Securing the benefits of industry digitisation

A REPORT FOR VODAFONE – NOVEMBER 2015

Contents

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Vodafone Foreword

Having the right tools for the job is always going to result in a better outcome. Policymakers around the world have long been focused on ensuring regulation protects and encourages consumers participating in the digital revolution. The needs of enterprises as they move towards the digitisation of industry have been less defined. This is why Vodafone has commissioned KPMG to review the regulatory and policy tools currently underpinning the future of successful enterprise development and investment across the globe.

In Vodafone's view, policy and regulation must be developed with the specific needs of the enterprise sector in mind, rather than as a by-product of regulation designed for consumer needs. By way of example, industry will require fit-for-purpose, harmonised access to 5G spectrum to help deliver innovations in telemedicine. Open internet rules must be applied flexibly enough to ensure a real-time, differentiated approach for applications like autonomous vehicles. Fit-for-purpose access to fixed networks is required in order to meet the burgeoning data needs of enterprise customers. It is also vital to ensure that regulation – intentionally or otherwise – does not unduly restrict the transfer of industrial data and services across borders.

It is clear there are a plethora of areas that the KPMG report could have concentrated on but, with the guidance of some of our existing 1,700 multinational customers, we have focused on three key areas:

• issues surrounding transfer of data post-Snowden;

• challenges to cross-border provision of Machine-to-Machine and the Internet of Things; and

• the impact of restrictions on a quality differentiated internet.

These are areas of immediate relevance to multinational businesses that are seeking to fully harness the opportunities of digitisation in the global economy.

This report would not have been possible without the contribution of those business leaders who gave so freely of their time and insights. We believe that their input has led to a report that raises some compelling findings and underpins the need for policymakers across the globe to work together to create policies enabling industry to innovate and transform through digitisation.

Jan Geldmacher

Chief Executive Officer,
Vodafone Global Enterprise

Executive summary

> *There are projected to be over 50 billion "things" connected to the internet by 2020, up from 25 billion in 2015.*

Regulatory and policy frameworks that will impact on the digitisation of industry are currently being developed at both national and regional levels. These cover a wide range of important policy matters including cyber-security, privacy and data protection. Due to the rapid pace of technological change, it is proving a challenge to establish frameworks that appropriately balance the needs of all stakeholders. Policy frameworks also need to be applied in a coherent manner, recognising that in some cases a different approach is needed for ICT services for enterprises compared to services for consumers. Achieving policy coherence across borders is particularly difficult. This study is an effort to help address these challenges, so that the full potential of ICT services might be realised for businesses and consumers alike.

Vodafone commissioned KPMG to assess the economic impact on business ICT services of emerging rules in a number of areas, including net neutrality, licensing and authorisation, numbering, and data localisation. Policy and regulation in each of these areas will shape the future growth of global ICT services used by businesses including Machine to Machine (M2M) or Cloud and Hosting technologies, as well as digital services that rely on a differentiated quality of service. To inform our study we interviewed teams within Vodafone as well as a select number of its Global Enterprise customers. We also conducted wider research and analysis.

The use of ICT services by businesses is already large and is rapidly growing:

- There was an installed base of 5.3 billion M2M devices globally as of 2014.[2]

- There are projected to be over 50 billion "things" connected to the internet by 2020, up from 25 billion in 2015.[3]

- sSpending on cloud services and infrastructure could reach $235 billion by 2017, compared to $174 billion in 2014.[4]

This adoption is expected to deliver significant and wide ranging socio-economic benefits:

- Our analysis, based on Vodafone data, suggests that the Gross Value Added (GVA) generated by providers of cellular M2M[5] services alone was in the region of €2.5 billion in 2013/14.

- The wider socio-economic benefits from ICT services are likely to be substantially higher, including for example reduced congestion and fewer traffic accidents thanks to the evolution of connected cars[6], carbon savings from smart energy markets[7] and improved health outcomes through remote patient monitoring and advice. As an example, Vodafone has estimated that the total carbon savings from its smart metering, smart logistics and fleet management, call conferencing and Cloud and Hosting services was 3.5 million tonnes of CO_2-equivalent (CO_2e) for active connections in 2014/15, 50% more than in 2012/13.[8]

- Cloud and hosting services can deliver cost savings as well as improving efficiency, scalability and improve productivity.[9,10]

> *Policy makers and regulators have an important role to play in both the demand and supply side of the market to create a supportive environment that allows the digitisation of industry to flourish.*

However, we also found evidence of the economic detriment that regulation of ICT services could cause. In particular:

- Net Neutrality regulations that cover business ICT services may restrict the ability of businesses to offer a range of ICT products that rely on a differentiated quality of service. For example, the use of video-conferencing for remote telemedicine consultations has the potential to reduce healthcare costs and improve patient outcomes. However, the viability of the service will be in large part dependent on the ability of service providers to guarantee network access at a certain level of quality. Similar needs for prioritised network access will apply to ICT applications for emergency services, connected cars, and smart energy meters.

  – By 2020, 50% of M2M devices are projected to require some form of quality of service differentiation.[12]

  – The value of the global video conferencing market (which may require a higher quality of service) is expected to reach $6.4 billion a year by 2020.[13]

- Our study has found that inconsistencies in the way similar services are regulated in different countries are already having commercial impacts on service providers and their customers. These impacts will grow in importance as the market for such services expands. For example, prohibitions on non-transitory roaming for M2M SIM cards in Brazil are leading to increased costs and delaying the launch of M2M services.

- Regulations that unduly restrict the cross-border transfer of personal and machine-generated data (for example in parts of the Asia-Pacific and Middle East regions), are likely to increase the costs of providing global ICT solutions. This can reduce the range of services available, increase costs and complexity for businesses working to provide the services and, in the extreme, threaten the commercial viability of some services.

Policy makers and regulators have an important role to play in both the demand and supply side of the market to create a supportive environment that allows the digitisation of industry to flourish. Our study suggests that the consequences of not doing this could be significant. There is an urgent need for all stakeholders – including industry, governments and regulators – to work together to create a consistent regulatory environment that is 'fit for purpose' for the global ICT enterprise market. We have suggested a number of policy actions that can be taken to this end.

About the study

A combination of technological innovation and improvements in network quality and reach is rapidly changing the nature of the global information and communications technology (ICT) market. These trends, in turn, are driving the rapid increase in the global connectivity of consumers and businesses. Digitisation is also becoming an important part of the production process for many goods and services. Across industry sectors, services provided to end customers are being enhanced by ICT solutions. Connected cars, telehealth solutions, and smart energy grids are just some of the examples we have seen.

A supportive public policy and regulatory regime is critical to the realisation of the social and economic benefits that can come with this process. Such a regime should stimulate the digitisation of industry on the demand side, while facilitating the provision of ICT products and services on the supply side. A growing number of multinational enterprises are expressing concern that the emerging global patchwork of regulation in this area is falling short of such ambitions.
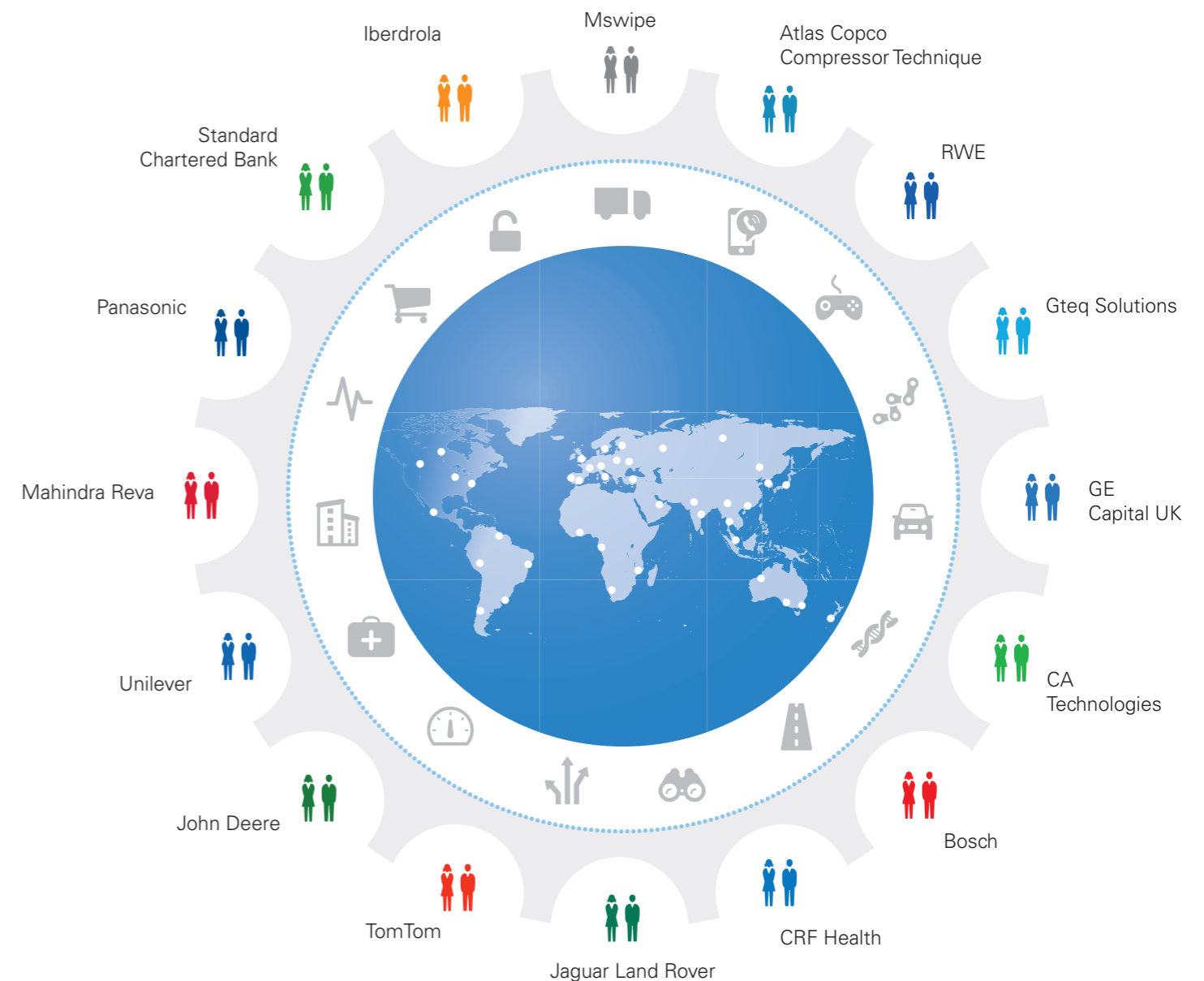
Given this, Vodafone commissioned KPMG LLP to undertake a study to assess the potential economic impact of a number of current and proposed regulations affecting ICT services, including M2M and Cloud and Hosting services. We have also considered how the concerns of business, governments, and consumers can be addressed through policies that enable the digitisation of global enterprises.

