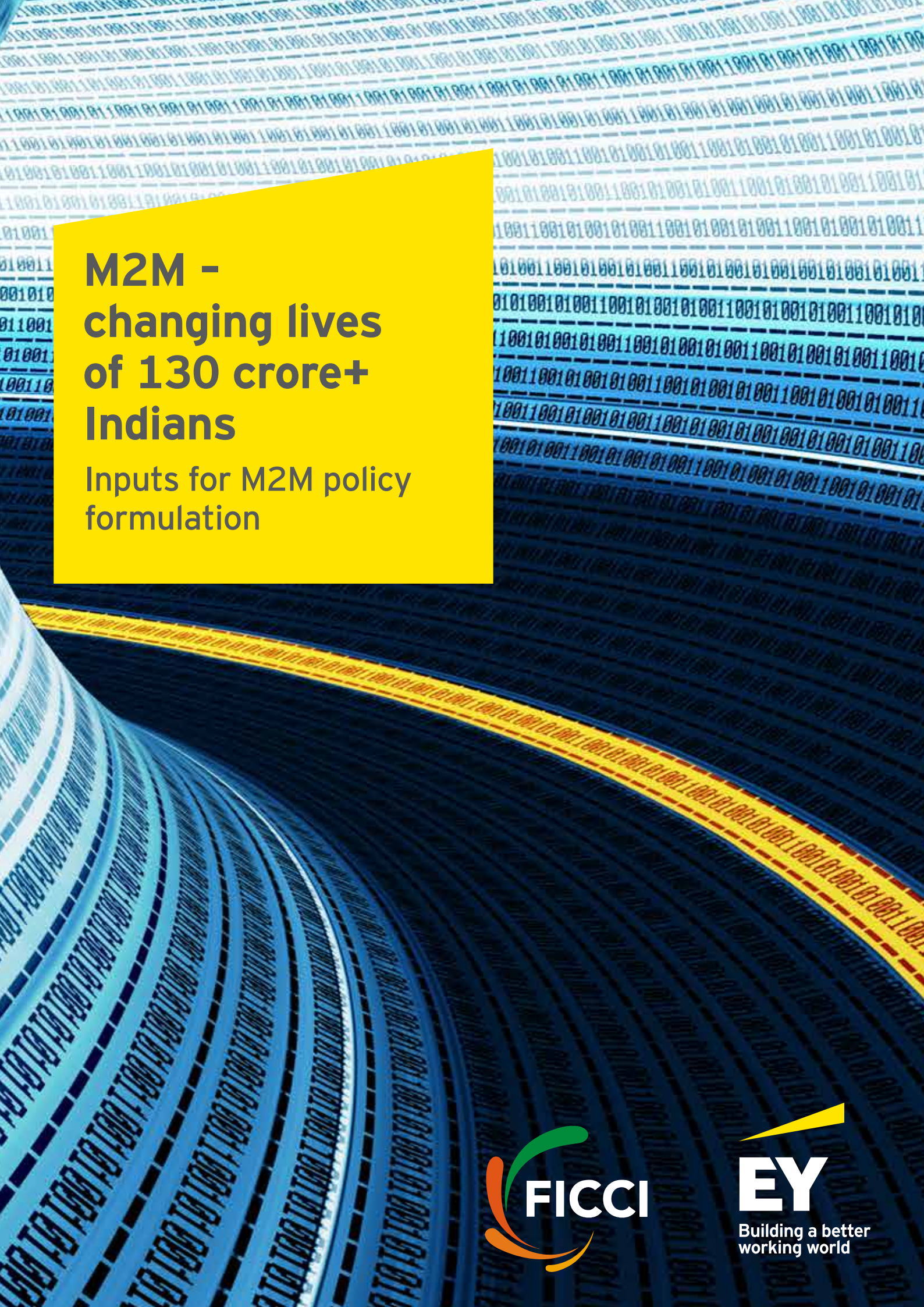


M2M - changing lives of 130 crore+ Indians

Inputs for M2M policy formulation

FICCI

EY
Building a better working world

Foreword

FICCI

The Federation of Indian Chambers of Commerce and Industry (FICCI), in association with knowledge partner EY, is proud to present this report – M2M – changing lives of 130 crore+ Indians. The report covers various facets of the machine-to-machine (M2M) ecosystem and addresses the issues and challenges faced by the stakeholders. It provides key inputs and recommendations to overcome some of the impediments to M2M growth in India and to aid in policy formulation.

M2M is envisaged to play a crucial role in India's transition to a digital economy, by supporting and nurturing a sustainable connected society. The role of M2M is all encompassing, equally benefitting both businesses and consumers. The exponential growth projections for connected devices is testimony to the importance of M2M communications. M2M is expected to play a pivotal role in key Government of India (GoI) programs such as Digital India, Make in India and Smart Cities Mission.

Given the significance of M2M, it is crucial to have all the necessary building blocks in place to drive the growth of the M2M market in India. Overcoming some of the key issues is likely to create a more enabling environment for the entire M2M ecosystem in India. A progressive and supportive M2M policy framework would a go a long way in realizing the connected India vision. India should take every possible step to be in line with global practices in M2M. The report asses the current global M2M trends and policies and tries to provide a holistic view on the current scenario, key challenges and drivers. We hope this report will help in advancing GoI and industry cooperation to drive the next wave of innovation and ICT growth in India.

We thank the contributors from the FICCI ICT & Digital Economy Committee and participants from the industry for their valuable contributions and for sharing their perspectives.



Sanjaya Baru

Secretary General
FICCI



Virat Bhatia

Chairman
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FICCI

EY

In the past few years, India's growth story has been difficult to ignore. A series of growth oriented initiatives and favourable economic conditions have been instrumental in leading the emergence of a 'surging India'. There is a renewed sense of optimism and the country is forging ahead to become one of the world's fastest growing major economies.

In these exciting times, a digital revolution is set to have a profound impact on the lives of over 1 billion Indians. For an aspiring digital economy, the benefits are far flung and spread across multiple industries including health, automation, banking, power and utilities, and agriculture amongst others. Today, India is at a cusp of a technology-led transformation that is leading the charge of driving momentum in flagship government endeavours including the Digital India. Smart Cities and Make in India programs.

In fact, a massive surge in data consumption is fuelling the rise of Machine-to-Machine (M2M) communication. As we head in to a hyper connected ecosystem, more machines will be connected to the internet, generating volumes of intelligent data driving productivity and efficiency. The existence of innovative use cases across industry verticals clearly underline its latent potential. Going forward, M2M in India is poised to become a blueprint of the connected society. It has the potential to drive radical socio-economic growth and offer substantial tangible benefits to citizens, businesses and the Government.

From a regulatory standpoint, M2M frameworks globally are still at nascent stages and follow piecemeal approach, and very few countries have formalized a comprehensive regulatory agenda. Given India's digital readiness, a progressive policy that enables development of a robust M2M ecosystem will be critical for promoting inclusive growth. A number of 'Ease of doing business' interventions are needed to accelerate growth of M2M in India.

The primary objective of the report is to provide inputs to help the GoI formulate the 'National Telecom Policy 2018', and develop a robust framework for M2M in India. Further, the report showcases global practices already prevalent in other geographies.

With that as a backdrop, FICCI, in association with EY, is pleased to present this report on M2M communication in India. I take this opportunity to express my gratitude to industry members who debated the issues and helped us formulate considerations. I would also like to thank the FICCI ICT & Digital Economy Committee for its involvement and support, which helped us in gathering valuable insights and framing a point of view.

I hope you find this report insightful.

