major countries

Source: GSMA Intelligence
The recovery in ARPU that began in late 2016 has accelerated in 2017, with the regional weighted ARPU growing for the first time since 2012. This has been driven by recoveries in major countries such as Brazil, Mexico and Colombia. Factors that have driven this include:

- strong growth in data usage leading to double-digit rises in data ARPU
- the elasticity effect of intense price competition in markets such as Chile, Mexico and Peru, which has driven strong consumption growth and thus monetisation
- new, more innovative mobile plans for consumers that are more tailored to evolving ways of consuming data and certain consumers’ spending limits
- an improved economic backdrop, especially in Brazil, where GDP grew 1% in the first quarter of 2017 following a deep two-year recession, and in Argentina following a contraction in 2016.6

Consequently, despite slow subscriber growth, recurring service revenues will grow modestly in 2017, the first positive year since 2014, and through the rest of the decade, at an annual rate of just over 4% from 2016.

1.8

Capex to remain high through to 2020 as 4G coverage broadens and capacity deepens

In advance of 5G, operators will continue to invest significant sums in both expanding 4G coverage and adding more capacity – for example, launching LTE-A networks and other upgrades to keep up with the growth in data usage. Annual capex will exceed $17 billion from 2018 onwards, and cumulative capex over the remainder of the decade (including 2017) is forecast at nearly $70 billion. Due to the revenue recovery, capex as a percentage of revenues will drop to 20% by 2020, down from more than 23% in 2016.

Operators will re-invest some of those savings in marketing, customer service and other operating costs, with EBITDA margin dropping from around 36% in 2016 to less than 34% in 2020. As a percentage of revenues, operators’ operating cash flow margins will remain broadly stable.

Mobile driving growth and innovation across the region
2.1 The direct economic contribution of the mobile ecosystem

The mobile ecosystem consists of mobile network operators, infrastructure service providers, retailers and distributors of mobile products and services, handset manufacturers and mobile content, application and service providers. The direct economic contribution to GDP of these firms is estimated by measuring their value added to the economy, including employee compensation, business operating surplus and taxes.

In 2016, the total value added generated by the Latin American mobile ecosystem was more than $70 billion (or 1.4% of GDP), with network operators accounting for the majority of this.

Direct GDP contribution of the mobile ecosystem

($ billion, % 2016 GDP)
2.2 Indirect and productivity impacts of mobile technology

In addition to their direct economic contribution, firms in the mobile ecosystem purchase inputs from their providers in the supply chain. For example, handset manufacturers purchase inputs from microchip providers, and content providers require services from the IT sector. Furthermore, some of the profits and earnings generated by the ecosystem are spent on other goods and services, stimulating economic activity in those sectors. We estimate that in 2016, this additional economic activity generated a further $20 billion in value add (or 0.4% of GDP) in Latin America.

The use of mobile technology also drives improvements in productivity for workers and firms across the economies in Latin America. The mobile economy has supported the productivity of the labour force, as workers can use mobile voice and messaging services to communicate more efficiently. Employees and businesses have also been able to access high-speed mobile broadband as 4G networks are rolled out, which provides better access to information and services, with key impacts in industries such as finance, healthcare, education and agriculture. Lastly, while the adoption of M2M and IoT is currently relatively limited, we expect this to drive efficiency gains in areas such as manufacturing, logistics and retail.

Overall, the productivity gains driven by the mobile ecosystem have been estimated at $170 billion in 2016. More than half of this impact is attributed to mobile internet, which has a substantial impact given the relatively low penetration of fixed line broadband in Latin America.

Overall, taking into account the direct, indirect and productivity impacts, in 2016 the mobile industry made a total contribution of $260 billion to the Latin American economies in value added terms, equivalent to 5% of the region’s total GDP.
In 2016 mobile operators and the ecosystem provided direct employment to approximately 740,000 people in Latin America. In addition to this, economic activity in the ecosystem generates jobs in other sectors. Firms that provide goods and services as production inputs for the mobile ecosystem (for example, microchips or transport services) will employ more individuals as a result of the demand generated by the mobile sector. Furthermore, the wages, public funding contributions and profits paid by the industry are spent in other sectors, which provide additional jobs.

We estimate that in 2016, around 1 million jobs were indirectly supported in this way, bringing the total impact (both direct and indirect) of the Latin American mobile industry to more than 1.7 million jobs.
2.4 Public funding contribution

The mobile ecosystem also makes a significant contribution to the funding of public sector activity in the region through taxation. For most countries in the world, this includes value added taxes, corporation tax, income tax and social security from firms and employees. We estimate that the ecosystem made a tax contribution to the public finances of governments across Latin America of almost $34 billion in 2016.

Note totals may not add up due to rounding.

These public contribution figures do not include regulatory fees paid by operators. For instance, most operators in the region make annual contributions to universal service funds, typically ranging between 0.2% and 5% of operator revenue.