Our study comprised:

- Interviews with Vodafone enterprise customers. These customers were selected by Vodafone to reflect a range of ICT services, geographies, and sectors.

- Interviews with Vodafone internal teams.

- Desktop research and analysis of publicly available information, academic and industry studies and forecasts.

- Economic analysis, drawing on Vodafone and publicly available data and forecasts.

Hogan Lovells participated in the preparation of this report by undertaking an internationally co-ordinated quality assurance review of its references to laws, regulations and policies. This review spanned some twenty jurisdictions around the world, and Hogan Lovells is particularly grateful for the expertise provided by colleagues and external counsel in Germany, Egypt, Saudi Arabia, Brazil, Korea, India, Turkey and South Korea.

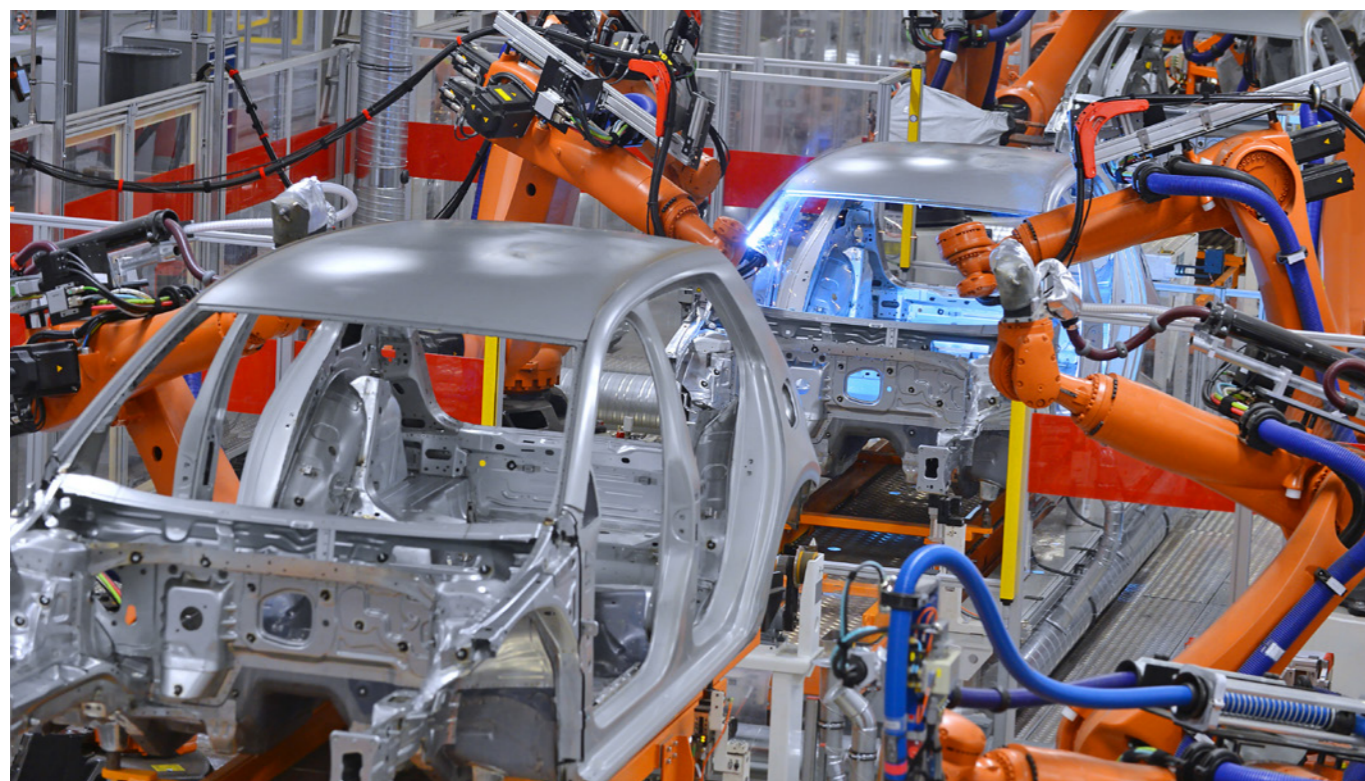## Interviews conducted with Vodafone enterprise customers selected by Vodafone to reflect a range of ICT services, geographies and sectors.

Iberdrola · Mswipe · Atlas Copco Compressor Technique · Standard Chartered Bank · RWE · Panasonic · Gteq Solutions · Mahindra Reva · GE Capital UK · Unilever · CA Technologies · John Deere · Bosch · TomTom · Jaguar Land Rover · CRF Health

The opportunity

The industrial internet is a 'catch-all' phrase intended to capture the emerging market for industrial machines that connect the physical and digital worlds.

The industrial internet enables firms to use software, sensors, M2M learning and other technologies to gather and analyse data from physical objects or from datasets to manage operations and in some cases to offer new, value-added services.[17]

Global enterprises are investing heavily in digitisation in order to drive efficiencies in the production and delivery of new and existing products and services across a range of sectors. At the same time, on the demand side, consumers and businesses are becoming more digitally connected, through the use of smartphones and other connected devices.

The ability to add sensors and data collection mechanisms to industrial equipment is driving exponential growth in the demand for machine-generated data.[18] Growing capabilities in the area of data analytics will continue to improve information on the status of industrial equipment. This will have wide-ranging impacts. For example, more granular, real-time information will help predict and prevent machine breakdowns. This, in turn, will enable businesses to more quickly respond to customer demands for upgraded products and services.
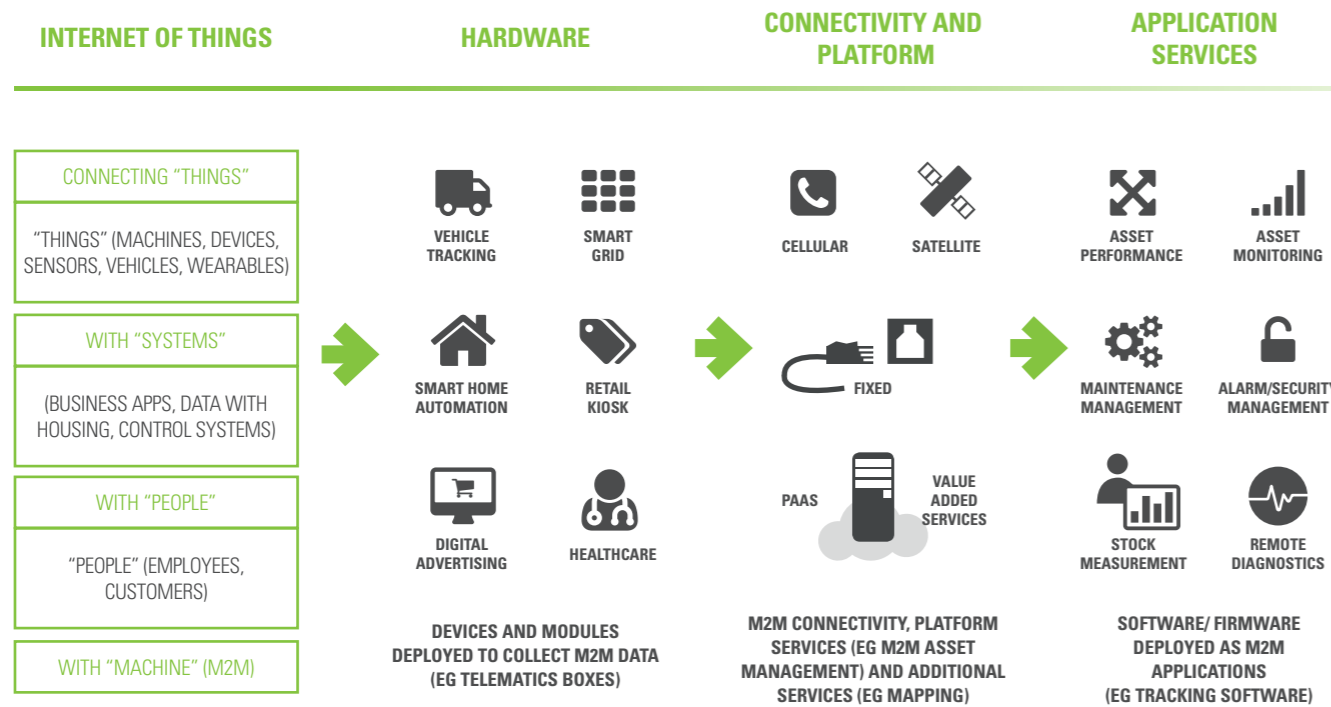
As these trends continue, it is likely that businesses will want products and services that are differentiated in terms of both price and quality. Much like consumers are used to paying different prices for different classes of rail or air travel, there are likely to be a wide variety of digital services where service providers will require a guaranteed or prioritised quality of service and customers will be prepared to accept a higher price for such a service. In other cases, it will be critical that communication networks are able to prioritise some ICT services over others, such as the police, fire, and emergency medical services.

Growth in ICT has been a significant contributing factor to the growth of the globalised economy.[14] Multi-National Corporations across all industry sectors, are increasingly reliant on ICT for managing their business processes, systems and operations. Digitisation allows businesses to improve the efficiency of operations, expand market reach and reduce risk.