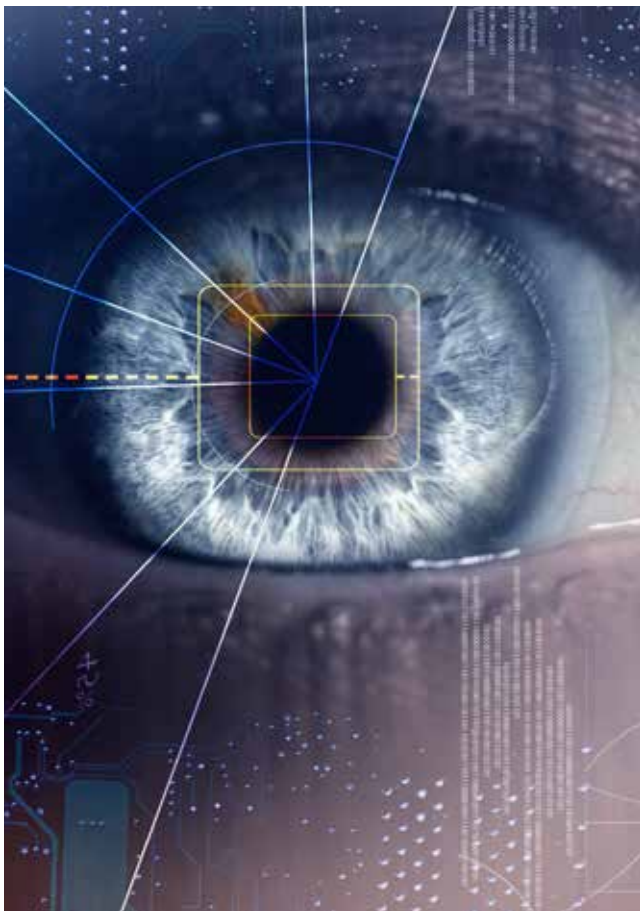


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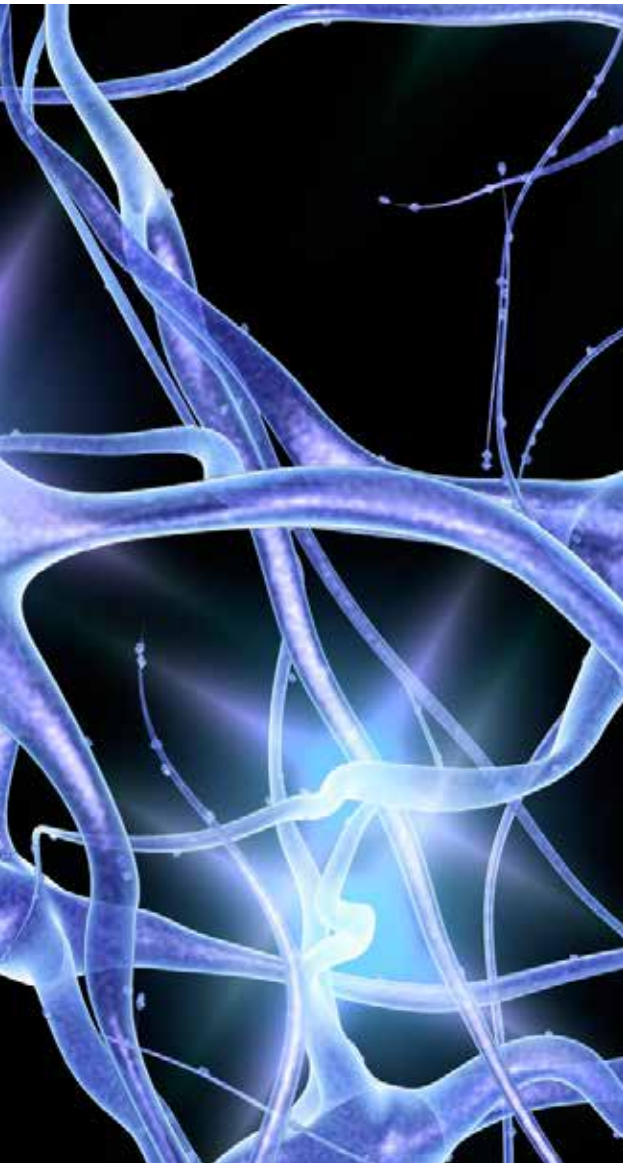
Emerging Markets TMT and
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About the report

M2M in India still at a nascent stage. Yet, it is a truly game-changing trend that promises to transform connectivity like never before. FICCI, in collaboration with EY, developed this report, which delves deep into the future outlook of the M2M market in India and its potential to accelerate innovation in a converged ecosystem. The report also analyzes key drivers and elaborates on critical use cases across industries.

In the past few years, a number of regulatory and policy initiatives have been undertaken. This report is an endeavor to provide policy considerations to the Government as it strives to develop a policy framework and roadmap for M2M in a Digital India.

Methodology

The FICCI ICT & Digital Economy Committee members provided inputs on M2M. The recommendations have emerged from inputs provided by the Committee members across the M2M ecosystem, which specifically focused on key issues and concerns of the stakeholders. The inputs have been backed by extensive secondary research, analysis and insights provided by EY. The report substantiates the recommendations through examples and prevalent practices for policy makers to consider.

Acknowledgements

The FICCI ICT & Digital Economy Committee comprising various industry stakeholders, including telecom service providers, device manufacturers, technology vendors, cloud service providers and key industry associations.

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Executive summary

M2M communications supported by cross-industry collaboration will have a fundamental impact on the way we live and work, reducing waste, improving health and delivering major social and environmental benefits in sectors such as security, transportation and logistics, education and energy.

M2M communications are also going to change the way businesses operate. Businesses are starting to consider M2M as a strategic priority and are investing in it for both revenue upside and efficiency-related benefits. Further, M2M is helping to reduce risks, enhancing customer experience; and fostering innovation.

Additionally, it will make dramatic improvements to economic growth by creating new business opportunities for mobile operators, equipment vendors and other players in the mobile space. Mobile networks already deliver connectivity to a broad range of devices. This new wave of connectivity is intelligently connecting almost anything and anyone.

M2M – at the cusp of a revolutionary growth in India

Proliferation of M2M is attributed to advancements in semi-conductor technologies and decline in the cost of sensors. The Government's Make in India initiative has the potential to further bring down hardware costs.

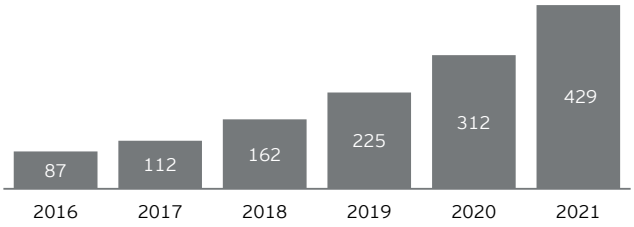
Growth in the adoption of new connectivity technologies has made M2M deployments universal. Coupled with increasing reach and usage of internet services, M2M is well poised to capitalize on expanding telecom networks.

Recently, as part of The Telecom Regulatory Authority of India's (TRAI) inputs on National Telecom Policy, the regulator envisages enabling access for connecting 1b M2M sensors/ devices by 2020 and 5b by 2022.

The GoI's flagship programs, such as Digital India and Smart City, are acting as catalysts in the success of M2M. Establishment of the IoT Centre of Excellence as part of the Digital India initiative is a positive step in nurturing and supporting start-ups in the M2M space. This is leading toward a vibrant M2M start-up culture and job creation on the back of innovative services.

M2M connections are likely to reach 429m by 2021. With significant investments and an enabling environment leading to accelerated growth, M2M has significant potential.

India M2M connections forecast (m)



Source: EY analysis

Exhibit: M2M – key industry verticals, applications and benefits

Industry verticals	Automotive	Logistics and fleet management	Power & Utilities	Insurance and Banking	Health care	Agriculture	Manufacturing
Application areas	▸ Emergency call facilities ▸ Infotainment services ▸ Navigation ▸ Vehicle diagnostics ▸ Insurance telematics	▸ Logistics planning and optimization ▸ Fleet vehicle management ▸ Fuel ▸ Management Condition-based maintenance	▸ Smart metering ▸ Smart grid ▸ Field equipment management ▸ Facility management ▸ Predictive maintenance and sensors to ensure asset visibility	▸ Remote maintenance of ATMs ▸ Personalized car, health and home insurance based on analytics of telematics, health and house conditions	▸ Telemedicine ▸ Remote patient monitoring ▸ Remote diagnosis and treatment ▸ Robotic surgery	▸ Monitor farm conditions – soil, water content, weather ▸ Remote operation of farm equipment ▸ Livestock monitoring	▸ Remote monitoring of assets ▸ Asset utilization ▸ Equipment efficiency ▸ Predictive maintenance
Benefits	▸ Enhance safety ▸ Reduce maintenance cost ▸ Enhanced driving experience	▸ Improve cost-efficiency ▸ Optimize road congestion ▸ Better asset monitoring	▸ Efficient energy generation, distribution and consumption Prevent revenue leakage Optimum utilization of resources	▸ Timely maintenance of ATMs ▸ Newer M2M-based business models	▸ Reduce cost of healthcare ▸ Minimize hospital visits ▸ Increased availability in remote areas ▸ Better care for the elderly	▸ Help make informed decisions Improve yields ▸ Increase transparency and efficiency	▸ Productivity and flexibility Automated information flow

Source: EY analysis

Creating an enabling environment is crucial for the proliferation of M2M ecosystem

For M2M to achieve its full potential, it is imperative to identify the right level of regulation which enables the larger ecosystem and sectors to connect, collaborate and innovate. With National Telecom Policy 2018 on the anvil, a favorable regulatory environment will be critical in the success of M2M. Swift periodic adjustments to accommodate cross sectors and newer use cases will lead to sustainable M2M growth.

Parameter	Current scenario	Global prevalent practices	"Ease of doing business" interventions needed for accelerated growth of M2M
Regulation	▸ M2M connectivity providers using licensed spectrum (Telecom Service Providers/ISPs) are already under regulation through Unified License (UL) and UL Virtual Network Operator (VNO) ▸ M2M connectivity providers using unlicensed bands are not covered under regulation	▸ Body of European Regulators for Electronic Communication (BEREC): No special treatment is necessary for M2M communication ▸ Brazil: M2M players are registered in the MVNO category ▸ UK: The regulator Ofcom observed that industry is best placed to drive M2M development ▸ Singapore: A license is required for M2M services	Follow light-touch regulations currently working in countries that lead M2M deployments
Spectrum	▸ No specific spectrum band has been identified for M2M services	▸ Global: M2M primarily uses licensed 2G/3G/4G spectrum bands (900/1800/2100); in addition, a combination of unlicensed bands are also used ▸ UK: The regulator Ofcom identified that spectrum in the very high frequency (VHF) range is suitable for M2M applications	▸ No separate allocation of spectrum is required for M2M in India. It can be provided over the licensed spectrum acquired by service providers ▸ The 700 MHz should not be prioritized for any specific usage. It should be treated in a technology and service neutral way.
QoS	▸ Currently, no M2M-specific measures are in place	▸ Global: No M2M-specific QoS measures are in place ▸ Various M2M applications have different characteristics – QoS needs vary widely between usage, devices and industries	▸ There is no need for M2M-specific QoS measures ▸ QoS is best left to the mutual agreement between stakeholders

Parameter	Current scenario	Global prevalent practices	"Ease of doing business" interventions needed for accelerated growth of M2M
KYC	▸ The Department of Telecom (DoT) is currently working on M2M-specific KYC norms	▸ Global: No M2M-specific rules in place	▸ Standard consumer KYC norms should not be applicable to M2M ▸ Define KYC obligations for both M2M players and OEMs that provide M2M devices to customers
Security	▸ Covered under existing licensing conditions	▸ GSMA IoT Security Guidelines act as a best practice for security and privacy matters ▸ NIST Cybersecurity Framework acts as a reference point for security measures	▸ No security measures are specifically required for M2M ▸ Ensure security of networks and data through measures and provisions under the licensing and policy regime
Privacy	▸ Privacy is governed by IT Act 2000	▸ No M2M-specific privacy measures are in place – usually governed by general data protection rule ▸ BEREC: observes that personal data may be collected by a number of connected devices and there is no need for special treatment with regard to EU Data Protection Principles	▸ Follow international best practices for privacy measures ▸ Amend telecom licensing conditions to bring it in line with the IT Act 2000 on the confidentiality and privacy aspect ▸ Encourage a common M2M-wide framework that relies on multi-stakeholder efforts for privacy ▸ Privacy-by-design should be adopted as a guiding principle