In addition to this, operators also make one-off and annual payments to secure access to spectrum. For instance, in 2016 there have been spectrum auctions in Mexico and Peru, raising almost $1.1 billion.
2.5 Outlook and trends for the period 2016–2020

We expect the economic contribution of the mobile industry in Latin America will continue to grow. In value-added terms, we estimate that the ecosystem will generate $320 billion by 2020, representing 5.6% of GDP. The majority of this increase is due to improved productivity driven by continued adoption of M2M and IoT technology, and the increased digitisation of industry and services.

Outlook to 2020

($ billion, % of GDP)
2.6 Latin Americans among most advanced mobile internet users globally

Time spent on internet accessed via mobile device

<table>
<thead>
<tr>
<th>Country</th>
<th>Hours per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>3.5</td>
</tr>
<tr>
<td>Mexico</td>
<td>3.5</td>
</tr>
<tr>
<td>Philippines</td>
<td>3.5</td>
</tr>
<tr>
<td>Malaysia</td>
<td>3.5</td>
</tr>
<tr>
<td>Argentina</td>
<td>3.5</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>3.5</td>
</tr>
<tr>
<td>UAE</td>
<td>3.5</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3.5</td>
</tr>
<tr>
<td>Brazil</td>
<td>4.0</td>
</tr>
<tr>
<td>Thailand</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Source: We are Social/Hootsuite, Digital in 2017 Global Overview
Latin America boasts some of the most advanced mobile internet users globally. Three of the top 10 countries surveyed by We Are Social/Hootsuite in daily mobile internet usage are Latin American and the same three countries are listed as second, third and fourth globally in social media usage per day. Overall, South America has the second highest social media penetration, while Central America is a few places lower at sixth.
2.7 Local startup environment is flourishing

Venture capital and private equity funding

Figure 16

Source: CB Insights

Venture capital and private equity funding has been especially strong in 2017, with more transactions (453) in the first half of 2017 than in all of 2016, which itself was a record year. Moreover, the number of deals has been rising strongly each year since 2014.

2017 has also seen a record level of funding in dollar terms. However, as most deals are for small dollar amounts – and the amounts are often not disclosed – the number of deals is a better indicator of the health and momentum of the startup environment.

7. Financing totals can be heavily influenced by large deals in a particular time period – for example, a single transaction in Brazil of over $2 billion in May 2017 (XP Investimentos) and one in Jamaica for more than $1 billion in April 2017 contributed significantly to this year’s high dollar figures.
Lion’s share of startups have relatively low valuations

Tecnolatinas identified over 5,000 technology-based private (non-state-owned) companies born and/or headquartered in the region; of these, 123 are worth more than $25 million and nine are ‘unicorns’ with a value of $1 billion or more. Although these nine unicorns account for more than 60% of the ecosystem’s total value of $38 billion, nearly 60% were valued between $25 and $100 million, and more than 4,000 private tech companies are worth less than $25 million.

E-commerce, with a market size of $70 billion in 2015, accounts for much of the value of Tecnolatinas today, with many of the unicorns such as Mercadolibre, Despegar, B2W and OLX in the e-commerce space.

The Tecnolatinas report highlights areas where it expects the greatest future growth opportunities: fintech, agtech/food tech, AI and automation software, synthetic biology, renewable energy, VR/AR and IoT.

Fintech is an especially ripe area for growth, as half of the region’s population is underserved by the formal banking system. Indeed, the number of fintech startups in the region had grown to more than 1,000 by December 2016, a significant share of the 5,000 tech firms identified by Tecnolatinas.

Among the many notable fintech startups are the following:

- Mesfix, a Colombian venture that helps SMEs (including micro-enterprises) raise capital by selling their receivables
- QueroQuitar, a Brazilian financial services startup that helps consumers manage and negotiate their debts
- Nubank, a Sao Paulo-based startup that offers consumer credit. It raised $80 million from American and Russian venture capitalists in 2016
- Kueski, a Mexican short-term micro-loan firm that raised $10 million in series A equity from Mexican, American and UK venture capitalists in 2016 and $25 million in debt financing.

Visa has also launched an accelerator programme to assist new ventures in the fintech space in Brazil with their business models and fundraising.

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8. Latin America Riding the Technology Tsunami, Tecnolatinas, 2017
9. Latin America Riding the Technology Tsunami, Tecnolatinas, 2017
10. “Mobile money in Latin America: An industry taking off”, GSMA, March 2017
11. “2017 will be the year of Fintech for Inclusion in Latin America”, Finnovista, December 2016
2.8
Geographic spread and nature of ecosystem value highlight need for local efforts