Consumers have also benefited from more competitive prices, reduced travel times, greater real-time information and an ever-expanding range of value-added services. For society, digitisation is having a range of impacts including greater energy efficiency, smarter transport use, fewer car accidents and injuries and improved health outcomes.

The mechanisms for digitisation are also changing. Forecasts suggest that the rate of growth in data traffic will exceed substantially the growth in mobile connections in coming years.[15] Telecommunications providers are diversifying their revenue streams towards new data and value-added services to capitalise on this. This has led to a significant increase in network infrastructure investment, to new services and to the IT platforms to deliver these. According to recent research by Boston Consulting Group, between 2009 and 2013 the mobile industry globally invested US$1.8 trillion in mobile communications infrastructure.[16]

A range of ICT products and services is being adopted by enterprises as part of their digital strategies. ICT services are being used to deliver new and improved services to customers. For example, video-conferencing for telemedicine, the leveraging of data generated by M2M devices and sensors or Cloud and Hosting services.

Trends in the M2M market

Figure 1: Overview of M2M and in the context of the Internet of Things

Source: KPMG

Machina Research estimates that there were 5.3 billion connected M2M devices at the end 2014, of which 72% were short-range connections (e.g. wi-fi).[20] Estimates of the number of cellular M2M connections in 2015 range from 255 million[21] to 320 million.[22] As the market has evolved, the number of firms involved in the M2M ecosystem has expanded, as has the range of application services available.

**Figure 2:** Cellular M2M connections globally, 2012-2019
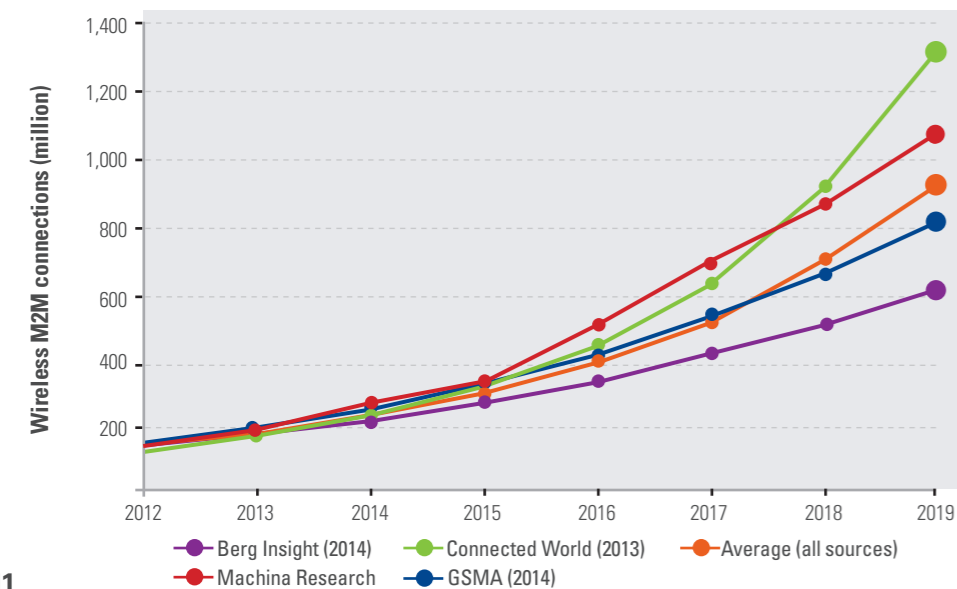
Significant growth is forecast in the number of cellular connections:

- approximately 310 million connections in 2015
- almost 950 million connections by 2019
- average annual growth rate (CAGR) of 32% over the next 4 years

Source: Berg Insight, Connected World, GSMA, Machina Research, KPMG analysis

Different industry sectors are adopting M2M technology at different rates. This trend is shown in Figure 3 below.

Figure 3: Global cellular M2M revenue by industry, 2011 – 2019 (forecasts start in 2014)
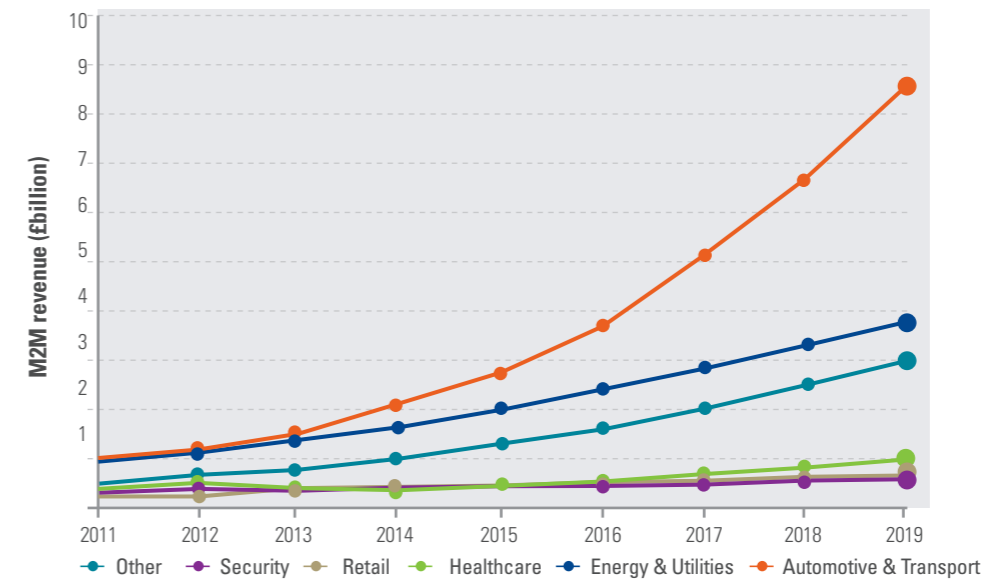
In this dynamic, growing international market, technology developments are being increasingly tailored towards the specific needs of different industry sectors. Total cellular M2M revenues are expected to increase at an average rate of 26% per annum, with automotive and healthcare leading the way (see Figure 3).

Source: 2011-12 vertical share as per Berg Insight 2012; 2013-19 vertical share as per Berg Insight 2014

HEALTHCARE

M2M connectivity is being used in healthcare predominantly to monitor diseases and symptoms.

It has been forecast that M2M communications will help treat 7 million patients globally by 2018, up from less than 350,000 in 2012.[23]

ENERGY AND UTILITIES

M2M is being deployed in smart metering and grids. Smart meters are being rolled out internationally including in the US and much of the EU. The EU aims to replace 80% of electricity meters with smart meters by 2020 wherever it is cost effective to do so.[24]

AUTOMOTIVE AND TRANSPORT

M2M has a variety of applications in the automotive sector including:

- remote monitoring and diagnostics;
- accident prevention; and
- placing an emergency call in the case of an accident.

It is expected that every new car will be connected in a variety of ways (a combination of embedded SIM, tethering and smartphone integration) by 2025.[25]

Trends in the Cloud and Hosting services market

In essence, cloud computing is the delivery of computing services over the internet. Cloud and hosting solutions allow individuals or businesses to use software and hardware, in most cases managed by third parties, at remote locations.[26]

> *Global enterprise spending on cloud services and infrastructure could be as much as $235 billion by 2017.*

The increasing adoption of IT in enterprises, and the growing volumes of data stored and shared, have brought with them often significant, and growing, overheads in the implementation of in-house computing systems. Time and finance invested in managing IT has increased exponentially alongside reliance on IT systems. Digitisation and data analytics have, in turn, become more important to businesses. As businesses look for new ways to scale back on overhead and infrastructure costs, they are turning increasingly to leveraging the benefits of the cloud. Reflecting this, cloud-related investment has increased dramatically in recent years. A recent IHS report[27] suggests global enterprise spending on cloud services and infrastructure could be as much as $235 billion by 2017.

Percentage of CIOs that consider cloud computing as a 'crucial technology for customer engagement'

2009

30%

2013

64%

IN 2014, AN IBM STUDY[28] FOUND THAT 64% OF CHIEF INFORMATION OFFICERS (CIOS) INTERVIEWED MENTIONED IT AS A 'CRUCIAL TECHNOLOGY FOR CUSTOMER ENGAGEMENT', COMPARED TO 30% IN 2009

The potential socio-economic benefits

The adoption of ICT services by industry is having a transformational impact. As adoption increases, the economic benefits that can be realised through their use are likely to grow further still. Economic benefits are wide-ranging and flow to a range of parties. Economic value added is created by the service providers, as well as generated by the users of the services. Positive economic benefits may be passed on to their customers and wider positive spillover effects accrue to society and the economy more generally.

**For Cloud and Hosting services**, we can expect to see:

- Improved efficiency and availability as clouds are based on grid computing. This means that the resources of many computers in a network can be applied to a single problem. It also means that the applications can rely on a high availability of IT architecture to minimise downtime.

- The ability to scale computing capacity on demand.

- Rapid deployment due to the use of standard, re-usable, and shared software and hardware. Both public and private clouds can provide self-service access to a shared pool of computing resources.[29]

Further economic benefits cited in relation to cloud services include reduced IT capex, reduced IT staff headcount, improved business scalability, faster time to market for new goods and services,[30] more effective mobile working, higher productivity, and an improved ability to enter new business sectors and geographies.[31]
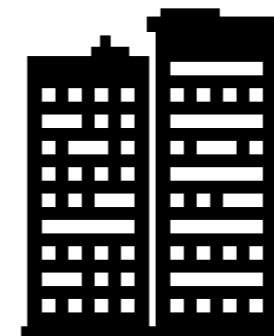
OF 479 ENTERPRISES INTERVIEWED WHO WERE ALREADY USING CLOUD FOR THEIR BUSINESS [32]

81% REPORTED LOWER IT COSTS

MAJORITY
10-20% IT COST REDUCTION
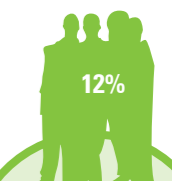
12%
30% + IT COST REDUCTION

ATLAS COPCO COMPRESSOR TECHNIQUE

Atlas Copco is a global provider of industrial productivity solutions that uses Vodafone global M2M communication services to monitor the performance and health of its compressed air products on customer sites around the world.