Source: EY analysis, TRAI, FICCI ICT & Digital Economy Committee



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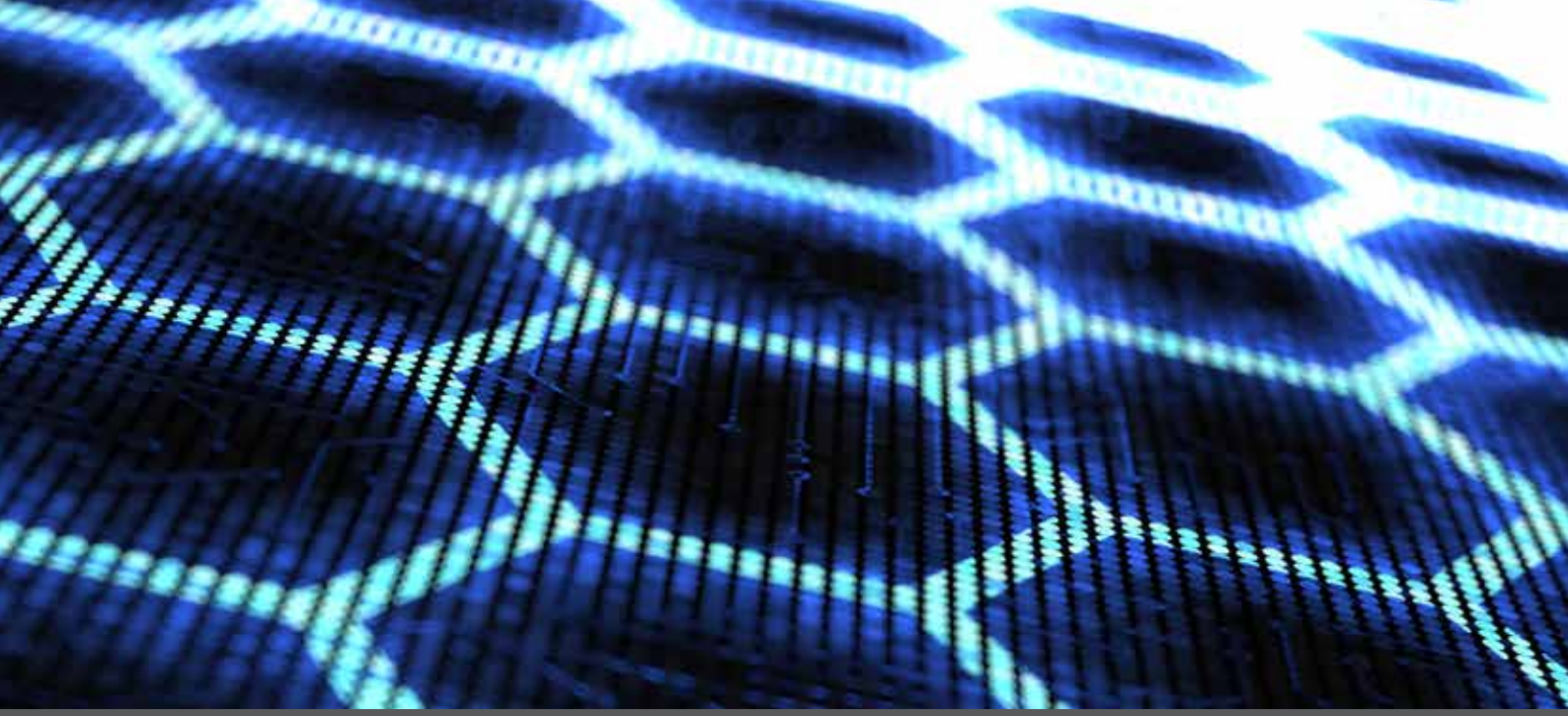
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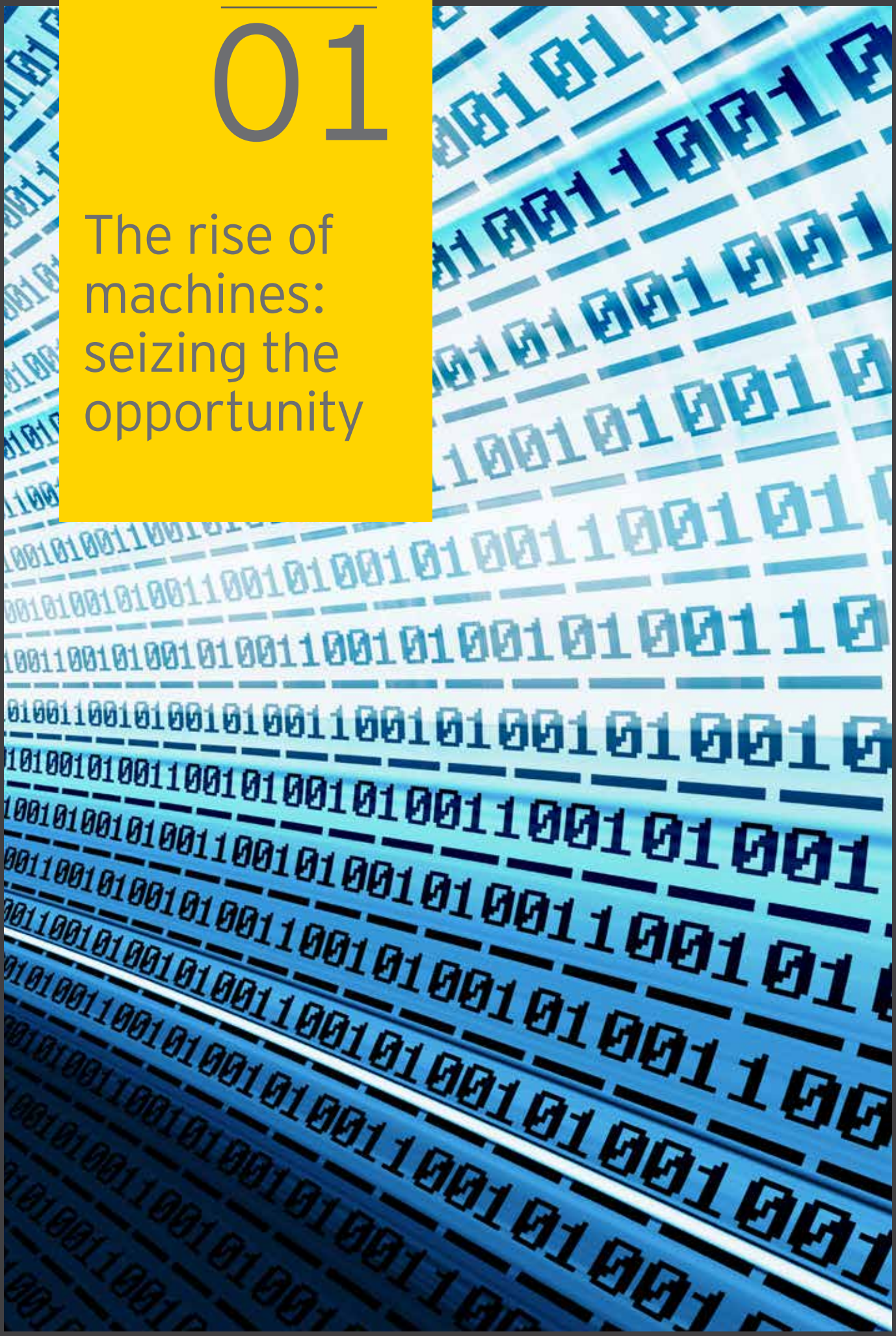
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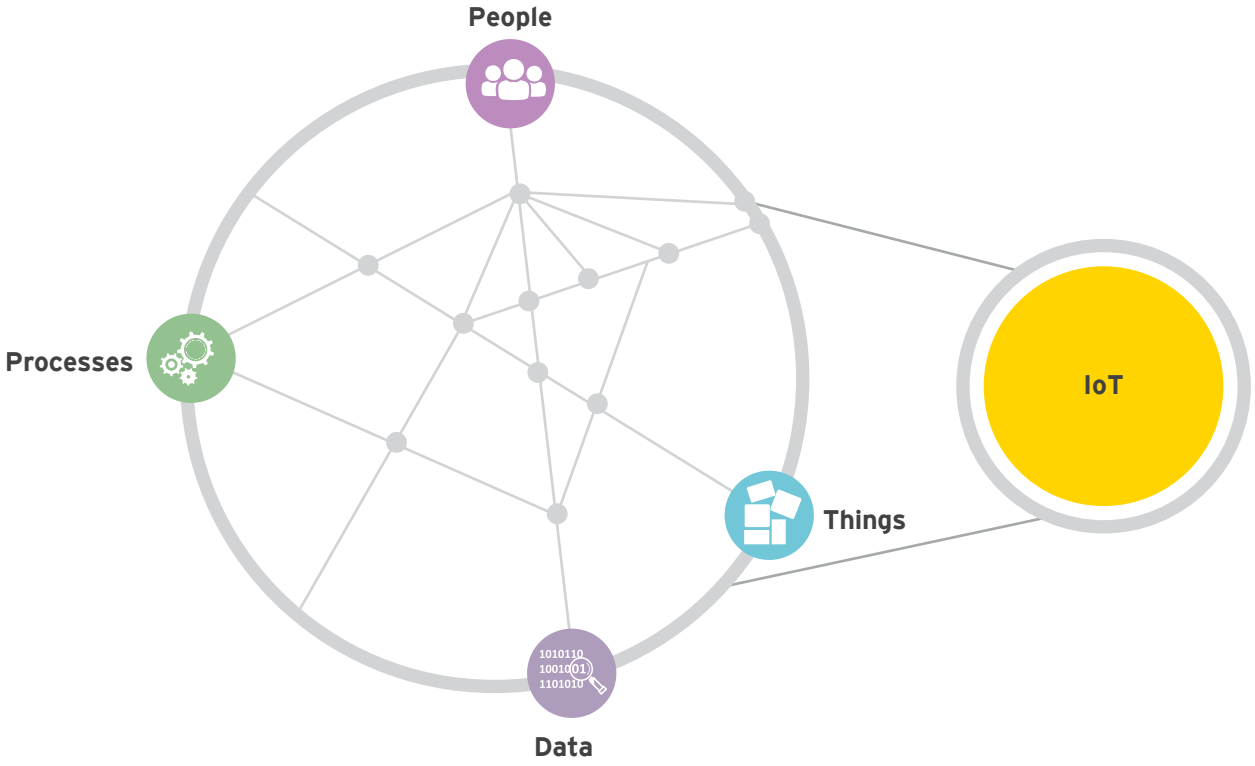
01