Table 2

Funding flowing disproportionately to regional leaders

<table>
<thead>
<tr>
<th>Country</th>
<th>Funding ($ million)</th>
<th>No. of deals</th>
<th>% funding</th>
<th>% deals</th>
<th>% population</th>
<th>% unique mobile subs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>5,033</td>
<td>484</td>
<td>51%</td>
<td>47%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Mexico</td>
<td>2,407</td>
<td>189</td>
<td>24%</td>
<td>18%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Chile</td>
<td>681</td>
<td>80</td>
<td>7%</td>
<td>8%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Argentina</td>
<td>658</td>
<td>115</td>
<td>7%</td>
<td>11%</td>
<td>7%</td>
<td>9%</td>
</tr>
<tr>
<td>Colombia</td>
<td>529</td>
<td>45</td>
<td>5%</td>
<td>4%</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>166</td>
<td>30</td>
<td>2%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Jamaica</td>
<td>151</td>
<td>2</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Peru</td>
<td>47</td>
<td>21</td>
<td>0%</td>
<td>2%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9,831</strong></td>
<td><strong>1,032</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Funding ($ million)</th>
<th>No. of deals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>3,247</td>
<td>223</td>
</tr>
<tr>
<td>Mexico</td>
<td>77</td>
<td>71</td>
</tr>
<tr>
<td>Chile</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td>Argentina</td>
<td>68</td>
<td>46</td>
</tr>
<tr>
<td>Colombia</td>
<td>234</td>
<td>28</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>345</td>
<td>13</td>
</tr>
<tr>
<td>Jamaica</td>
<td>1,035</td>
<td>1</td>
</tr>
<tr>
<td>Peru</td>
<td>38</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,360</strong></td>
<td><strong>453</strong></td>
</tr>
</tbody>
</table>

Includes all transactions in the CB Insights database (including VC plus private equity, corporate investments, angels, etc.)

Similar to other regions, startup funding flows disproportionately to the regional leaders. Over the past five years, more than half of startup funding has flowed to Brazil, and nearly as much in terms of share of deals – though it has only one-third of the region’s population and mobile subscribers.
Similarly, the share of established tech startups by country shows a strong bias towards larger countries, with the top three countries accounting for 80% of the total. By value, Brazil and Argentina alone account for 82%.

The disproportionate share of financing and, especially, of established tech startups in Argentina and Brazil highlights the importance of forming and supporting an ecosystem to the development of the technology sector. However, once the ecosystem is sufficiently developed, it is largely self-nurturing thanks to network effects and virtuous cycles. Apart from Latin American tech hubs such as Buenos Aires and São Paulo, the same development cycle has occurred and continues internationally in places such as Berlin, Israel and Singapore.

Smaller countries, such as Colombia and Peru, are making multi-pronged efforts to support ecosystem development. In contrast with the US and other developed countries, the lack of a strong venture-capital network as well as foreign investors’ hesitation around committing significant capital into a region with a history of hostility towards them puts more of the burden on government-backed entities to deliver seed funding and startup support. This is something that Israel recognised when developing its tech sector in the 1990s. Nevertheless, startups today have access to advantages such as cloud infrastructure and collaborative workspaces that previous generations did not, so the seed capital required is usually much less now.

Startup Perú was launched by the Ministry of Production in 2012. In the first seven months of 2017, more than 800 ventures applied for and more than 100 received seed funding of between $5,000 and $150,000. The Ministry of Production also launched Innovate Perú in 2014, with a goal to not only support entrepreneurs but also develop innovative systems and processes within existing companies. Peru has a $100 million fund to promote micro, small and medium-sized enterprises, with 40% contributed by the Inter-American Development Bank (IDB) and the remainder by the Ministry of Finance. Additionally, The World Bank approved a $45 million loan in 2017 for the development of science, technology and innovation in Peru.

In Colombia, iNNpulsa, an agency within the Ministry of Commerce, Industry and Tourism, was set up in 2012 to “promote entrepreneurship, innovation and productivity as the path for business development and Colombia’s competitiveness”. Its medium-term aim, for 2018, is to help realise the government’s goal of being one of the three most innovative and competitive economies in the region. From its inception to early 2016, iNNpulsa has invested around $80 million into 1,200 ventures. There have also been local initiatives in Colombia, such as Medellín’s incubator Ruta N, which started in 2010, providing funding and workspace to local entrepreneurs.
2.9
IoT market to see growth driven initially by smart cities and smart meters

Several promising initiatives have been announced by operators, in cooperation with equipment vendors and the wider ecosystem, in the IoT space recently. Among the focus areas are smart cities and smart meters, but as the technology develops a greater range of initiatives will be tested and deployed.

Telefónica and Huawei have opened a laboratory in Brazil for the development and testing of IoT applications. The Open IoT Lab is located at Telefónica’s research centre in Rio de Janeiro and will be open to partners and third-party developers, with the goal to boost the IoT ecosystem and drive innovation in the IoT space. Solutions will be built using narrowband IoT (NB-IoT), a low power, wide area (LPWA) technology standard using licensed spectrum that enables low battery consumption with greater coverage.