Atlas Copco offers its customers a suite of services which make use of M2M technology, including for maintenance, availability and energy use monitoring. These services can help improve machine efficiency, as well as lessening the risk of machine breakdown, and thus reducing costly production downtime for its customers. Using M2M to monitor machine energy usage can also allow its customers to manage and reduce their energy use, generating costs savings and carbon footprint reductions.

For M2M services, we have conducted analysis to estimate the economic value currently generated by M2M service providers. They contribute to the economy through generating economic growth via the value added to the inputs purchased from suppliers – Gross Value Added (GVA).[33]

> *€2.5 billion: Estimated Gross Value Added (GVA) of the global cellular M2M market in 2014.*

We estimate that the total GVA of the global cellular M2M market was €2.5 billion in the year ended 31 March 2014 – comprising a direct contribution of €1.4 billion and an indirect contribution of €1.1 billion.[34]

This figure is likely to grow significantly, consistent with the forecast explosive growth of M2M over the coming years.

M2M solutions are often not only used to deliver business benefits internally, but are increasingly being implemented in products and services sold to end customers to add value. Innovation in M2M has the potential to open up completely new market segments and enhance existing ones. For example, data analytics tools can be used to drive product performance through using M2M for remote diagnostics and device performance monitoring. This can help achieve efficiencies in M2M use and delivery.

The 2015 Vodafone M2M Barometer found that over 81% of M2M adopters are using M2M more than they were a year ago.[35] Over 40% of all respondents are using M2M to expand into new countries (including nearly half of respondents in the automotive industry).

This is consistent with findings in the equivalent 2014 report which found there has been a significant increase in the number of executives saying that M2M is helping them deliver more consistent services across multiple geographies.[36]

Sector specific examples of the economic benefits of digitisation

In order to highlight the significant size of the economic opportunity that digitisation brings, we have examined trends in digitisation across a number of key sectors.

AUTOMOBILE

KEY SECTOR DEVELOPMENTS AND TRENDS IN DIGITISATION

The global automotive industry was worth an estimated $800 billion a year in 2014. The global connected car market is expected to grow an average 18% per year and be worth €40 billion by 2018.[38]

Suppliers are making substantial investments in ICT technologies to increase connectivity and autonomy.

The level of connectivity and autonomy is expected to increase over the next 10 years, with capabilities ranging from interactive media, technologies to assist with managing traffic jams and intersections to eventually semi or fully autonomous driving cars. These rely on both sensor and mobile connectivity based solutions, depending on the specific technology deployments.

In the UK, the number of connected cars is expected to increase significantly from 50% penetration today:

- By 2025, it is forecast that virtually all cars will be connected

- Based on current trends, a 25% penetration of fully autonomous driving vehicles is expected by 2030[39]

ESTIMATES OF THE ECONOMIC BENEFITS

KPMG[40] estimates significant economic impacts of connected and autonomous vehicles in the UK by 2030, unlocked by connectivity and increasingly autonomous vehicles:

- **£51billion** value added annually in the UK by 2030 (at 2014 prices)

- **+1%** impact on UK GDP

- **345,000** total jobs created in UK automotive manufacturing and adjacent industries

Cisco[41] estimates:

- annual costs of personal mobility to businesses and society of **€2.4 trillion in the US alone** [42]…

- but, these costs could be **reduced by an estimated 40%** due to reduced crashes and pollution, and improved parking, road congestion and traffic services

Cost to society of road accidents is approximately €130 billion per year in Europe with 90% of these accidents involving human error. The European Commission considers these errors can be avoided with connected cars and communications between vehicles and infrastructure and ultimately with automated driving.[43]

ESTIMATES FOR THE US, EUROPE AND JAPAN[44], SUGGEST THAT VEHICLE CONNECTIVITY WOULD LEAD TO:

7% less	8% fewer	10% lower	3% reduction
TIME STUCK IN TRAFFIC (THEREBY INCREASING PRODUCTIVITY)	CRASHES	TRAFFIC/ROAD/TOLL OPERATION COSTS	IN CARBON DIOXIDE EMISSIONS

M-HEALTH SOLUTIONS ARE SUPPORTING INDIVIDUALS

GLOBAL VALUE

US$11 BILLION
2014

US$58.8 BILLION
2020

100,000 mHealth apps

available as of 2014

BY 2017 1.75 billion will use a healthcare app
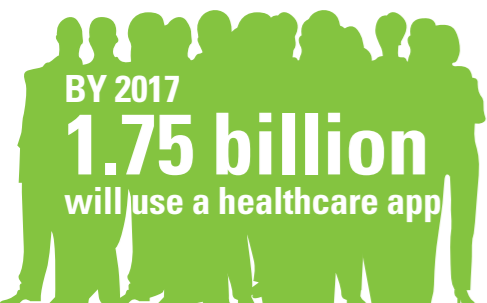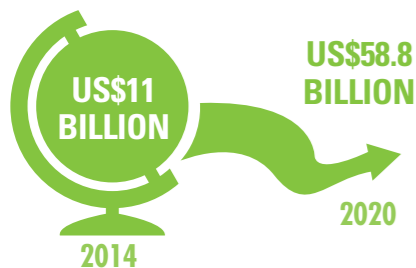
KEY SECTOR DEVELOPMENTS AND TRENDS IN DIGITISATION

Rapidly growing and ageing populations and an increase in chronic illness are placing pressure on healthcare systems in many countries. The widespread adoption of ICT is expected to:

- increase prevention through more people actively monitoring their own health;
- allow remote treatment of those who fall ill; and
- reduce re-admissions as technology helps them and their care givers look after themselves.

M-health, telehealth and telemedicine solutions are transforming the relationship between doctor and patient.

Faster internet connections and improved technologies coupled with the wider use of electronic medical records are facilitating the digitisation of the health market on the supply side:

- IHS predicts that the US telehealth market will grow to $1.9 billion in 2018 from $240 million in 2013, an annual growth rate of 56%[45]; and
- In 2013, an estimated 52% of US hospitals utilised telehealth solutions, with a further 10% beginning the process of implementing them.[46]

Global M2M healthcare revenues are expected to be $4.5 billion by 2018. M2M solutions are being deployed in healthcare in a wide range of uses to facilitate remote patient monitoring appointment reminders and medication compliance checks.

M-HEALTH SOLUTIONS ARE IMPROVING PATIENT OUTCOMES

A study in the US carried out by Vidant Health, which started a program of remote health monitoring in February 2012 found:

2013

74% DROP IN ADMISSIONS

7% DROP IN RE-ADMISSONS
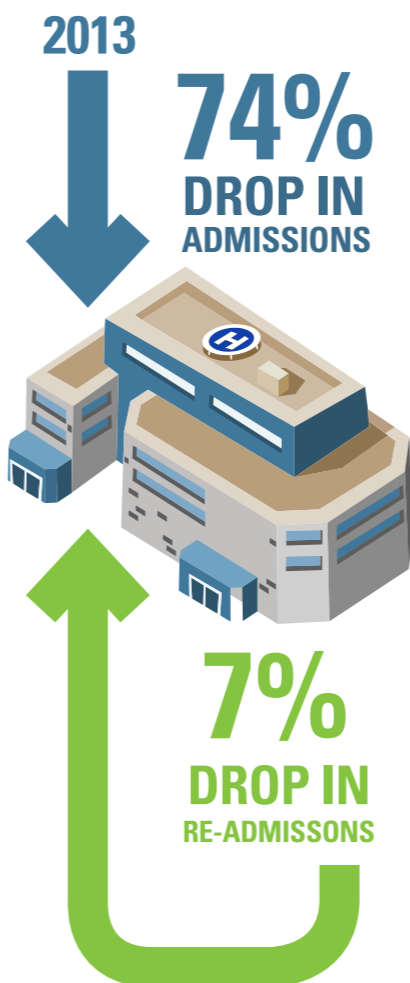
ESTIMATES OF THE ECONOMIC BENEFITS

Remote patient monitoring is projected to result in global cost savings of up to $36 billion by 2018.[47]

Telehealth initiatives across Canada are estimated to have saved:

- CAD $70 million in personal travel costs; and
- CAD $55 million for the Canadian health system.[48]

In the UK, in 2011 the Lancashire and Cumbria Care Trust launched a large-scale telestroke service across the region allowing consultants to assess patients for thrombolysis treatment by video-link. This has led to significant benefits including:[49]

- faster patient diagnostic services which help reduce the chance of disability and death;
- 24 hours a day provision of a thrombolysis service; and
- estimated cost savings for the North Cumbria University Hospitals NHS trust of £3.9 million a year for the next five years.

M2M connectivity is increasingly used by hospitals to remotely monitor patients' conditions, such as blood sugar levels and heart rates. In the US, Vidant Health, which started a program of remote health monitoring in February 2012, has seen significant benefits for the 600 to 700 patients enrolled in the scheme. The benefits include:[50]

- a 74% decline in hospital admission for these patients in 2013 and a further 54% decline in the first eight months of 2014; and
- a 7% drop in readmissions within 30 days for those with congestive heart failure.

BY 2019

1.75
BILLION USERS

BY 2019

32%
**GLOBAL ADULT POPULATION
USING MOBILE BANKING**

£ FINANCIAL SERVICES

KEY SECTOR DEVELOPMENTS AND TRENDS IN DIGITISATION

One area in which banks are increasingly investing is the use of videoconferencing at ATMs and on mobile devices. Video banking can allow banks to "expand the reach and convenience of customer engagement in a relatively low-cost fashion".[51] A number of banks are using video conferencing facilities in branches and on mobile in an effort to achieve these benefits.

- In the US, Bank of America has partnered with Cisco to offer video conferencing in 500 of its branches.[52]

- Citibank started to rollout ATMs enabled with video conferencing capabilities across Asia in 2013.[53]

- In the UK, Barclays rolled out its 'video banking' service in 2014 which allows customers to have a face to face conversation with an advisor over mobile, tablet or computer.[54]

ESTIMATES OF THE ECONOMIC BENEFITS

There are a number of benefits associated with the banks' move towards videoconferencing instead of face-to-face appointments at banks. These include:

- better customer service at a lower cost; and

- lower security costs and less paperwork associated with ATMs compared to traditional bank branches.