The rise of machines: seizing the opportunity



Mobile broadband is driving unprecedented growth in data and is fuelling India's digital transformation. Evolution of new technologies and next-generation networks are key drivers of this accelerated shift. Moreover, digital disruption is driving convergence like never before. Today, collision between previously separate industries is creating a sustained ripple effect. Against this backdrop, a new trend is redefining connectivity. With billions of smart devices connected worldwide, M2M technologies are disrupting the way businesses operate. These machines are sharing information autonomously, generating data that enables businesses to respond quickly.

Exhibit 1: M2M/IoT – an interaction between people, data, processes and things



"[M2M is] Physical telecommunication based interconnection for data exchange between two ETSI M2M compliant entities, like: device, gateways and network infrastructure." – European Telecommunications Standards Institute (ETSI)

IoT is a "Global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies. Through the exploitation of identification, data capture, processing and communication capabilities, the IoT makes full use of things to offer services to all kinds of applications, whilst ensuring that security and privacy requirements are fulfilled." – International Telecommunication Union (ITU-T)



1.1. Asia-Pacific region to drive growth in global M2M market

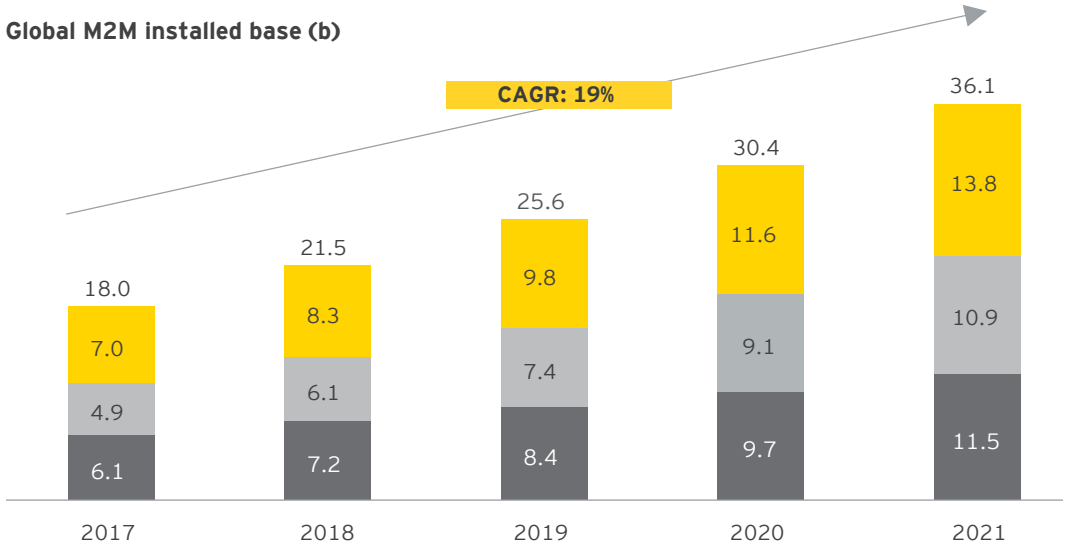
Changing market dynamics – including expansion and evolution of networks, falling costs of hardware such as sensors and actuators, improved battery life, surge in smartphone and tablet usage, and proliferation of the internet – is fuelling growth in global M2M market.

Asia-Pacific region continues to present the biggest M2M opportunity owing to focus on innovation and increased investment[1]. The revenue opportunity is pervasive across all regions globally, with Asia-Pacific expected to account for more than 42% of worldwide M2M revenue in 2021, followed by the Americas and the EMEA regions. The market would be driven by spending on connected cars, manufacturing operations, freight monitoring, production asset management and smart buildings[2].

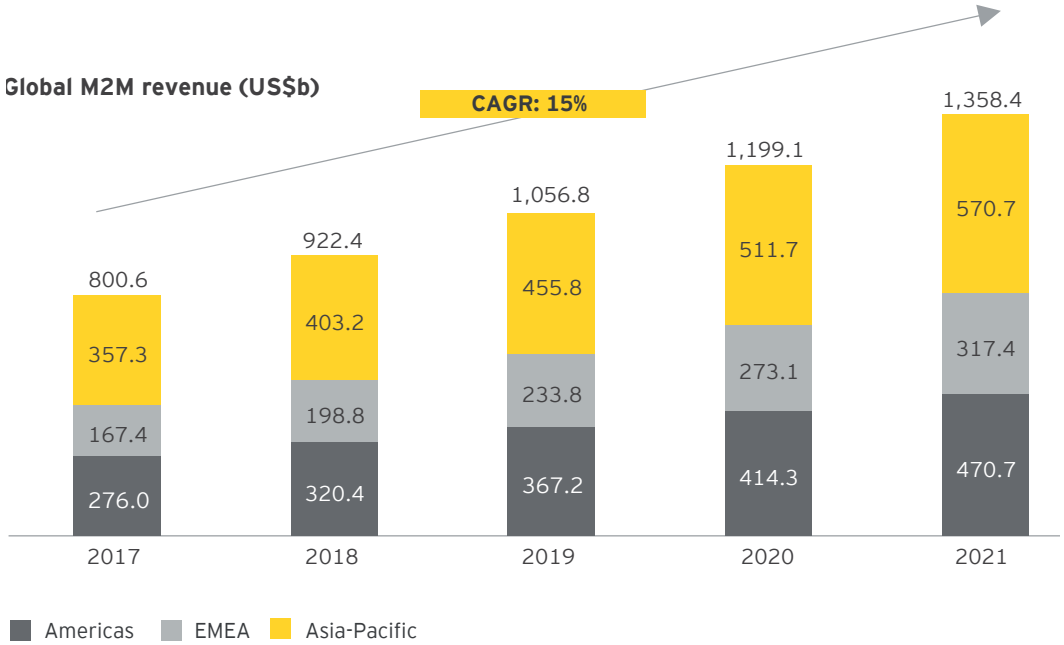
1. "Worldwide Internet of Things Forecast, 2017-2021," IDC, October 2017
2. "Worldwide Internet of Things Forecast, 2017-2021," IDC, October 2017

Global M2M installed base and market revenue, 2017-21

Global M2M installed base (b)



Global M2M revenue (US$b)

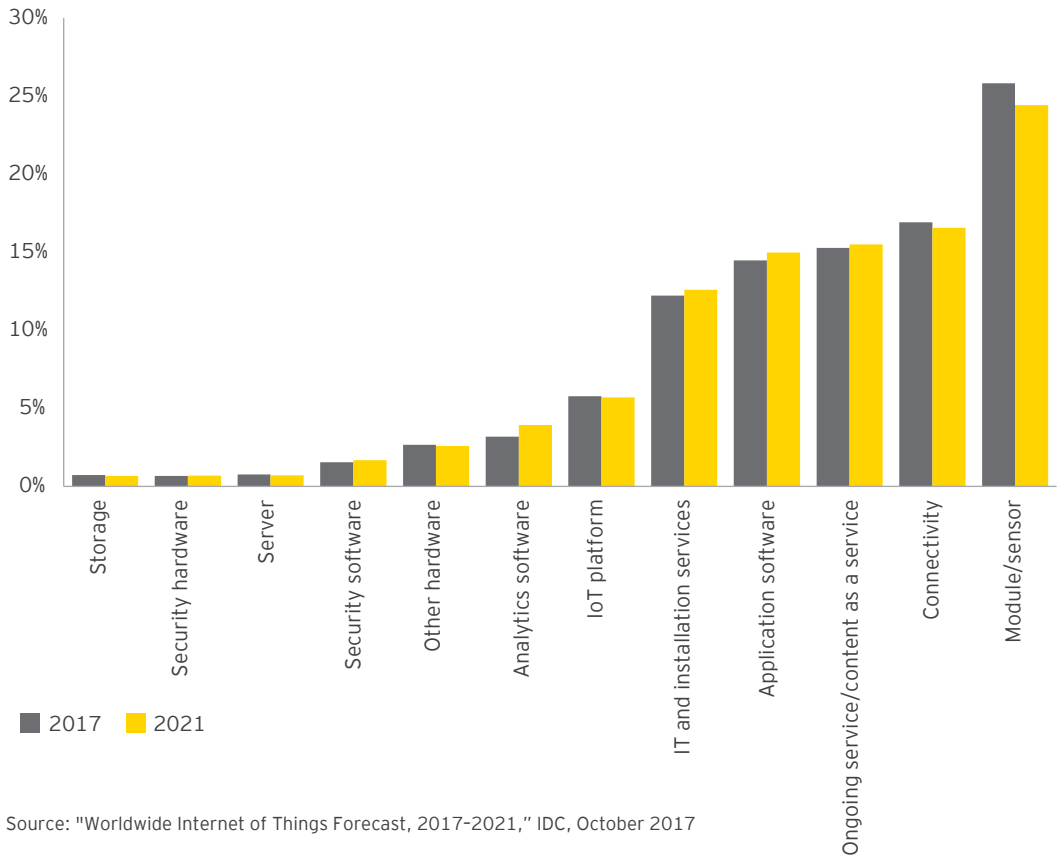


*The numbers incline India's base case scenario

Source: "Worldwide Internet of Things Forecast, 2017-2021," IDC, October 2017; Note: M2M revenue includes both M2M endpoint shipment revenue and the M2M stack revenue opportunity for all the layers of the technology stack, including connectivity, M2M platforms, storage, servers, analytics, security, and services.