Telefónica and Huawei also have a smart meter project with Chilean water utility Kamstrup. The group successfully tested connectivity management of a telemetry solution for residential water meters. Telemetry will allow clients to monitor their daily use, will facilitate accurate invoicing by avoiding estimated use, and will detect leaks and abnormal situations in the home. It will also offer the water network operation team information regarding provision to the end customer.

In Mexico, AT&T and GE unit Current are collaborating with local authorities to begin equipping streetlights with cameras, microphones and sensors. These sensors will help authorities estimate crowd sizes and check vehicle speeds. For motorists, they will help locate parking places. Police can use the smart infrastructure to monitor criminal activity. Most importantly, the smart technologies will help save on energy costs, monitor air quality and issue alerts for emergency weather conditions. AT&T is providing both the connectivity and the platform for the service.

Figure 19
Source: GSMA Intelligence

Cellular M2M connections
(million)

<table>
<thead>
<tr>
<th>Year</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>21</td>
</tr>
<tr>
<td>2016</td>
<td>25</td>
</tr>
<tr>
<td>2017</td>
<td>31</td>
</tr>
<tr>
<td>2018</td>
<td>37</td>
</tr>
<tr>
<td>2019</td>
<td>45</td>
</tr>
<tr>
<td>2020</td>
<td>53</td>
</tr>
</tbody>
</table>

Note: Cellular M2M forecasts exclude licensed LPWA connections
2.10 Mobile Connect

Mobile Connect is the global, mobile industry-led, single login solution that delivers secure consumer access to websites and apps. It uses the consumer’s unique mobile number to verify and grant online access anywhere the user sees the Mobile Connect logo. Mobile Connect can play a significant role in driving growth within digital economies.13

Mobile Connect provides clear advantages to consumers, such as eliminating the ever-increasing number of passwords needed to securely maintain online identities, and giving consumers control over their data, helping them interact online with confidence. Mobile Connect can reduce the risk of fraud for service providers when users access their services, and can reduce the number of abandoned online transactions. Issues around safety and security are a particular concern in Latin America; such concerns were cited by 64% of non-mobile internet users in the GSMA Intelligence 2016 Consumer Survey.

The Mobile Connect solution is already available to more than 3.1 billion consumers globally. Telefónica is leading the way in Latin America, having enabled Mobile Connect in Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay; more than 158 million mobile subscribers in these markets have access to Mobile Connect. América Móvil has also made Mobile Connect available to its 68 million customers in Mexico.

Latin America is a key region targeted for growth in 2017, as more operators in more countries make Mobile Connect available to their customers, and operators grow their customers’ engagement with the service in all markets.

13. See www.mobileconnect.io for more information on Mobile Connect
Mobile’s role in addressing social challenges in Latin America and the Caribbean
Latin America has seen rapid growth in the number of mobile internet subscribers over recent years, with a total of nearly 350 million, registering growth of almost 10% since the start of 2016. Of these subscribers, more than two thirds connect to the internet via mobile broadband (3G or 4G) networks. As the importance of digital access and engagement increases, so this figure will continue to grow strongly, to reach about 420 million by 2020.

Despite the growth to date, only slightly more than half of the population currently have a mobile internet subscription, well below the developed market average of two thirds – though some lower-income groups may connect using Wi-Fi only. As a result, around 300 million people are digitally excluded and unable to enjoy the socioeconomic benefits that mobile internet can bring. By 2020, nearly two thirds of the population will be connected, still well behind the developed market average but in line with the global average. However, nearly 250 million people across the region will still be digitally excluded. There remain significant barriers to adoption, particularly for underserved population groups (rural, women, low income and youth).

Mobile internet penetration also varies significantly across the region. Chile had the highest penetration as at the end of 2016, with Argentina only slightly behind. In contrast, the Dominican Republic, Guatemala and Haiti have mobile internet penetration rates of one third or less (Cuba has among the lowest levels of mobile internet penetration globally, at 3% of the population).
The GSMA Intelligence Consumer Survey 2016 covered 54 countries from across the globe, including eight markets in Latin America. Among the key findings in the survey from the 8,000 respondents in Latin America were the following:

- An average of 25% of respondents had not used the internet on a mobile phone in the past three months, ranging from 13% in Brazil to 39% in Nicaragua.
- The largest barrier identified was safety and security concerns, cited by an average of 64%.
- Lack of digital skills was cited by an average of 56% of non-users. Affordability was also a significant barrier in many markets (average 56%), partly a reflection of the high levels of inequality in the region.
- By contrast, as 3G coverage exceeds 90% in the region and 4G is now 70%, poor coverage was cited by only 6% of non-users on average.