The role of government policy in stimulating industry digitisation

THE EC HAS ESTIMATED THAT eCALL COULD

CUT EMERGENCY RESPONSE TIMES

40% IN URBAN AREAS

50% IN RURAL AREAS

Effective government policy is likely to play an important role in fostering the digitisation of industry. Acknowledging this, policymakers and regulators are working to develop frameworks to drive growth and stimulate industry digitisation to achieve wider policy objectives.

Some examples of the role of government policy in stimulating digitisation are set out below:

- The creation of a connected EU digital single market is one of the ten priorities set out by European Commission President Jean-Claude Juncker. It is estimated that a single market will drive an additional €250 billion in growth.[55] Key focus areas include (1) promoting the digitisation of industry, (2) the development of global standards and interoperability, (3) making the most of the data economy and cloud computing and (4) leveraging 'big data' through new initiatives to promote the 'free flow of data' and a European Cloud.

- In India, Prime Minister Narendra Modi has initiated the 'Digital India' programme to transform India into a digitally empowered society and knowledge economy.[56]

- Policies are in place to drive energy smart meter rollout in a number of countries including across Latin America, the Middle East and Africa, the US, China and Japan.[57] Smart metering aims to improve the communication channel between consumers and utilities to better match the supply and demand of energy use. Consumers can manage their energy use by accessing real-time information about their usage and be billed based on their actual energy consumption rather than on an estimation. For their part, utility companies can manage the supply of energy to meet the dips and peaks in energy demand. The EU aims to replace 80%[58] of electricity meters with smart meters by 2020, resulting in 200 million smart meters for electricity being installed across the EU by that time. It is estimated that smart meters and grids can:

  – reduce the EU's emissions by up to 9%;

  – provide average energy savings of 3%; and

  – generate total cost savings of €309 per electricity metering point, split amongst consumers, suppliers and distributors.

- In April 2015, the European Parliament voted in favour of regulation requiring all new cars to be fitted with eCall by April 2018.[59] eCall is an application that relies on M2M connectivity to automatically contact the nearest emergency centre in the event of an accident.

These examples show a range of positive developments across the globe where the aim is to stimulate the demand side of the market to promote greater digitisation of industry. As set out earlier in this report, there are clear socio-economic benefits associated with the use of ICT services by businesses. The more policy makers and regulators can stimulate, rather than constrain, the digitisation of industry, the greater the potential to realise these benefits.

Regulatory threats to industry digitisation

Many national and regional policy makers and regulators are currently developing and/or modifying their regulatory frameworks to cater for the growing use of ICT services by enterprises. However, getting the correct regulatory settings is challenging given the fast moving nature of the market. Technological advancements are rapidly changing the nature of existing services and creating new commercial opportunities for services that previously did not exist.

The stakes are high: decisions made by regulators now can have significant impacts on the range, price and quality of ICT products and services available now and in the future. Regulations can also have a major influence on the level of industry investment as well as the ability of businesses to deliver the raft of socio-economic benefits promised by industry digitisation.

'Net Neutrality' regulations

THE REGULATORY ISSUE

Over the last few years, policy makers have faced calls to introduce 'net neutrality' rules that seek to force Internet Service Providers (ISPs) to treat all data on the internet equally. As a result, net neutrality rules are being proposed, or have been introduced, in a number of countries including in the US, EU, Netherlands, India and Chile.[60]

> " *There are likely to be important differences between the needs of consumers and businesses in terms of internet access and use.* "

> " *There is a risk that applying net neutrality regulations that fail to take into account the specific needs of businesses will threaten the viability of a wide range of new and innovative ICT services.* "

However, the details of these rules differ widely, depending, in part, on the nature of competition in each country. For example:

- In the UK, the approach has been to promote internet access based on a 'best-efforts' public internet. This is intended to ensure that network operators carry all traffic on more or less equal terms whilst also allowing them to offer managed services, where certain traffic can be prioritised. Broadband providers agreed a voluntary traffic management transparency code in 2011.[61]

- In the Netherlands, net neutrality regulations go further by effectively prohibiting specialised or prioritised services by ISPs on the public internet.

- In the US, where there is less competition at the wholesale level, the net neutrality debate has been focused on ensuring that retail ISPs are not able to favour one type of data over another on their network. The latest rules only apply to retail internet services for consumers with wholesale and business services exempt from the regulation.[62]

- In the EU, agreement has been reached on the details of a new draft law on net neutrality, which, among other things, allows internet operators to offer specialised services in certain circumstances.[63]

There are likely to be important differences between needs of consumers and businesses in terms of internet access and use. Regulations aimed at addressing consumer protection matters (such as a ISPs' policies on blocking and throttling of content) may have less relevance for business customers. In addition, enterprises may wish to offer a range of ICT services to their customers that rely on differential quality of service. For example, videoconferencing for a telemedicine consultation over the public internet may require the network provider to prioritise this service over others (such as gaming) in order to deliver the service demanded by the customer. There is a risk that applying net neutrality regulations that fail to take into account the specific needs of businesses will threaten the viability of a wide range of new and innovative ICT services.

The ability of network operators to offer differentiated quality of service for ICT applications (including M2M) will depend on their ability to actively manage network traffic, including the prioritisation of some services over others. Net neutrality regulations that prevent or restrict this are likely to have a significant impact on the ability to meet customers' requirements. Also, a 'patchwork quilt' of different net neutrality requirements across the globe could significantly impair a provider's ability to configure a consistent multi-country service.

SERVICES THAT COULD BE IMPACTED BY NET NEUTRALITY RULES

Net neutrality regulations where the scope extends to business ICT services have the potential to have far-reaching impacts on the development of the market. This is because of the wide range of business services in the future that are likely to require differentiated quality of service over communication networks.

For example, videoconferencing requires a high guaranteed quality of service. It is likely that videoconferencing will be increasingly used in innovative ways to deliver services to customers across a number of industry sectors. For example, in the health sector videoconferencing could be used to deliver remote patient consultations in order to reduce costs and improve patient outcomes. In the banking sector, videoconferencing within braches or at ATMs could deliver personalised services (including bespoke financial advice) to a wider population of customers than currently available. Videoconferencing has been widely reported to lead to significant benefits to enterprises including operational efficiency and cost reduction.[64] The value of the global video conferencing market is expected to grow from $3.3 billion in 2014 to $6.4 billion in 2020; an average annual growth rate of 9.4% over this period.[65] This market may be at risk from net neutrality regulations that result in restrictions on network operators from offering businesses differentiated quality of service ICT products over the public internet.

A range of M2M application types will also require different levels of quality of service (see below).

Forecast trends in the number of M2M devices, by QoS requirements, 2015 and 2020[66]

■ No significant QoS requirement   ■ Limited QoS requirement   ■ Comprehensive/Stringent QoS requirement

2015   2020

2.2   1.1   0.8

5.2   3.2   2.3

NUMBER OF M2M DEVICES
(BILLIONS)

Examples of M2M services requiring differentiated Quality of Service

Low QoS

Consumer white goods

Fitness/training

Street Lighting

Vending machines

In-Vehicle entertainment and internet access

Modems, Routers & Femtocells

Medium QoS

Vehicle Diagnostics/Navigation

Roadside assistance

Pet tracking

Connected medical dispensers

Fire alarms

Smart Cities

Public transport applications

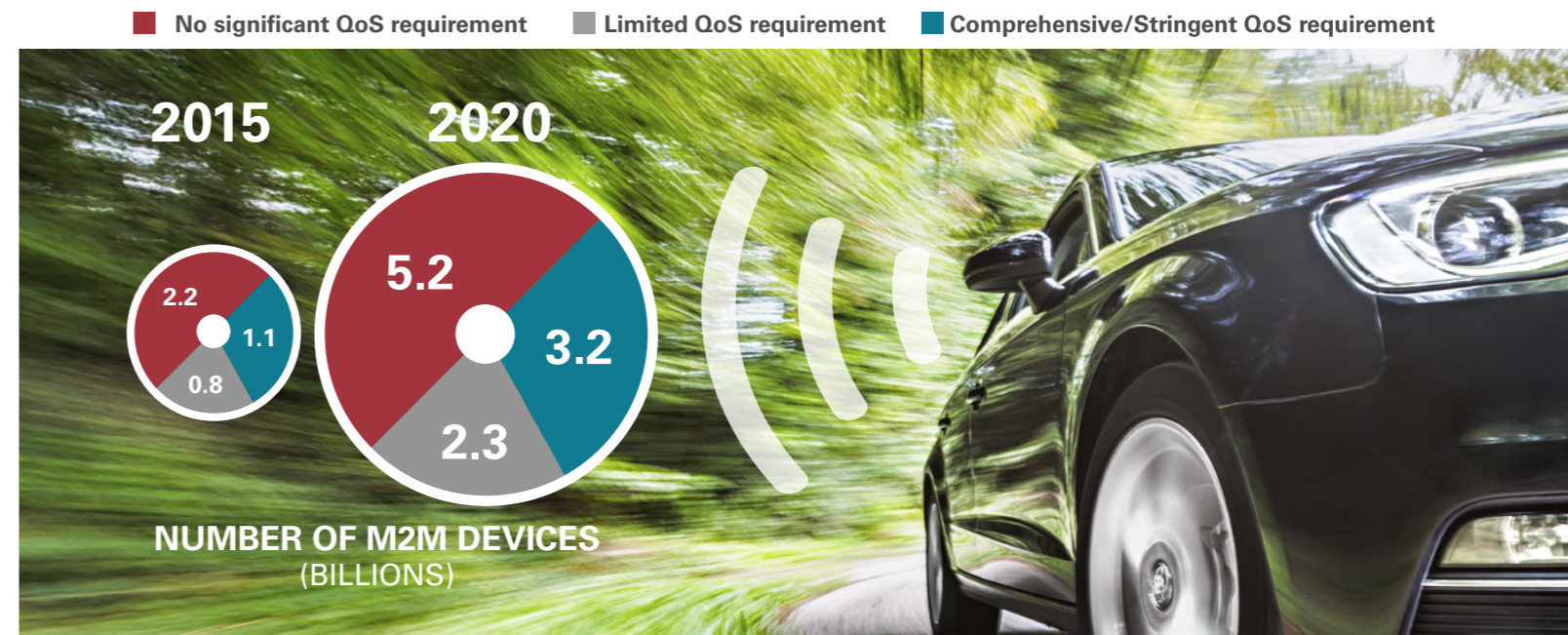Residential Heating, Ventilation and Air Conditioning devices

High/Stringent QoS

Smart Meters (Water, electricity, Gas)

In-vehicle congestion/toll devices/emergency call services

Stolen vehicle recovery

Usage-based insurance (e.g. for vehicles)

Clinical remote monitoring applications (e.g. heart monitors)

Electronic point of sale

Source: Machina Research (2015), DNA of M2M, www.machinaresearch.com; Machina Research and Aegis Spectrum Engineering for Ofcom (April 2014), M2M applications characteristics and their implications for Spectrum

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For some M2M products, customers are likely to place a high value on real-time/high-quality connectivity over communication networks (such as the ability of a M2M device to send messages to hospital staff when a patient needs emergency treatment).[67] Similarly, in energy smart grids, M2M communications can be used to deliver real time monitoring information to improve grid efficiency and to help reduce the likelihood, and duration, of power outages (as well as reduce carbon usage).