Modules/sensors, connectivity and ongoing services (e.g., content as a service) would continue to account for the majority of revenue in the M2M market in 2021. Analytics software, security software and IT services are expected to witness the highest growth between 2017 and 20213.

Exhibit 3: Proportion of global M2M revenue by technology, 2017–21 (%)



Source: "Worldwide Internet of Things Forecast, 2017-2021," IDC, October 2017

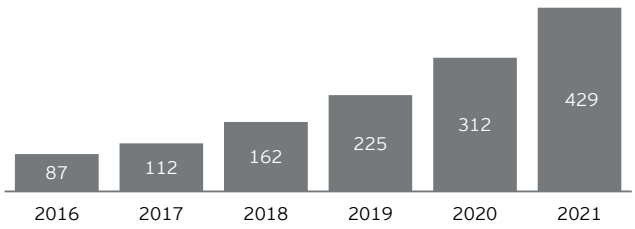
1.2.Significant untapped potential in India

M2M presents tremendous opportunities to drive significant socio-economic benefits to governments, communities, industries and citizens. It s poised to lead the charge of unlocking new growth avenues, and become a key enabler for realizing the vision of Digital India, Make in India and Smart Cities.

A number of factors are expected to drive M2M growth in India. Among the key drivers, innovation in product offerings, increasing operational efficiencies and focus on greater customer experience will be critical. In addition, thrust on evolving partner ecosystem, maturing M2M solution, increased network coverage and data speeds would also provide impetus.

3. "Worldwide Internet of Things Forecast Update, 2016-2020," IDC, December 2016.

India M2M connections forecast (m)



Source: EY analysis

M2M creates a huge addressable market for players. While India has embarked on its M2M journey much later than developed markets, it is expected to grow at a much faster rate in the future. It has the potential to replicate or surpass the exponential mobile data growth story witnessed in the country.

Exhibit 5: Indian M2M market segments

Industrial M2M	
Industrial internet	Equipment sensors Machine monitoring
Embedded computing	Wireless embedded computing Embedded security
Niche solutions	Healthcare Retail Security
Connected cities	Smart lighting Traffic monitoring
Connected vehicles	Automotive infotainment Telematics Vehicle tracking

Consumer M2M	
Connected homes & building	Home automation Smart meter reading
Lifestyle	Connected device control and wearables

India market segmentation	2016	2020
Consumer M2M	40%	45%
Industrial M2M	60%	55%

Source: NASSCOM.

4. NASSCOM

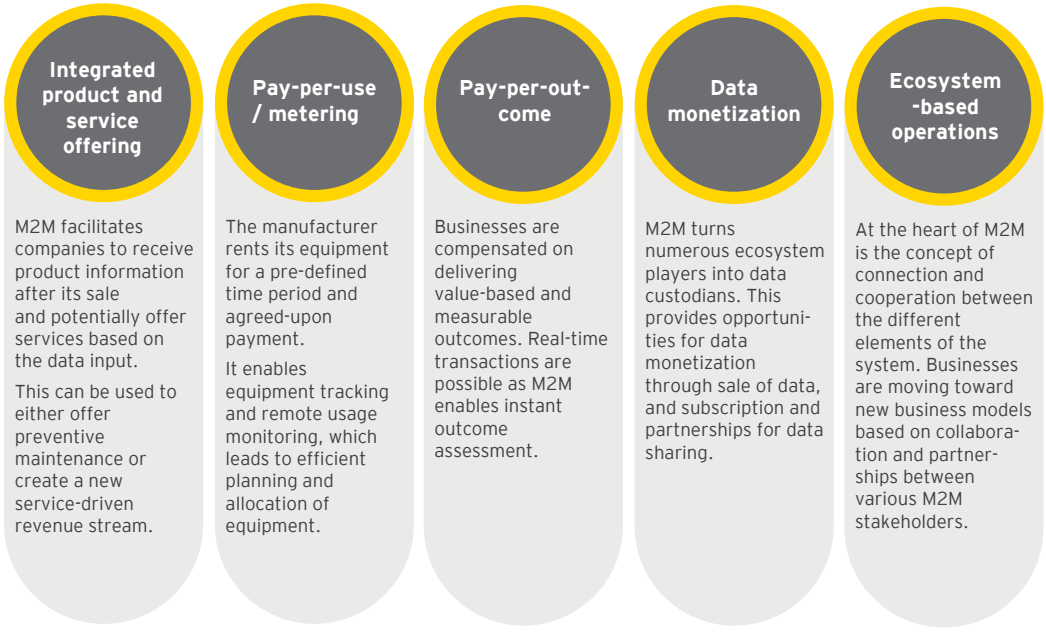
1.3.Building digital business leaders

From efficiency to transformation, M2M is changing the way businesses operate. Digital is the new strategic imperative. Organizations are looking at unlocking value through digital adoption. Simply put, M2M has the potential to transform business and open revenue streams across industries by driving effectiveness and decision making. The near-term benefits include improved operational efficiency, asset utilization, security and safety, automation and productivity gains. The long-term benefits would drive improvement in resource optimization, waste reduction, environmental sustainability, job transformation and customer experience.

The business case for M2M adoption can be analyzed from a cost and revenue perspective.

1. **The cost-driven business case**: Connected machines offer opportunities to optimize processes in order to reduce costs. According to a recent survey, 43% of the firms are planning to adopt M2M for reducing operating costs[5].
2. **The revenue-driven business case**: New and innovative solutions open up additional revenue opportunities.

Exhibit 7: Revenue-driven business models



Source: EY Analysis.

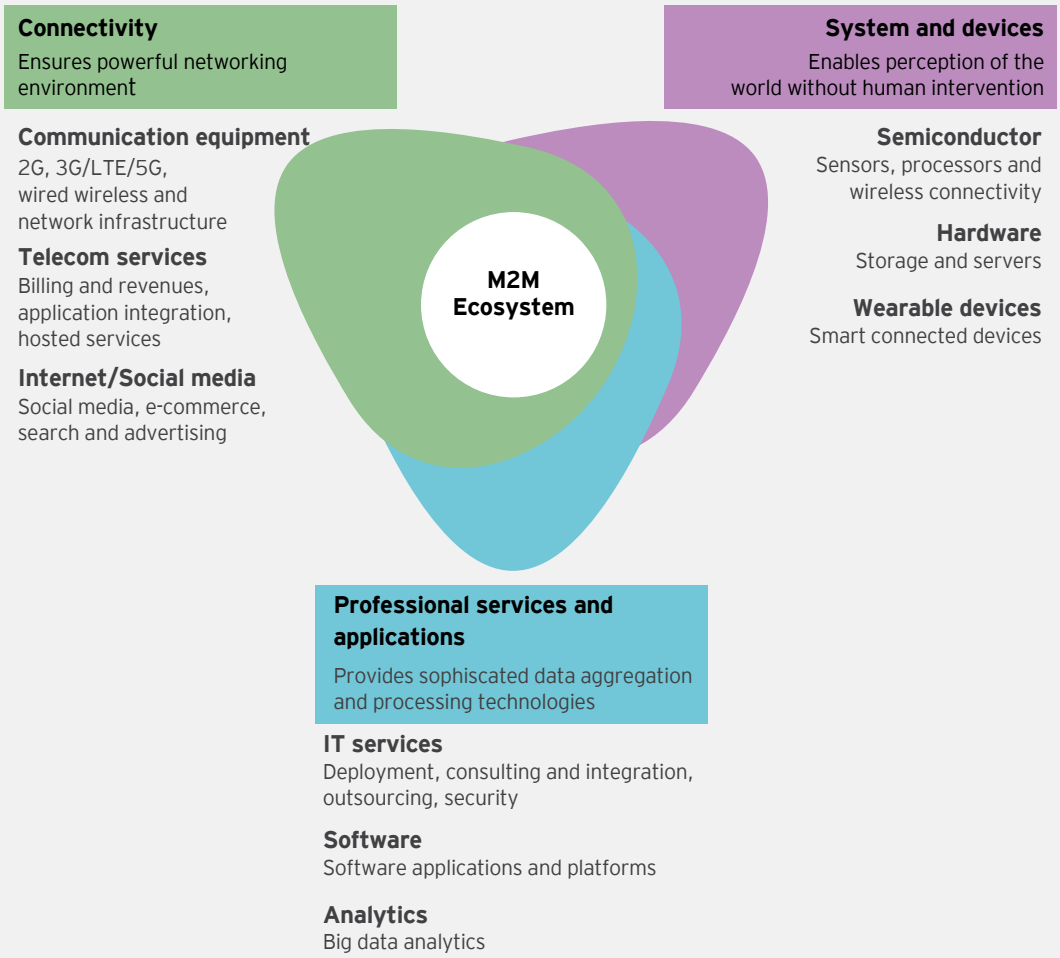
3. **The combined business case**: A combination of cost- and revenue-driven business models can help companies to drive additional benefits. For example, measuring and managing hazardous environments through M2M would reduce the risk for employees while improving employee satisfaction, leading to increased productivity. It will simultaneously optimize physical environments to control energy costs.

5. "Vodafone IoT Barometer 2016," Vodafone, July 2016.