### Key barriers to digital inclusion in Latin America

Safety/security the highest barrier for non-users of mobile internet

<table>
<thead>
<tr>
<th>Country</th>
<th>Safety and security concerns</th>
<th>Lack of digital skills</th>
<th>Affordability</th>
<th>Lack of awareness and locally relevant content</th>
<th>Lack of network coverage</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>50%</td>
<td>66%</td>
<td>77%</td>
<td>43%</td>
<td>3%</td>
<td>19%</td>
</tr>
<tr>
<td>Brazil</td>
<td>29%</td>
<td>39%</td>
<td>41%</td>
<td>16%</td>
<td>3%</td>
<td>7%</td>
</tr>
<tr>
<td>Chile</td>
<td>73%</td>
<td>81%</td>
<td>69%</td>
<td>42%</td>
<td>2%</td>
<td>19%</td>
</tr>
<tr>
<td>Colombia</td>
<td>68%</td>
<td>57%</td>
<td>52%</td>
<td>28%</td>
<td>8%</td>
<td>13%</td>
</tr>
<tr>
<td>Guatemala</td>
<td>71%</td>
<td>33%</td>
<td>34%</td>
<td>20%</td>
<td>6%</td>
<td>11%</td>
</tr>
<tr>
<td>Mexico</td>
<td>81%</td>
<td>49%</td>
<td>59%</td>
<td>38%</td>
<td>12%</td>
<td>19%</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>42%</td>
<td>24%</td>
<td>25%</td>
<td>15%</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>99%</td>
<td>99%</td>
<td>91%</td>
<td>48%</td>
<td>10%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Note: sample size 8,000 (1,000 per market). Results shown for those who have not used the internet on a mobile phone in the past three months. Percentages for “strongly agree” to questions regarding safety, skills, affordability etc. as reason for non-usage. The number of non-users ranges from 129 (13%) in Brazil to 386 (39%) in Nicaragua.
Although considerable progress has been made in recent years, a large percentage of the population across Latin America and the Caribbean remain unbanked, and half are underserved by financial services. In some countries, such as Haiti and Nicaragua, the preponderance of the population is underserved.

3.2 Delivering financial inclusion across the region

Although considerable progress has been made in recent years, a large percentage of the population across Latin America and the Caribbean remain unbanked, and half are underserved by financial services. In some countries, such as Haiti and Nicaragua, the preponderance of the population is underserved.

Mobile money can drive financial inclusion in Latin America and the Caribbean

Half of adults are underserved by formal financial services

Ranging from over 80% in Haiti and Nicaragua

To less than 35% in Brazil and Jamaica
Over the last few years, the majority of financial regulators in the region have understood the power that mobile money has to deliver financial services to the underserved, combat poverty and boost the economy. Most regulators across the region have therefore adopted an enabling regulatory framework for mobile money, or are actively working towards adopting one for their market.

Enabling mobile money regulation timeline

- Bolivia
- Peru
- Colombia
- El Salvador
- Honduras
- Brazil
- Paraguay
- Uruguay

2011
2012
2013
2014
2015
2016
Regulators’ efforts are paying off and, coupled with industry investment, mobile money services are experiencing fast growth across all the relevant metrics: accounts, agents and transaction volumes and values. Latin America was the fastest growing region in terms of registered accounts in 2016.

- Active mobile money accounts grew from less than 1 million in December 2011 to more than 10 million by the end of 2016.
- The number of live mobile money services in the region grew from 10 to 33 during this period. At least three countries have more mobile money accounts than bank accounts.
- Four deployments have more than 1 million active accounts each.

**Mobile money highlights, 2016**

There are **33 live services in 17 countries**

Mobile money is available in the **majority of markets in the region** where less than 30% of the population has an account at a formal financial institution.
3.3 WeCare: supporting the Sustainable Development Goals

The 17 UN Sustainable Development Goals, and the 169 associated targets, represent an enormous level of ambition for the world and the region. Successful delivery of the SDGs requires the power of mobile to be fully leveraged by all stakeholders involved and a commitment to innovate and collaborate for an effective implementation.

In that spirit, the mobile operator community in Latin America launched the WeCare campaign back in 2014 in Brazil. It is a unique example of self-regulation, commitment to the community and a powerful vehicle for the regional mobile industry to actively contribute to achieving the UN Sustainable Development Goals. More than 48 mobile operators from 14 countries have already joined the campaign. They are working hand-in-hand with local authorities and civil organisations on joint initiatives to tackle handset theft, protect children, contribute to public safety, promote the recycling of electronic waste and develop preparedness for natural disasters, among other initiatives.

During 2017, mobile operators in Guatemala, Chile, Peru and Ecuador joined the WeCare campaign.