Enterprise customers interviewed as part of this study noted the importance of having high QoS for their M2M devices and the benefits that this delivered through their M2M applications. They were concerned that this may be impacted by net neutrality regulations.

Machina Research estimates that the number of M2M devices requiring some form of differentiation of quality of service is likely to grow significantly over the next few years making up over 50% of all M2M devices by 2020. Those M2M devices requiring comprehensive or stringent Quality of Service (QoS) standards are estimated to increase from 1 billion to 3 billion units.[68]

Source: Machina Research (2015), DNA of M2M, www.machinaresearch.com.

CASE STUDY

MAHINDRA REVA

Mahindra Reva is currently India's only electric car manufacturer and launched India's first connected car in March 2013, with the mobile carrier connectivity services being provided by Vodafone. All of Mahindra Reva's cars are online and connected to their server.

Mahindra Reva uses a telematics platform enabling a central diagnostics team to remotely monitor vehicle performance data in real time. This allows the maintenance team to understand the root cause of the performance issue and quickly address many issues over-the-air. This is a significant benefit as it reduces the time to debug faults, particularly given that it indicated that service centres spend approximately 60 -70 per cent of their time on establishing the root cause of faults.

Therefore M2M capabilities with real time monitoring capabilities have allowed Mahindra Reva to be more efficient and lower costs.

Emergency services are also likely to value ICT services offering prioritised network access during an emergency where real-time data and information will be of critical importance:

- Fire rescue teams of the future are likely to require short, high bandwidth bursts of data to receive a 3D image of a burning building in a fire engine so they can familiarise themselves with building layouts before entering. Coastal maritime rescue teams will have similar needs.

- Prioritised communications is likely to be necessary as fire and rescue teams expand the use of connected drones to monitor emergency situations, for example, in a hostage situation, riot or natural disaster. As Cisco has observed:

" *With the convergence of internet technologies and broadband wireless communications, mission-critical services for public safety emergency communications are undergoing tremendous change and growth. However, challenges and requirements are increasing for public safety and [for] those organizations responsible for providing network services to address the increasing complexity across mission-critical voice, data, and video communications.* [69] "

CASE STUDY

IBERDROLA

Iberdrola, a multinational utility company, currently uses M2M connectivity in its data concentrators (Iberdrola's meters are connected directly through electric wire, as part of its Power Line Consumer initiative). These are being rolled out in Spain to reach 11 million customers and cover 40% of the country by 2018. Iberdrola also plans to use M2M connectivity in its energy grid in Spain to enable real-time monitoring. While the M2M model is still evolving to meet the requirements of smart grid customers, Iberdrola hopes to eventually leverage M2M to become one of the solutions to achieve the quickest and most efficient way to deliver energy to customers. It will also be used to identify and rectify problems in the energy grid. For example, in case of an emergency, like adverse weather conditions, it is essential that Iberdrola has real-time M2M services in place to help restore electrical supply and reduce energy downtime, particularly if identified problems can be fixed remotely using M2M connectivity.

Iberdrola considered that, for utility companies, prioritised services are critical to ensuring real-time connectivity and full reliability to provide a high quality energy supply to its customers. It could also allow customers the flexibility in the future to use applications to control and manage their energy supply.

The potential socio-economic impact of net neutrality regulations

It is forecast that by 2020 over 50% of M2M applications (nearly 5.5 billion devices) will require some form of differentiated QoS.[70] Many of these devices will require access to fixed and mobile communication networks in order to provide services to customers. Hence, there are significant socio-economic impacts from net neutrality regulations that restrict the ability of network providers from offering differentiated quality of service for business services.

Regulatory restrictions on differentiated QoS are likely to impact the use of ICT services in a wide range of sectors. In their report for Ofcom, Machina Research and Aegis defined the types of services likely to require priority access to connectivity based on a range of customer requirements including:

- security: whether the data sent to or from the application needs to be subject to security measures, (e.g. encryption);

- criticality: the importance of the data sent to or from the application;

- sensitivity to delay: the impact on the overall service of a delay in receiving or transmitting data; and

- sensitivity to error: the impact on the overall service of communication errors, leading to partial or full loss of data sent or received.[71]

In the automotive and energy industries, some of the M2M applications that are likely to rely on high quality of service requirements include:

- electricity (smart metering);

- in-vehicle congestion & toll devices;

- stolen vehicle recovery;

- in-vehicle emergency call system; and

- usage-based insurance.[72]

Machina Research[73] forecasts that, taken together, these 5 applications alone would account for over 4 billion revenue generating units globally by 2024

The economic benefits associated with these and a host of other ICT applications may be put at risk if requirements for differentiated QoS can no longer be met as a result of regulatory restrictions. The potential lost economic benefits could include:

- the reduction in energy emissions that could be achieved through smart meters and smart grids (estimated at 9% of emissions in the EU);[74] also the ability of smart grids to increase infrastructure capacity by up to 30% to meet growing demand;[75]

- the cost savings and improved customer service realised through the increased use of videoconferencing in banks (a number of banks are moving towards videoconferencing in branches and over mobile;

- improved patient outcomes and significant cost savings achieved through telehealth (a market estimated to be worth $240 million in 2013 and could be worth as much as $1.9 billion by 2018 in the US alone);[76]

- substantial GVA and employment generated by the connected/autonomous car market (estimated to increase UK GDP by 1% by 2030[77]) in addition to the reduced congestion, accidents and carbon emissions.[78]

" *The economic benefits associated with a host of ICT applications may be put at risk if requirements for differentiated QoS can no longer be met as a result of regulatory restrictions.* "

Numbering and Licensing rules impacting global M2M services

The regulatory approach to M2M globally is evolving.[79] Some regulators are seeking to agree globally or regional consistent approaches, while others appear to be applying legacy regulations crafted to address consumer issues.

We have identified examples where specific regulations are having adverse impacts on the provision and use of specific M2M services. One such example is the application of national numbering regulation which can affect the use of a Global SIM.[80] Another is a licensing requirement that governs the location of certain types of infrastructure needed for service provision.

A Global SIM uses 'supranational' numbering allocated by the ITU for use in multiple geographies, reflecting the fact that enterprise customers typically require M2M services to be deployed in a number of different countries. Historically, it is the case that electronic communications services (in particular SIM based electronic communications services provided to consumers) have been provided on a national basis, using national numbering.[81] Regulatory obligations have also tended to flow from the use of national numbering and are likely to have been developed with consumer protection principles in mind. For example, number portability has been implemented in many countries in order to facilitate the ability of consumers who wish to change service providers without have to give up their number. However, given that numbers for M2M services are not allocated to people, it is less obvious why number portability obligations should be imposed on M2M services. Despite this, a recent CEPT report identified several European countries where number portability obligations have been applied to numbers allocated to M2M services.[82]

It is not only prohibitions on non-transitory roaming for M2M that create barriers to provision. Licence regulations governing the location of the infrastructure for service provision can also inhibit flexibility in the choice of M2M deployment models in certain industry sectors.

Equally, consumer focussed regulations in place which also affect the M2M market, for example Know Your Customer (KYC) obligations for all SIMs (including those used for M2M purposes such as vending machines), can also prove challenging and add to costs.

BRAZIL

There are specific provisions in the Brazilian national numbering plan which do not envisage the use of non-Brazilian numbering for SIMs which are used in Brazil on a non-transitory basis.[83]

As a result, it is necessary to use a SIM with numbering from the domestic national numbering plan in order to roll out an M2M solution in Brazil. A global deployment model cannot be used. In practice, this means M2M services being provided via a locally licensed operator.

INDIA

The National Telecom M2M Roadmap envisages the prohibition of foreign SIMs for M2M in India. The Roadmap further states:

"the government is of the opinion that foreign SIM should not be permitted in the devices to be used in India."[85]

MIDDLE EAST

There are signs of an emerging trend in Middle Eastern states, involving the replication of the Saudi Arabian AVL regime.

For example Oman has adopted an almost identical condition in its licence for the provision of "Automated System[s] for Vehicle Management Service".[86]

Such provisions create significant uncertainty when configuring a connected car solution across multiple markets that utilises centrally hosted network architecture.