1.4.Paradigm shift in the interplay of sub-sectors

M2M is a unifying concept where technology sub-sectors converge and interact with each other. Various components such as internet, semiconductor, software, communication equipment and IT services together play a pivotal role in establishing the M2M ecosystem. Most of the market-leading companies across these sub-sectors are not restricted to one segment as they try to leverage their expertise in one segment to penetrate adjacent ones.

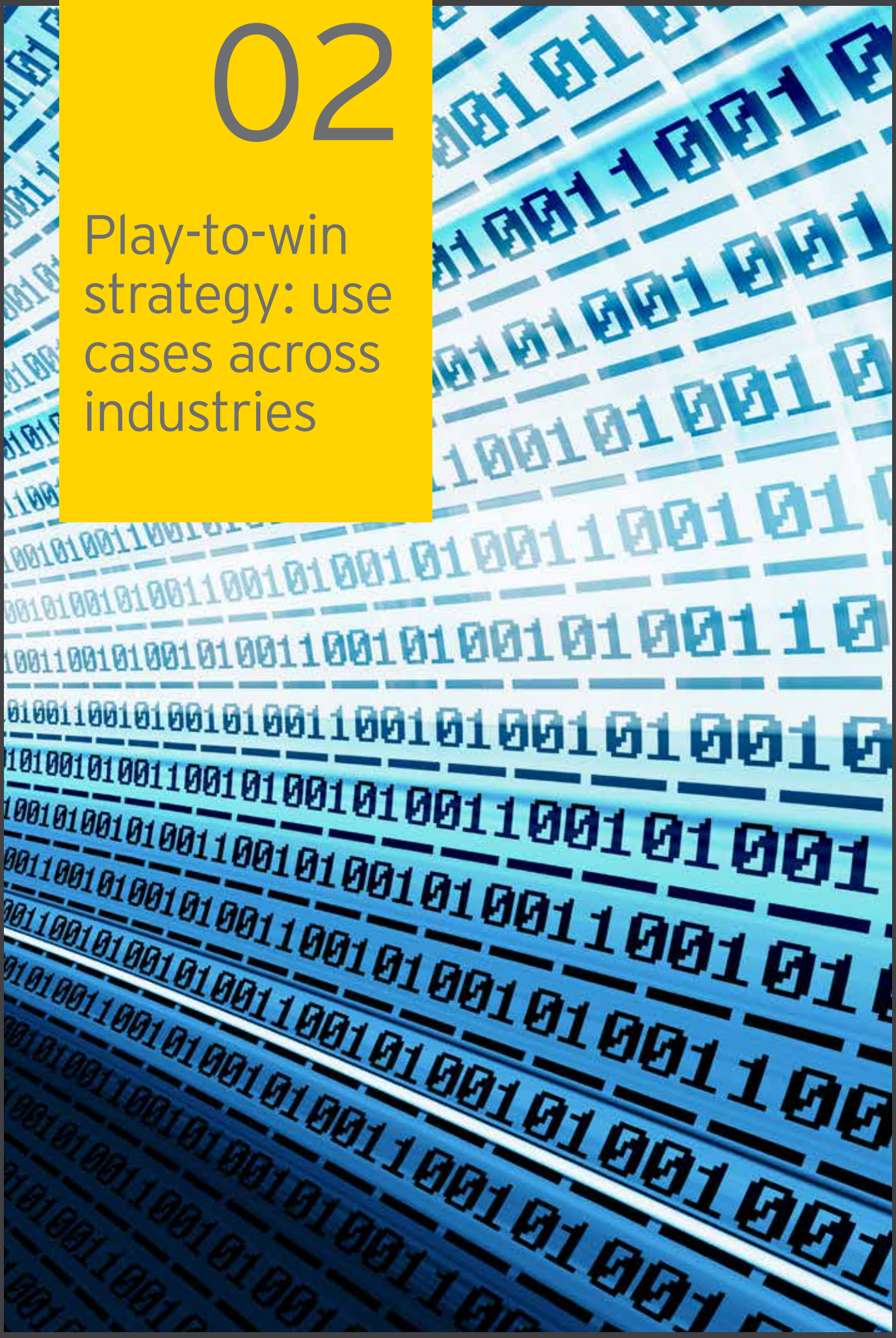
Exhibit 8: M2M ecosystem



Source: EY analysis.

02

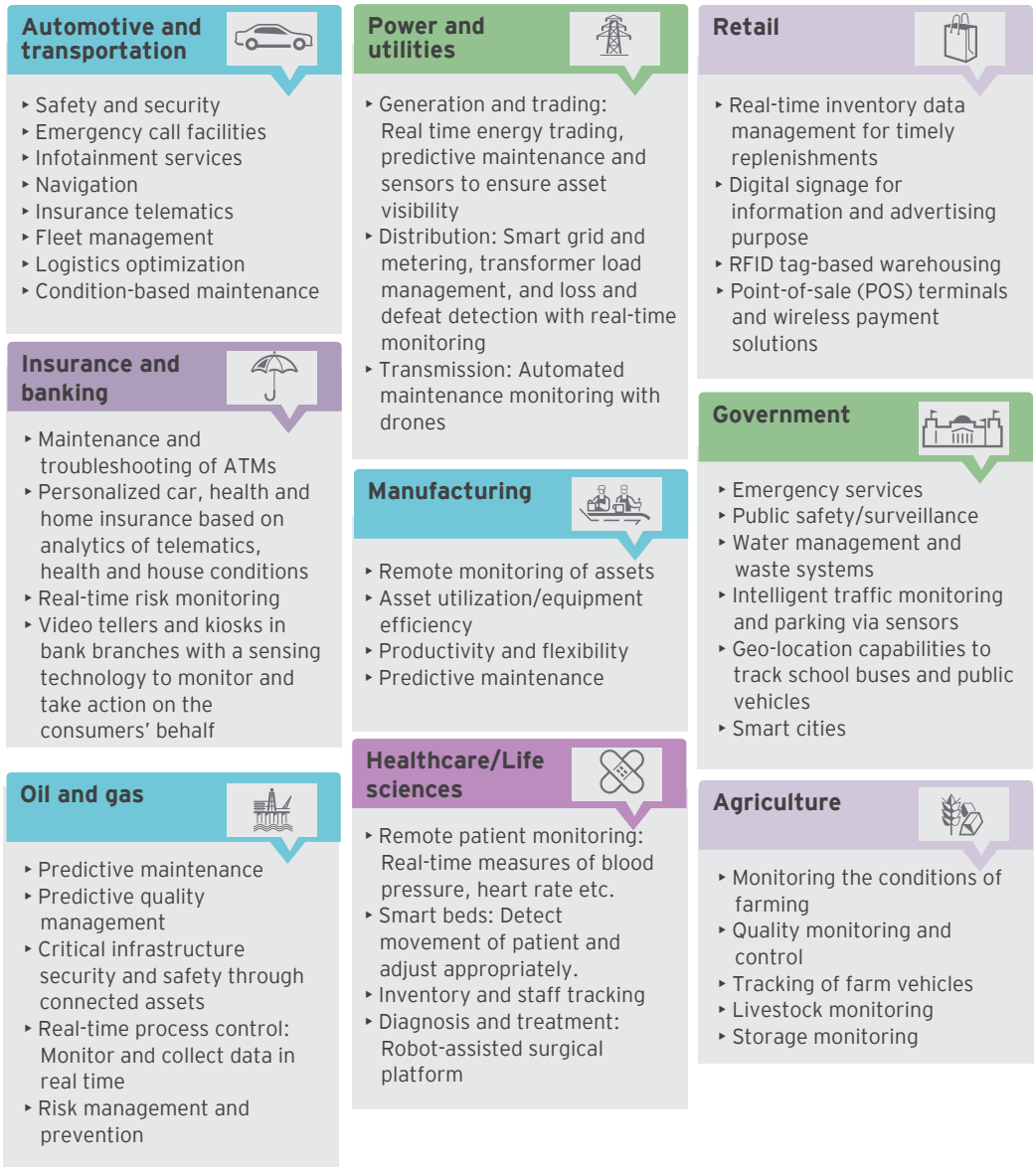
Play-to-win strategy: use cases across industries



Globally, various industries have adopted M2M to improve efficiency and reduce costs. In India, businesses are beginning to capitalize on the benefits and opportunities that M2M offers. Industries at the forefront of adopting M2M solutions by 2020 include automotive and transportation, utilities, finance and insurance, retail and healthcare.

M2M could address some of the basic challenges such as lack of optimum infrastructure for healthcare, education, banking, power and transportation. For example, sensors can make farm land smart by measuring soil humidity level and generating alerts for watering; small wearable devices can measure a patient's vital parameters such as temperature, blood pressure and pulse rate; and smart grids can help in overcoming power shortage issues through efficient power management.

Exhibit 9: Increasingly M2M creates more opportunities to disrupt applications across industries



Source: EY Analysis.

2.1. Automotive and transportation are early adopters of M2M

Adoption of M2M in the automotive industry is leading to increased demand for connected vehicles. By 2017, approximately 21m new automobiles globally were expected to be equipped with data connectivity, either through a built-in communications module or tethered to a mobile device6. Given the rising aspirations of the tech-savvy young consumer and automakers

In the transportation industry, M2M is helping improve cost-efficiency, enhance safety and reduce maintenance cost through services such as asset tracking and fleet management. The rapidly increasing number of vehicles on Indian roads is taking a toll on traffic management. Intelligent transportation systems can leverage M2M capabilities – such as sensor ecosystem, communication modules, network channel, real-time processing, big data and cloud computing – to optimize road congestion, driving behavior and safety conditions. Furthermore, the GoI has already mandated the installation of GPS devices with video camera and panic button in all public transport, driving the adoption of M2M in the industry[7].