<table>
<thead>
<tr>
<th>Campaign launches in the region</th>
<th>Campaign launched in February 2014</th>
<th>Public announcements of industry initiatives</th>
<th>Areas of industry initiatives</th>
<th>Mobile network operators committed to the SDGs</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>1st</td>
<td>19</td>
<td>10</td>
<td>48</td>
</tr>
</tbody>
</table>
Countries that have launched WeCare campaigns and SDG-related initiatives

The initiatives announced in countries around the region contribute to achieving the following Sustainable Development Goals of the United Nations:

- Reducing Handset Theft
- Disaster Response
- Digital Inclusion
- Mobile & Health
- Contribution to Public Safety
- SMS Spam Control
- Child Protection
- Environmental Care
- Mobile Privacy
- Mobile’s role in addressing social challenges in Latin America and the Caribbean

For more information on the WeCare campaign, please visit: www.gsma.com/latinamerica/wecare
Designing policies for the digital ecosystem

The converging digital ecosystem is highly dynamic, fast-paced and modular. In this new competitive reality, markets are volatile as innovation thrives and consumer preferences change quickly. Smart mobile devices have increasingly become a relevant part of everyday life. As users communicate, share content, make purchases or search for information online, they create an enormous pool of data that can be used to better tailor offers of digital services to consumers. With the increasing adoption of smartphones, 9 out of 10 people connected to the internet in Latin America had a smart mobile device as of 2016.

In this context, businesses are expanding beyond national borders, and transnational data transfers are increasing with the need to host and process data in multiple jurisdictions. Rising consumer demand for data requires new technologies and significant investment. At the same time, the industry is moving forward to connect the unconnected and to serve the nascent IoT industry.

All of these issues pose regulatory and policy challenges for the present and future digital ecosystem. With that in mind, the following are important policy issues that must be considered by policymakers seeking to support and enable the digital ecosystem.

14. For more on the converging digital ecosystem, see: A new regulatory framework for the digital ecosystem, GSMA/NERA, 2016
15. For more on competition in the digital ecosystem, see: Resetting competition policy frameworks for the digital ecosystem, GSMA, 2016
16. “9 out of 10 people connected to internet in Latin America have a Smartphone”, ComScore, October 2016
4.1

Fit-for-digital policies are necessary to boost innovation, investment and regulatory certainty

The sustainability of the mobile industry can either be supported by an adequate regulatory framework and forward-looking policies or be hampered by the unintended effects of legacy regulation. In this context, regulators and policymakers face the challenge of striking the right balance of future-proof regulation based on incentives that speeds innovation, brings long-term efficiencies, enables investment and provides regulatory certainty.
Countries such as Argentina, Brazil and Colombia are starting the process of modernising their regulatory frameworks. This includes the implementation of measures that facilitate deployment of infrastructure and incentivise infrastructure sharing; the design of a regulatory agency for the converging ecosystem; the use of public buildings for the installation of antennas; a rethink of privacy frameworks; and the discussion of policies for IoT.

However, these are small steps towards a comprehensive future-proof policy that must be continually re-examined and be flexible enough to suit changes in consumer preferences, markets and technology over time.¹⁷

For example, most countries in the region lack a regulatory framework that provides flexibility, incentives and low risks for investment in network expansion. Such frameworks should be targeted at infrastructure sharing, efficient spectrum management, local administrative effectiveness, independent regulators and ex-post regulation. At the same time, rather than limiting operators’ ability to innovate commercially with restrictions on the segmentation of commercial offers or the application of fair-use policies, modern frameworks should incentivise innovative business models for all ecosystem players, avoiding regulatory distortions and paving the way for new areas of business, such as IoT, big data and 5G.

Over the last couple of years, countries in the region have begun discussing the opportunities and advantages that would come with the constitution of a digital regional market, with the Pacific Alliance taking the lead. Latin America has not constituted a supranational institutional structure that could form the basis for establishing policies and mechanisms towards digital integration, as in the European Union. However, countries gathered in different forums – mainly the Pacific Alliance and eLAC – have identified key areas in which policies and regulation could be regionally harmonised, allowing Latin American countries to take advantage of economies of scale and scope. The key areas include spectrum harmonisation, roaming, taxation, e-government, cross-border data transfer, international trade and e-commerce. To allow these initiatives to grow and have a tangible positive impact, countries and stakeholders in the region need to move beyond intentions and work on initiatives that include precise objectives, performance indicators, deadlines for actions and benchmarking, based on realistic and feasible working programmes and budgets.

¹⁷. GSMA has developed a series of policy recommendations to establish principles-based, flexible regulatory frameworks in Argentina, Brazil and Colombia.
4.2 Closing the digital divide requires policies to make coverage economically sustainable

Extending the reach of mobile networks is the first step towards closing the digital divide in Latin America. While 2G networks cover most of the population, 7.4% of Latin Americans still lack access to a mobile broadband (MBB) capable technology (3G or 4G). Despite being the developing area with the highest level of coverage, more than 50% of the rural population remains uncovered by a MBB capable network. This coverage gap is the consequence of a basic economic challenge: deploying infrastructure in remote areas can be twice as expensive compared to urban areas, while revenue opportunities can be just a tenth. Achieving economically sustainable coverage of these rural areas requires a concerted approach between industry and government. Setting an overarching broadband policy must incentivise network investment and engineer institutional governance to allow for agency collaboration. In Latin America, municipalities have retained high levels of autonomy, which slows infrastructure rollout.