ITALY

The use of E.164 numbers for M2M is currently under review. [87]

GERMANY

The use of E.164 numbers for M2M is currently under review. [88]

BELGIUM

The numbering regulations for M2M is currently under review. [89]

SAUDI ARABIA

In Saudi Arabia the licence to provide Automated Vehicle Location (AVL) Services (which has particular relevance for connected car functionality) states:

"The infrastructure for service provision including, but not limited to, elements such as transmitters, receivers, system administration equipment, subscribers' data storage devices, servers, call centres etc. used to provide the service must be located within the Kingdom". [84]

UK

The UK regulator, Ofcom, is supportive of the use of supranational numbering for M2M, as reflected in its statement on "Promoting investment and innovation in the Internet of Things". [90]

EUROPEAN UNION

A European Conference of Postal and Telecommunications Administrations (CEPT) report[91] in 2013 recommended that the extra-territorial use[92] of E.164 numbers should not be allowed, citing issues such as scarcity, competition and portability, tariff transparency and emergency calling. The report did, however, note that M2M could be considered as an exception.[93]

The potential socio-economic impact of numbering and licensing rules on global M2M services

CRF HEALTH — CASE STUDY

CRF Health, is a global leader in electronic Clinical Outcome Assessments (eCOA). It mainly uses M2M connectivity to send mobile data during clinical trials and to track the related fees. CRF Health has only used Vodafone's Global platform in a limited capacity and has not utilised the platform for more comprehensive reporting, monitoring or analysing of its services. However there are plans to do this in the future.

CRF Health highlighted cost and time savings to its business through the use of the Global SIM as compared to its previous solution. Previously, CRF Health had to wait some time, often days and even weeks, for SIMs to be activated by a third party. Additionally the SIM card needed to be in an active mode prior to shipping, which led to additional costs. Now, with the Global SIM, the SIM is automatically activated from the first data transfer; this has led to cost and time savings for CRF Health and its Customers.

The use of a single tariff has also led to positive outcomes for its customers. CRF Health can now provide accurate and predictable fees of particular trials and studies before they take place which has significantly improved its pricing model and allows customers to budget more effectively.

There are increasing risks, in a range of countries, that these could become more widespread in future as M2M regulation develops. This is the case in the EU, for example, where a number of Member States have consulted, or are in the process of consulting on a range of numbering regulations which could restrict the provision of M2M services via a Global SIM.

If this were the case, the economic impacts could be significant. The scale of the impact would depend on the number of jurisdictions imposing regulatory barriers, the scale and market potential of M2M services in each and the M2M solution that Vodafone would be required to implement to serve its customers as an alternative to the Global SIM and GDSP.

The economic impacts that would apply to Brazil as well as other countries that imposed similar regulatory restrictions could include:

- reduced direct economic contributions by service providers, resulting from the lost M2M revenues, and high set-up costs and increased operational costs developing and migrating customers to an alternative deployment model for M2M provision in jurisdictions where the global solution could no longer be used;

- reduced economic contributions of M2M customers associated with any lost revenues over the period of transition from a Global SIM to the alternative M2M solution and as a result of any increased costs involved in the use of an alternative M2M SIM solution (e.g. production, testing and monitoring costs);

- reduced economic contributions of suppliers in the value chain for both service providers and M2M customers as a result of their reduced activity over the transition period;

- less investment and innovation by M2M services users over the transition period; and

- reduced economic spillover benefits as a result of reduced M2M service provision over the transition period and lost benefits to customers from the use of services that deploy GDSP.

Vodafone's enterprise customers specifically highlighted the benefits to their business associated with the use of a single Global SIM in their installed base of multi-national M2M devices. The benefits that could be lost as a result of regulations preventing the use of the Global SIM include:

- efficiency benefits of being able to deal with a single provider to meet their needs across multiple countries;

- the coverage benefits of Vodafone's own global footprint (including that of its network partners);

- the ability to develop standardised global products without needing to tailor the production process to fit different national SIMs; and

- the associated time and cost savings.

Not having to change SIMs dependent on where the device is deployed was a particularly important benefit noted by the majority of Vodafone's M2M customers interviewed as part of this study. With a Global SIM solution, a single SIM can be embedded in all products during the manufacturing process, irrespective of where in the world the product will be sold. Companies we interviewed indicated that the ability to have one standardised manufacturing process, during which SIMs are embedded in every product, leads to time and cost savings in production. The Global SIM means that the end destination of the M2M device does not need to be taken in to account in the manufacturing process and SIM customisation does not need to occur.

Ultimately, it should be the enterprise customer that is the primary driver of the specific M2M deployment model, using the Global SIM or an alternative approach such as the GSMA's embedded SIM specification.[94] It is important that regulation does not unduly restrict the range of M2M deployment models available.

CASE STUDY

IMPACTS OF BRAZILIAN REGULATIONS PREVENTING THE USE OF A GLOBAL SIM

In order to comply with the Brazilian regulations governing the provision of M2M services, Vodafone had to develop and deploy a "local solution" to provide connectivity using numbering from the Brazilian national numbering plan via partnering with an existing Brazilian telecoms provider.

The direct impacts of this on Vodafone include:

- lost M2M revenues while the local solution was developed (approximately 2.5 years);

- additional cost associated with the development of a bespoke M2M solution for Brazil in conjunction with the local partner, including significant Capex;

- significant added complexity and time delays to develop, test and deploy the solution;

- higher operating costs on an ongoing basis.

If the regulations restricting use of the Global SIM for M2M were not in place, Vodafone indicated that its M2M solution could have been launched in Brazil with no additional cost or delay using the Global SIM and the GDSP, which is centrally controlled through the cloud.

Enterprise customers are also likely to be negatively impacted as a result of the regulatory requirements, in a number of ways including:

- lost revenues associated with their use of M2M connectivity in their products for the Brazilian market over the period of delay in deployment;

- additional costs and complexities associated with being required to use two SIMs in their devices (the Global SIM outside of Brazil and a local SIM in Brazil), including supply chain production costs, monitoring and testing costs; and

- loss of the service benefits associated with the GDSP.

More generally the Brazilian economy is likely to also have been negatively impacted by the regulatory restrictions resulting in delays to the deployment of M2M services by global enterprises. The economic contributions and wider economic spillover benefits associated with M2M use would not have been realised during this period. With potentially higher costs of M2M deployment, economic activity may be affected in the longer term. And with higher costs of M2M deployment, economic activity could potentially be affected in the longer term.

ATLAS COPCO

Atlas Copco indicated that if regulations were introduced that prevented its use of the Global SIM it would pose significant challenges for it, in terms of adjusting the production process and changing the Global SIMs deployed in the installed base of devices.

It noted that some of its equipment has a lifespan of around 30 years; machines are often sold on second hand and it is not possible for Atlas Copco to know where the machine will end up when the SIM is installed in the production process. Some machines are also sold via dealers, or installed as an intermediary product in a manufacturing process. Devices can be shipped globally, particularly the smaller, lower value, high volume machines.

While technicians are deployed worldwide to maintain machines, it was highlighted that they are not IT technicians, therefore would require new, additional skills if SIMs were required to be installed and programmed for different jurisdictions. Atlas Copco also indicated that if regulations were introduced requiring different SIMs for different countries, i.e. it was not able to use the Global SIM, it would limit its M2M deployment to large regions, using large telecommunication providers, and it would not be able to deploy its M2M devices globally.

MSWIPE

Mswipe is an Indian company providing mobile payment services through the use of an M2M SIM. The Mswipe solution is based around a hardware device called the Wisepad that connects to a smartphone, tablet or PC via Bluetooth. Users can download the Mswipe application on their internet-enabled device and can accept payments from all major debit, prepaid and credit cards. Mswipe's gateway connections are optimized for 2G connections and payment details are sent via a Vodafone M2M SIM. Mswipe provides a bank-agnostic solution which allows small merchants to accept card payments using a mobile device and an M2M connection. The Mswipe terminal and connectivity allows for payments to be transferred quickly and directly to the merchant's bank account the next day.

Mswipe highlighted that the use of a Global SIM delivers significant benefits when it is rolling out solutions in different countries, particularly given the need for cross border acquirers to have a unified platform. Where it has had to develop local solutions this has added to logistical costs and reduced the ability to achieve economies of scale.

Data localisation regulations

In a post-Snowden world, issues of data protection, security and law enforcement access are an increasing focus for policymakers, regulators, companies and individuals worldwide.

" *Many countries, particularly in emerging markets, already limit the export of certain types of data through legal requirements or government authority licence obligations.* "

Growing concerns around data privacy, data protection and state surveillance have prompted a number of governments and regulators to call for restrictions on the transfer of data (including machine generated data) outside of national borders.[95] We note the important distinction between data localisation regulations (where there are stringent regulations on data leaving the country) and the range of regulations that exist on cross-border transfer of personal data (where transfers can occur only if certain obligations are met).[96]

As the volumes of data generated and transmitted continue to grow, and as the integrity and security of that data comes under more focus, more countries may look at ways to ensure that data about their own citizens, or data that they perceive to have national security implications remains secure, protected, and available for access where necessary. Many countries, particularly in emerging markets, already limit the export of certain types of data through legal requirements or government authority licence obligations.

Some industry stakeholders have also identified an emerging perception in some countries that national 'data sovereignty' requirements are in place, even where they are not.[97]

At the same time, there are some recent examples where industry agreed standards and self-regulatory initiatives have been introduced to address concerns around privacy and security. For example:

- one such industry standard is ISO/IEC 27018:2014, which establishes commonly accepted control objectives, controls and guidelines for implementing measures to protect Personally Identifiable Information (PII) in accordance with the privacy principles in ISO/IEC 29100 for the public cloud computing environment;

- the European Commission's recently established 'Alliance for Internet of Things Innovation' (AIOTI) has brought together many different companies in order to remove any barriers (e.g. interoperability, security) to the development of the 'Internet of Things' and the Digital Single Market; and

- the EC has also established the EU Rolling Plan for ICT Standardisation which aims at structuring governance of standardisation and pulling market forces towards convergent objectives.[98] A European Multi-Stakeholder Platform on ICT Standardisation has also been established bringing together all key stakeholders (including European Standardisation Organisations, the main international ICT bodies, industry and consumers) to achieve more coordinated action.[99]

These examples provide evidence of proactive measures taken by industry players to provide alternative measures to data localisation laws and regulations in order to address legitimate public policy concerns.