Exhibit 10: Case study – M2M adoption in automotive in India



- One of the leading automakers in India has sensors attached to the production equipment and machines that capture data to proactively detect equipment downtime, defect in equipment and maintenance requirement of the equipment. The sensors also capture data on energy consumption, air pressure, humidity, and pollution level and sends alerts whenever any of the parameters go beyond the threshold.
- Another automobile major has launched an intelligent information platform for cars that enables communication between the customer, car, the customer's family and the automaker. It enables features such as:
  - Location sharing to connect with family in case of security concerns
  - Emergency alerts in case of emergency assistance
  - Trip analysis to review the driver's driving style
  - Vehicle health monitoring to understand the health of the car's engine and battery
  - Parking assistance

Source: Dynamic CIO.

2.2. Digitizing power and utilities

M2M plays a key role throughout the value chain of utilities, including sensors in transmission and distribution network and smart meters in customers' homes. Smart grids leverage intelligent monitoring systems to manage energy generation, distribution and consumption. Smart meters are helping businesses as well as private consumers to effectively reduce energy spending through real-time updates on energy consumption.

The utilities industry in India can immensely benefit by leveraging M2M for smart grids/meters, smart building and efficient waste and water management to ensure optimum utilization of resources. Smart

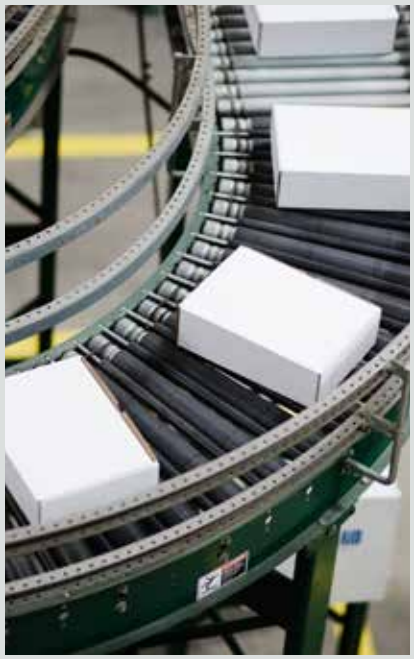
6. "The Road to Connected Autonomous Cars," Gartner, 20 December 2016.

metering solutions in electricity, water and gas usage can optimize energy efficiency through better insights on real-time consumption, losses and fraud. Waste management solutions can integrate data from containers and traffic information in deciding the optimal route for waste collection fleets[8].

2.3. Moving toward the next level of automation in manufacturing

M2M adoption can empower manufacturing companies to innovate and improve asset productivity, with predictive maintenance being a key value proposition. For example, the capability to track products opens up opportunities for service-oriented manufacturing by integrating supply and distribution chains. In India, M2M adoption in manufacturing remains limited to certain sub-verticals such as auto-manufacturing. Current adoption of M2M services is primarily to derive benefits around productivity and asset utilization, while the need for automated information flow is expected to drive future adoption[9].

Exhibit 11: Case study — M2M adoption in manufacturing in India



- A leading earthmoving and construction equipment manufacturer has empowered customers to be in constant touch with their machines through real-time updates. The telematics-based technology helps users to collect vital parameters of machine performance and its location using sensors on three fronts:
  - Service: For collecting important parameters for health monitoring and service alerts
  - Operation: For monitoring equipment usage, status and health, fuel consumption and idle time
  - Security: Geo-fencing for marking the secure boundaries of operation and ongoing monitoring of location with alerts when the machine goes outside the defined boundary conditions
- The platform handles more than 60,000 transactions per day for a fleet of 1,300 machines, with plans to add 2,000 new machines each month.

Source: IDC.

7. "M2M / IoT in Automotive Sector," Telematics Wire, 5 April 2016.
8. "M2M enablement in power sector," DoT, May 2015.
9. "Best Practices: Adoption of Machine to Machine in India Manufacturing," IDC, November 2014.

2.4. Transforming retail commerce

Improvement and innovation in product logistics, customer experience, remote monitoring capabilities and communication channels are driving M2M in the retail industry. Globally, the number of cellular M2M connections in the retail industry is forecasted to reach 44.3m by 2019, up from 23.1m in 2014 at a CAGR of 13.9% 10. Wireless M2M connectivity enables retail devices such as point-of-sale (POS) terminals and vending machines to be set up in locations where fixed connectivity is unavailable

The Indian retail market is witnessing gradual adoption of M2M-enabled products and services. For example, one retail store has installed specific access points that enables customers to log in and scout through the various offers available at the store. The information gathered is then used at the time of marketing. This enables the retailer to connect with users in a more targeted fashion[11].

2.5. Smarter solutions for citizens

Governments are fast shifting from traditional methods of service delivery to digital governance through networked infrastructure, digital platforms, citizen-engagement tools and Smart City policies. With the growth of wireless systems and advances in M2M technology, seamless communication is helping in efficient public safety measures. Government agencies are adopting M2M to transmit real-time videos, access mug shots, support license plate recognition systems and optimize fleet management[12]. M2M also enables remote assistance to vehicles in distress. It helps in bringing rapid and automatic assistance to motorists involved in incidents[13].

10. "Retail M2M and IoT applications," Berg Insight, August 2015.

11. "The Internet of Things: Implications for Retail," The Free Press Journal, 14 January 2015; "When Retail Loops in IoT," Indian Retailer, 24 March 2015.

12. "How M2M and Wireless Technology Can Improve Public Safety Communications," Kovacorp, July 2013; "3 Ways Machine-to-Machine Tech Can Assist Governments," Govtech website, May 2012.

13. "M2M at the core of Smart Cities," ET Telecom, 23 October 2015.



2.6. Connecting wellness

M2M is playing an integral part in healthcare modernization through remote monitoring and predictive analysis. Telehealth is using medical devices and communication technology together to monitor diseases and symptoms. Lack of basic medical infrastructure in rural areas and inadequate health workforce are driving M2M adoption in the Indian healthcare industry.

Exhibit 12: Case study — M2M adoption in healthcare in India



- A leading hospital in India has started providing a wearable device to pregnant mothers that when paired with a mobile phone app gives real-time information on fetal heart rate, labor progress and uterine activities and transmits it to the doctor, who can access it on a mobile device. This live monitoring eliminates the need for frequent visits to the hospital, saving money for patients. The hospital has also deployed a central nursing station, which gives nurses a central view of all the patients and enables live monitoring of patients' vital health statistics.
- Another leading Indian hospital has leveraged M2M solutions for its diabetes management initiative. The solutions enable constant remote monitoring of patients' blood sugar levels and transmit the information to their health record system.

Source: EY analysis, The Economic Times.

2.7. Powering industrialization in agriculture

M2M applications are empowering farmers and agriculture businesses to monitor equipment, manage crops and livestock, assess environmental conditions and monitor fleet of tractors and other harvesting vehicles. M2M is enabling farmers to make informed decisions and improve yields, as well as increase transparency and efficiency within wider agricultural value chains.

Some drivers of the adoption of M2M in agriculture are low availability of irrigable land, inadequate information on environment predictions and limited facility of continuous crop health monitoring. M2M can enable farmers with holistic digital service, solution offerings and agronomy advice through the digital agribusiness platform.

Exhibit 13: Case study – M2M adoption in agricultural in India



- A service provider launched a mobile-based remote control system for agricultural water pumps. Through the system, modem farmers can control the pumps remotely, check the availability of power supply, check the on/off status of the water pump and, in some advanced modems, receive alerts in case of cable or pump theft. Farmers can dial a dedicated number and use the on or off code to control the pumps.
- This can help them overcome routine problems such as fluctuation in power supply, difficult terrain, animal attacks on the way to pumps, hazardous locations of pumps, open wiring, shock hazards and rains etc. As a result, each farmer/end user can save an estimated 1,000 liters of water, one liter of petrol and at least three hours of time per day.

Source: GSMA.

2.8. Automating financial services

The financial services industry is progressively using M2M to capture mobile interactions, strengthening identity management and improving customer service. Through M2M, timely maintenance is possible for automated teller machines (ATMs). Currently, M2M services are not well entrenched in the insurance industry in India. However, many insurers are piloting M2M-based products. Usage-based auto insurance, using telematics, is likely to help insurers to monitor driver behavior[14].

14. "Banking and IoT – The Internet of Things will redefine financial services," Beyond the Arc, 3 June 2016.



2.9. Enabling analytics for oil and gas

The oil and gas industry is characterized by remote and inaccessible facilities where wireless communication is the only viable option in many cases for transferring data. M2M applications in oil and gas are primarily associated with big data and cloud-based analytics, asset performance management/reliability and IT/cybersecurity. Key use cases revolve around asset performance surveillance, management and optimization, predictive maintenance, and reducing unplanned downtime.

Shipments of oil and gas M2M devices featuring cellular or satellite communication capabilities are expected to increase at a CAGR of 21% to reach 0.3m in 2019 from 0.1m in 201415. In India, however, the adoption of M2M in the oil and gas industry has been limited. Recently, an Indian conglomerate partnered with an industrial M2M platform developer to create an oil and gas M2M analytics application.



15. "M2M Applications in the Oil and Gas Industry," Berg Insight, August 2015.