In the past, regulators have relied on public interventions such as collecting universal service fund (USF) levies, stringent coverage obligations or deploying wholesale networks to extend coverage. However, these initiatives have unintended negative effects that often outweigh the benefits, on top of the extra public expenditure they generate. Before considering this type of intervention, regulators should optimise their regulatory framework to improve the profitability of extending coverage, thus creating a natural incentive for operators to invest in rural areas. This can be accomplished by reducing unnecessary regulatory costs, offering more harmonised spectrum – especially the 700 MHz band – and giving operators the flexibility to optimise their operations, such as through network sharing agreements.

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18. GSMA Intelligence data for June 2017; Latin America 3G population coverage 92.6%
19. Estimated using GSMA Intelligence and World Bank data
4.3 Licensed spectrum is key for digital inclusion and next-generation networks

Spectrum continues to be a vital asset for mobile operators. As business models adapt to reflect the rising level of competition in markets as well as technology developments, consumer preferences also continue to change. An example is the growth in demand for data, which has continued to accelerate in recent years, growing by 64% in 2016 and forecast by Cisco to grow 45% per year through to 2021.20

To meet this increasing demand and continue along the path towards universal broadband access, operators need affordable and fair access to sufficient, harmonised spectrum. Effective spectrum policy and a long-term spectrum roadmap play a key role, helping the industry secure the investment needed to further expand mobile access and enhance the quality, range and affordability of services. Although there has been an improvement in the amount of spectrum assigned to mobile industry over the last five years, there is still a need for more timely and affordable spectrum to meet consumer demand and improve quality of service. Countries in Central America such as El Salvador, Guatemala and Panama need to get up to speed in assigning spectrum for mobile services, as they are behind the regional average.

Figure 25

Licensed mobile spectrum by country in Latin America (MHz accumulated)

20. Cisco VNI Mobile Forecast Highlights, 2016-2021
Governments play a key role in the development of mobile communications. For example, those countries that use spectrum to maximise state revenues (by adopting policies that inflate spectrum prices) risk driving up the cost and reducing the quality of mobile services. In 2016, the cost of spectrum amounted to 12.8% of mobile service revenue, which is around twice the level seen in the US and other developed markets. Furthermore, the amount of spectrum that is assigned to mobile services varies widely in Latin America. Spectrum prices – mainly through reserve prices – are increasing in the region, making extremely high prices more and more common, mostly because of national political factors. Similarly high ongoing annual fees, such as in Mexico, also contribute to the rising cost of mobile spectrum. Evidence shows that high spectrum prices can negatively impact consumers through more expensive, lower quality mobile services. High prices can also lead to spectrum going unsold, which means a valuable state asset goes unused and fails to benefit the digital economy. Spectrum pricing best practice relies on the following:

- Establishing reasonable reserve prices and annual fees
- Licensing spectrum as soon as possible, thus avoiding the creation of artificial scarcity
- Avoiding policies that create risks for mobile operators leading them to overbid for spectrum
- Publishing long-term management plans including a spectrum roadmap that prioritise social and economic benefits over short-term income for the state.

**Spectrum for 5G**

Significant, new and widely harmonised mobile spectrum is needed to ensure 5G services meet future expectations and deliver the full range of potential capabilities. 5G needs spectrum within three key frequency ranges to deliver widespread coverage and support all use cases: sub-1 GHz, 1–6 GHz and above 6 GHz.

Technology-neutral spectrum licences are essential since they allow bands currently used for existing mobile technologies to be easily refarmed for 5G, thus ensuring spectrum is used more efficiently.

**Three key frequency ranges for 5G**

**Sub-1 GHz**
Will support widespread coverage across urban, suburban and rural areas, and help support IoT

**1–6 GHz**
Offers a good mix of coverage and capacity benefits
Includes the 3.5 GHz IMT range, which is likely to be the basis of many initial 5G services

**Above 6 GHz**
Supports ultra-high broadband speeds envisioned for 5G
Focus on above 24 GHz including 26 GHz and/or 28 GHz bands
Some interest in exploring bands in the 6–24 GHz range

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22. See Effective Spectrum Pricing, GSMA, 2017
23. See 5G Spectrum Policy Position, GSMA, 2017
4.4 Policies must be forward-looking in the era of the data economy, big data and IoT

Privacy

Privacy and data flows are a key policy issue for the digital ecosystem. Many countries in Latin America are seeking to create forward-looking rules that are consistent with the reality of the digital ecosystem, by rethinking existing laws and regulations or seeking to create or implement new privacy frameworks. Latin American countries should take advantage of these processes to create comprehensive data policies and regulations that boost innovation, consider the digital ecosystem’s dynamism and allow for more sustainable, advanced and inclusive services.

For example, big data can improve decision-making in areas that are critical for development, such as health, natural disaster management and urban planning. Privacy frameworks should not only allow big data but also encourage its use, while ensuring appropriate protections for users are in place.24 Latin America should ramp up its efforts to make greater use of big data to make better public policy decisions. To ensure trust in the data ecosystem, aspects should be addressed such as accountability and transparency, which involves coordinated action between relevant stakeholders. An example is the project “Big Data for measuring and fostering the digital economy” by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), which aims to boost use of big data to support policy-making at the national and regional levels.