Data localisation requirements in selected countries

TURKEY

Public communication network and service providers are prohibited by law from transferring customer call data outside the country (with exceptions for roaming and international call details).[100]

RUSSIA

Russia recently signed a law requiring all entities in Russia collecting the personal data of Russian citizens through electronic communications (including subsidiaries and branches of foreign companies) to store it in databases located in Russia.[105]

CHINA

Companies in some business sectors, for example banking and healthcare, may not transfer customer data overseas without explicit user or regulatory permission. Furthermore, a draft bill was put to public consultation in July 2015, which would require critical information infrastructure operators, including in the finance sector and public utilities companies, to store data collected in China in the country.[106]

BRAZIL

Considered data localisation requirements and rejected them. [101]

EGYPT

Telecommunications providers are restricted from sending some types of customer data across borders. [102]

INDIA

Telecommunication licences contain provisions on the transfer of some types of customer data across borders. [103]

HONG KONG

There has been recently published guidance[104] to businesses exporting personal data from Hong Kong in relation to Section 33 of the Personal Data (Privacy) Ordinance. This expressly prohibits the transfer of personal data to places outside Hong Kong except in circumstances specified in the Ordinance.

VIETNAM

A decree issued in 2013 requires companies providing services across mobile networks, social networks, games services and all organisations with 'general websites' to have a minimum of one server inside Vietnam containing all information processed on the website or social network during at least the previous two years.[107]

INDONESIA

Requires all electronic systems operators providing a 'public service' (services provided by non-government institutions in areas like banking, insurance, health, security, industrial services, and social activities) to set up a data centre and disaster recovery centre in Indonesian territory for the purpose of law enforcement and data protection.[108]

The potential socio-economic impact of data localisation requirements

In a globalised information economy, providers of ICT will often deliver their products and services using centralised platforms and architecture, located across multiple jurisdictions. Therefore, any requirement for data localisation can impede effective service delivery as well as increasing costs and altering investment incentives. The economic consequences of this can be significant.

The European Centre for International Political Economy (ECIPE)[109] found that data localisation requirements and related data privacy and security laws could have substantial negative economic impacts:

- GDP losses ranging from 0.1% (India) to 1.7% (Vietnam); and

- negative impacts on domestic investment, exports and welfare.

Similarly, a 2013 report[110] estimated that if cross-border data flows were seriously disrupted in the European Union it could result in:

- a reduction in EU GDP of 0.8% and 1.3%; and

- an 11% reduction in EU manufacturing exports to the US.

There is also evidence from Vodafone's customers of the economic impact of data localisation requirements.

CA TECHNOLOGIES

CA Technologies (CA), a large global independent software corporation, provides cloud services to Vodafone and its enterprise customers. One of the main products offered is Portfolio Project Management (PPM) which is a software as a service solution that helps Vodafone manage its solutions portfolio and validation process. PPM is an important service, as it manages data relating to both individuals and projects.

CA is keen to consolidate and provide its cloud services from a centrally managed platform to benefit from cost efficiencies it can pass on to its clients. However, it is facing constraints to this due to demands – from both customers and regulators – for data be "on-shored".

Regulatory barriers, leading to the need to support customers locally, result in CA facing a range of additional costs associated with developing local solutions:

- Each local solution incurs set-up and running costs.

- If CA were able to deliver all services through its central platform in Munich, costs would be significantly lower as CA would only need sales staff to sell the product in each local market and not the technical support staff that would be required for a local solution.

- The ability to achieve economies of scale are also inhibited where local solutions are deployed. Large customer volumes are required to achieve an acceptable return on investment.

Where local markets are small, it may not be commercially viable for CA to set up a separate solution in each market. And even where a data centre can feasibly be built, the extra costs associated with it will drive up costs for customers which could make the solutions prohibitively expensive.

CA are currently working on mitigating this situation, driving down operational costs directly by developing the solutions and indirectly through leveraging service providers with local presence to achieve the needed economies of scale by combining other solutions.

Potential socio-economic impacts of data localisation rules, include:

- increased costs to service providers and customers resulting from the additional capex and operating costs (exacerbated by loss of economies of scale) associated with developing in-country data centres and platforms where multi-jurisdiction architecture was previously in place;

- reduced economic contributions of service providers linked to lost revenues from the range of products and services that they may no longer be able to provide if local architecture is required;

- reduced economic contributions from enterprises if data localisation rules (or the costs associated with complying with these rules) remove the commercial viability of their digitalised products within the market;

- reduced range of services available to customers, preventing them from realising the benefits associated with their use, (e.g. cost savings associated with expense management solutions and SIM monitoring and management through the GDSP); and

- increased complexity and cost to industry due to the lack of consistency across jurisdictions, which hampers moves towards greater digitisation.

A number of Vodafone's customers we interviewed expressed concern about laws that restrict data flows in jurisdictions where they operate, and the fragmented approach that may result. Concerns were not only about the impact on services they purchase from Vodafone, but also on services they can offer to their own customers.

CASE STUDY

GE

GE highlighted the impact of EU Member States' inconsistent interpretation of EU data protection laws. When GE sought to open a shared data centre in Hungary, Hungary's interpretation of EU law meant that GE could not transfer data to US data centre in Hungary and then back out again without signoff from the "owners" of the data. The shared data centre was delayed for a year while negotiations took place.

CASE STUDY

JAGUAR LAND ROVER

Data localisation issues also increase compliance costs and in smaller markets particularly, these costs can be high compared to the potential size of the market and Jaguar Land Rover revenues.

CASE STUDY

PANASONIC

Panasonic, a multinational electronics corporation, purchases M2M services and unified communications from Vodafone. The unified communication solution combines mobile telephony, mobile data and fixed telephony set-up across Europe and is used across its European entities.

Panasonic indicated that a single unified communications solution across Europe results in cost savings. For example, the service allows its employees to place internal calls across its European entities at a lower cost, and provides a single number reach and an integrated call plan.

Although the solution is still being rolled out and not all Panasonic users have been integrated, Panasonic estimated that it had reduced its annual operational costs by approximately 25% (approximately €1m).

To achieve these benefits more widely, Panasonic is analysing the possibilities to roll out a similar solution in other parts of its business outside of Europe.

Policy recommendations

To recap, the key findings of our study include:

- Effective government policy is likely to play an important role in fostering the digitisation of industry. The digitisation of the business sector can deliver significant economic growth across a wide range of industries. In particular, industries such as Healthcare, Automotive, and Energy are likely to experience transformational changes to how products and services are produced and consumed. However, governments can do more to improve the global compatibility of public policy and regulatory frameworks.

- Supply-side regulatory restrictions have the potential to hamper the development of the market. There are risks of unintended consequence from 'consumer' style regulation being inappropriately applied to emerging ICT services vital for the digitisation of industry. For example:

  – a requirement for enterprise M2M applications to use numbers from the National Numbering Plan; and

  – 'net neutrality' regulations that restrict the offering of differentiated quality of service applications to enterprise customers.

- A globally inconsistent regulatory approach could result in higher costs and poorer quality of services for multinational enterprises. Examples highlighted in this report include:

  – geographic restrictions on where machine generated data can be stored;

  – regulations that restrict the transfer of customer data beyond country borders; and

  – an emerging perception in some countries that national 'data sovereignty' requirements are in place, even where they are not.

- Some self-regulatory approaches are emerging that may address potential regulatory concerns around privacy and security.

To address the major regulatory threats to the digitisation of industry (particularly for those firms offering services in a global market) we recommend that policy makers and regulators:

- aim to develop effective demand stimulation policies for the digitisation of industries. Policies should be tightly focused on achieving specific economic and public policy objectives (such as the use of smart meters to promote energy efficiency or regulations similar to eCall to reduce car accidents);

- ensure that 'net neutrality' rules allow business customers to obtain specialised services necessary to fuel the digitisation of industry. Net neutrality regulations should take into account the different needs of consumers and businesses. Regulations designed for mass market internet services should not be applied to the business market. We recommend that policy makers should either exempt relevant business services from the scope of regulation or include a sensible materiality clause to ensure that business services using the industrial internet (where the quality dimension is likely to be important) are not unduly restricted commercially;

- remove unnecessary restrictions within local numbering plans for using ITU supranational numbering resources for cross-border M2M applications (where such restrictions cannot be justified on economic or public policy grounds); and

- remove unnecessary restrictions on the transfer of machine and user generated data across borders (where such restrictions cannot be justified on economic or public policy grounds) and instead rely on internationally recognised regulatory standards on data protection and privacy (such as those that apply in the European Union).

Appendix
Key notes and assumptions

Gross Value Added (GVA) is the measurement of the contribution to the economy of an individual producer, industry or sector. It estimates the difference between the value of the goods and services produced and the cost of the inputs – such as raw materials – used to create those goods and services. GVA is used to estimate Gross Domestic Product (GDP) which is a key indicator of the state of the economy.

Our analysis of Vodafone's M2M economic contribution is shown in gross terms. We have not assessed the net contribution of Vodafone's M2M services. Therefore, the analysis does not take in to account what the people and other resources would have been used for if Vodafone did not provide these services.

Vodafone's direct economic contribution in terms of GVA associated with the provision of M2M services is assessed using Vodafone's own data, available from its financial and human resources systems. The data contained in the financial accounts is prepared on an accruals basis for the financial year and so does not relate to cash spent in the year.

Vodafone's indirect economic contribution from its M2M services has been calculated using GVA multipliers. These multipliers were generated from analytical input-output tables and employment data available from Eurostat for European Union countries and either the World Input-Output Database (WIOD) or the relevant national statistics agency for non-EU countries.

To contextualise the contribution that Vodafone makes through the provision of its M2M services, economic data from a number of external public sources is presented. It should be noted that these data do not always correspond to the equivalent year of Vodafone analysis where data availability prevented this. These data generally also refer to calendar years as opposed to financial years.

To calculate Vodafone's GVA associated with the provision of M2M services globally we have used revenue data provided by Vodafone and have made assumptions, which were agreed by Vodafone, to estimate the costs associated with the provision of these services.

We have scaled up Vodafone's GVA to that of the whole industry based on the number of connections in the total market in quarter 1 2014.

For consistency with the Vodafone Group Plc Annual Report 2014 and the reporting of Vodafone's performance, the same Euro to GBP exchange rates have been used. The average exchange rate for the relevant years has been used.

Currency	Exchange Rate
Euro/GB Pound (€/£)	1.19
€/USD	1.33

End Notes

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