Cross-border data flows

International flows of data bring technical benefits and play a crucial role in innovation, competition and socioeconomic development. In running a mobile network, large batches of data are generated, and operators are able to store and process large amounts of data in multiple countries. This allows them to offer a wide range of services and advanced solutions to consumers while also building economies of scale. Since data centres are sometimes located in countries other than that of the source of data, cross-border data flows are crucial for the provision of innovative and advanced services.

From a legal and economic standpoint, this has several implications ranging from the applicable jurisdiction, to balancing the protection of the right to privacy with legitimate business purposes and pro-consumer benefits. To address these matters, restrictions on international data flows must be legitimate, proportionate and applied only in limited circumstances. Regulations applying to cross-border data transfers must be risk-based (to ensure data is handled appropriately and with due safeguards) and interoperable across the region (to achieve greater legal certainty and enable a scalable solution that allows companies to take advantage of economies of scale and scope).

Several countries in Latin America, such as Argentina and Mexico, restrict cross-border transfers of personal information to those countries that are not deemed to provide “adequate” protection. These countries rely heavily on consent to allow data transfers to jurisdictions that are deemed “inadequate”. This solution, however, from a practical perspective, should not be the only basis for the international transfer of data. Policymakers should consider the importance and validity of other instruments such as binding corporate rules (BCRs), legitimate interest and voluntary certification.

Many governments and regulators recognise the tremendous impact and value that mobile operators and the wider IoT ecosystem can deliver. However, IoT is still a nascent industry, and, as such, innovative technologies and business models are constantly being developed. The creation of new approaches can be heavily affected by legacy regulation – particularly because services in IoT are fundamentally different to traditional services.

IoT is fundamentally different from traditional telecoms services

<table>
<thead>
<tr>
<th></th>
<th>Traditional services</th>
<th>IoT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level of maturity</strong></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Connected elements</strong></td>
<td>Handsets</td>
<td>All types of device</td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>Correlated to number of people</td>
<td>Correlated to number of devices</td>
</tr>
<tr>
<td><strong>Core service</strong></td>
<td>Connectivity</td>
<td>Many types of application</td>
</tr>
<tr>
<td><strong>Connectivity ARPU</strong></td>
<td>High</td>
<td>Varies</td>
</tr>
</tbody>
</table>
Designing policies for the digital ecosystem
The changes underway in the digital ecosystem are sweeping and profound. If the goal of government intervention in the economy is to identify and remediate shortcomings in market outcomes, thus enhancing social and economic welfare, policies that fail to achieve that should be redesigned or reconsidered. Legacy policies designed when competition was less intense and markets were not so dynamic and interrelated often end up distorting markets and inhibiting competition and innovation. This means rethinking policy and regulations for the digital revolution to ensure they boost competition and are both light and flexible.

Before the end of 2018, many countries in Latin America will undergo national elections. If governments want to make the digital revolution a priority, a forward-looking digital strategy should be put forward that can effectively and positively shape the digital agenda in each country as well as in Latin America. This means creating a clear, transparent, predictable and business-friendly environment that allows growth in terms of investment, innovation and productivity, thus leveraging the fourth industrial revolution.

4.5 Policies and objectives must be aligned with the fourth industrial revolution

Countries such as Argentina and Peru are ramping up their digital identity initiatives. These entail making e-government services available for citizens through multiple electronic devices and platforms, and are focused on achieving greater financial, social, cultural and economic inclusion. To fully meet these objectives, the initiatives must be based on open standards, provider- and technology-neutral, and voluntary.

Digital identity

Designing policies for the digital ecosystem

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Extending the benefits of the digital age

**ACCESS**
Consumers and businesses need connectivity that is available, dependable, reasonably fast and affordable.

**POLICY LEVERS**
- Set a broadband policy that encourages network investment
- Support infrastructure rollout and remove administrative barriers
- Plan spectrum transparently to increase investment certainty

**TRUST**
Consumers and businesses must have confidence that their data and transactions are secure, and that they can control how their personal information is used.

**POLICY LEVERS**
- Set data security & privacy rules without stifling innovation
- Encourage the use of digital IDs to enable the digital economy
- Build digital finance systems to enable e-commerce and mobile money

**INCENTIVES**
Consumers need basic digital skills and compelling reasons to subscribe to broadband access, including relevant content and local services.

**POLICY LEVERS**
- Promote digital literacy and lifelong learning
- Push m-government services to increase efficiency and engagement
- Support local content and services in local languages

**INNOVATION**
Consumers and businesses benefit from new products and services that flow from a healthy and competitive digital economy.

**POLICY LEVERS**
- Modernise telecoms regulation to fit the digital age
- Apply regulation consistently in a technology-neutral way
- Support digital enterprise and the digitalisation of industry