03

India's M2M readiness: timeline of regulatory and policy developments

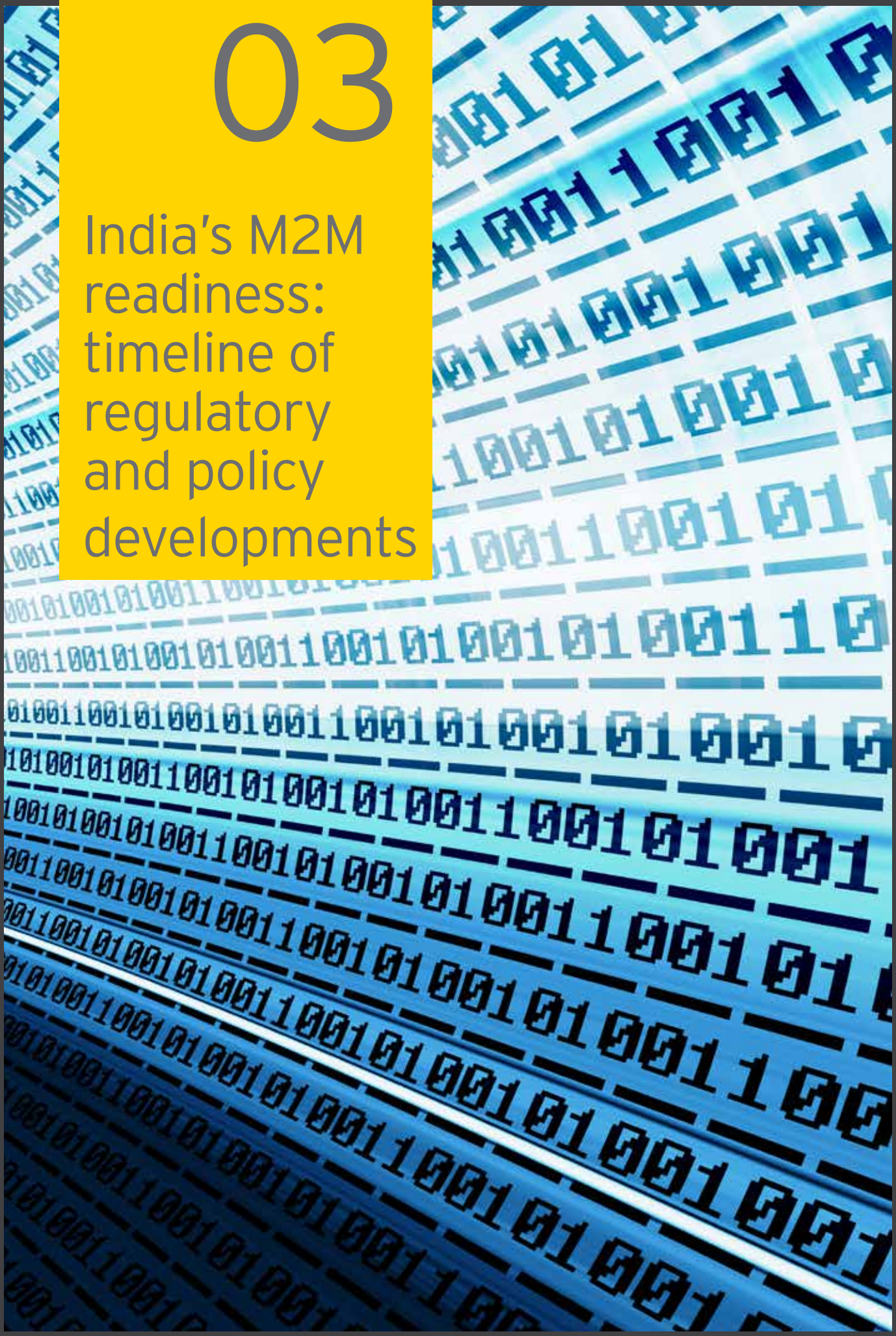


Exhibit 14: Key timelines for M2M in India

2012

National Telecom Policy 2012

- The policy provided specific emphasis on emerging technologies, especially M2M, as an opportunity to roll out affordable access and efficient service delivery to a wider customer base. It identified the need to adopt best practices in the areas of privacy, security and cross-border flow of data.

2013

Smart grid pilots

- In 2013, the Ministry of Power, GoI, identified 14 smart grid pilot projects to be rolled out across the country. The projects would be partly funded (50%) through GoI grants.

2014

Draft policy on IoT

- In October 2014, MeitY released a draft policy for IoT, with the aim of increasing India's share in the global IoT market to 5%–6% by 2020.
- The IoT policy proposed a multi-pillar approach to its implementation, comprising of five verticals (demonstration centers, capacity building and incubation, R&D and innovation, incentives and engagements, and human resource development) and two horizontal supports (standards and governance structure).

Make in India

- In September 2014, the Make in India program was launched to build India as a manufacturing hub. It focuses on bringing investment, fostering innovation and enhancing skill development. The initiative lays emphasis on 25 sectors including automotive, bio-technology and defense. The electronic systems industry has been identified as one of the focus sectors under this program.





2015

Constitution of Apex body, Review Committee and Consultative Committee

- In July 2015, the DoT formed three committees to look into specific aspects of M2M: a) Apex Body – To oversee harmonization of regulations and technical developments related to M2M across all sectors; b) M2M Review Committee – To support the implementation of actionable points evolving from the National Telecom M2M Roadmap; and c) M2M Consultative Committee – To bring M2M-related industry concerns and regulatory bottlenecks to the notice of the M2M Apex body.

Smart Cities Mission

- In June 2015, the GoI launched the Smart Cities Mission. A total of 100 Smart Cities have been selected among the various states and union territories (UTs) of India. The initiative would be operated as a Centrally Sponsored Scheme (CSS), with funding of up to INR480b (US$7.5b) over five years from the GoI and a matching contribution from the states.

National Telecom M2M roadmap

- In May 2015, the DoT released a roadmap that focused on the communication aspects of M2M with the aim to have interoperable standards, policies and regulations suited for Indian conditions across sectors. The roadmap identified key issues and outlined actionable points for consideration for the development of the M2M policy.

Revised draft policy on IoT

- In April 2015, the Ministry of Electronics and Information Technology (MeitY) released a revised version of the draft IoT policy released earlier in October 2014.



2016

Numbering scheme

- In December 2016, the DoT approved a 13-digit numbering scheme for SIM-based M2M devices that would co-exist with the existing 10-digit mobile numbering scheme.

TRAI consultation paper

- In October 2016, the TRAI released a "Consultation Paper on Spectrum, Roaming and QoS related requirements in M2M Communications." The DoT sought the recommendations of TRAI on three aspects related to M2M communications: QoS, roaming and spectrum requirements.

Identifier code

- In July 2016, the DoT issued 3-digit M2M identifier codes: 559, 575, 576, 579 and 597.

Draft M2M service providers' registration guidelines

- In June 2016, the DoT released draft guidelines for M2M service provider registration. As part of general conditions, registration can be granted to any companies following certain guidelines. Also, M2M service providers shall not infringe upon the jurisdiction of any authorized telecom licensee/other service provider (OSP) and they shall provide only those services for which this registration is granted to them.
- As part of technical conditions, M2M service providers can take telecom resources only from authorized telecom licensee, should adhere to the KYC norms and traceability guidelines, and ensure QoS stipulations.

Source: "Government to bring new telecom policy soon," The Economic Times, 28 July 2017; "13-digit numbering scheme for SIM based M2M devices," GoI, DoT, 9 December 2016; "Consultation Paper on Spectrum, Roaming and QoS related requirements in M2M Communications," TRAI, October 2016; "M2M service providers registration draft guidelines," GoI, DoT, May 2016; "DoT Committees for M2M," DoT website, http://www.dot.gov.in/relatedlinks/dot-committees-m2m, accessed 30 August 2017; "Smart Cities Mission: A step towards Smart India," National portal of India website, https://india.gov.in/spotlight/smart-cities-mission-step-towards-smart-india, accessed 30 August 2017; "National telecom M2M roadmap," GoI, DoT, May 2015; "Revised Draft Internet of Things (IoT) Policy," DoT, 8 April 2015; "IoT Policy document," DoT, October 2014; "About us," Make in India website, http://www.makeinindia.com/about, accessed 30 August 2017; "Smart Grid Pilot Projects Under Execution in India (2013-2016)," Desi Smart Grid, 30 October 2013; "National Telecom Policy – 2012," GoI, DoT, June 2012; "Recommendations on spectrum, roaming and QoS related requirements in M2M communications," TRAI, 5 September 2017.



2017

TRAI recommendations on M2M

- In September 2017, the Telecom Regulatory Authority of India (TRAI) released "Recommendations on spectrum, roaming and QoS related requirements in M2M communications".." The DoT would take necessary steps for the implementation of M2M policy measures. The key recommendations are:
  - TRAI recommended that suitable amendments in licensing conditions should be made for provisioning of M2M services. Connectivity providers using LPWAN technologies should be put under licensing through new authorization under UL M2M.
  - Spectrum allocation should be technology and service neutral. No separate spectrum band is to be allocated exclusively for M2M services.
  - Delicense 1 MHz of spectrum from 867-868 MHz and a chunk of 6 MHz of spectrum at 915-935 MHz for smooth rollout of M2M services using license exempt spectrum.
  - Devices with pre-fitted eUICC should be allowed to be imported only if they have the ability to get reconfigured "over the air" (OTA) with local subscription. Devices fitted with eUICC shall be allowed in operation in roaming for maximum three years from the date of activation of roaming in the network of Indian TSP and mandatorily converted/ reconfigured into an Indian TSP's SIM within the stipulated period or on change of ownership of the device.
  - Country-specific relaxation on permanent roaming of foreign SIMs, if any, can be considered based on the strategic importance, bi-lateral or multi-lateral trade agreements and principle of reciprocity by the Government.
  - It should not be mandatory to use only domestically manufactured SIMs in M2M.
  - There is no case for regulatory intervention for setting ceiling for roaming charges for the devices imported with in-built SIM.
  - International roaming in M2M shall be allowed under the well-recognized framework of GSMA '"M2M Annex."
  - To boost M2M manufacturing in India, the Government may consider the feasibility of allowing extra-terrestrial usage of IMSI ranges with suitable framework on the basis of country specific bilateral agreements.
  - Once the M2M sector develops, TRAI would put in place comprehensive regulations on QoS parameters in M2M communication, as per service requirements.
  - India needs to have in place balanced and clear rules for data security and privacy. After due deliberation, TRAI would issue recommendations on data protection.



2018

Proposed new Telecom Policy

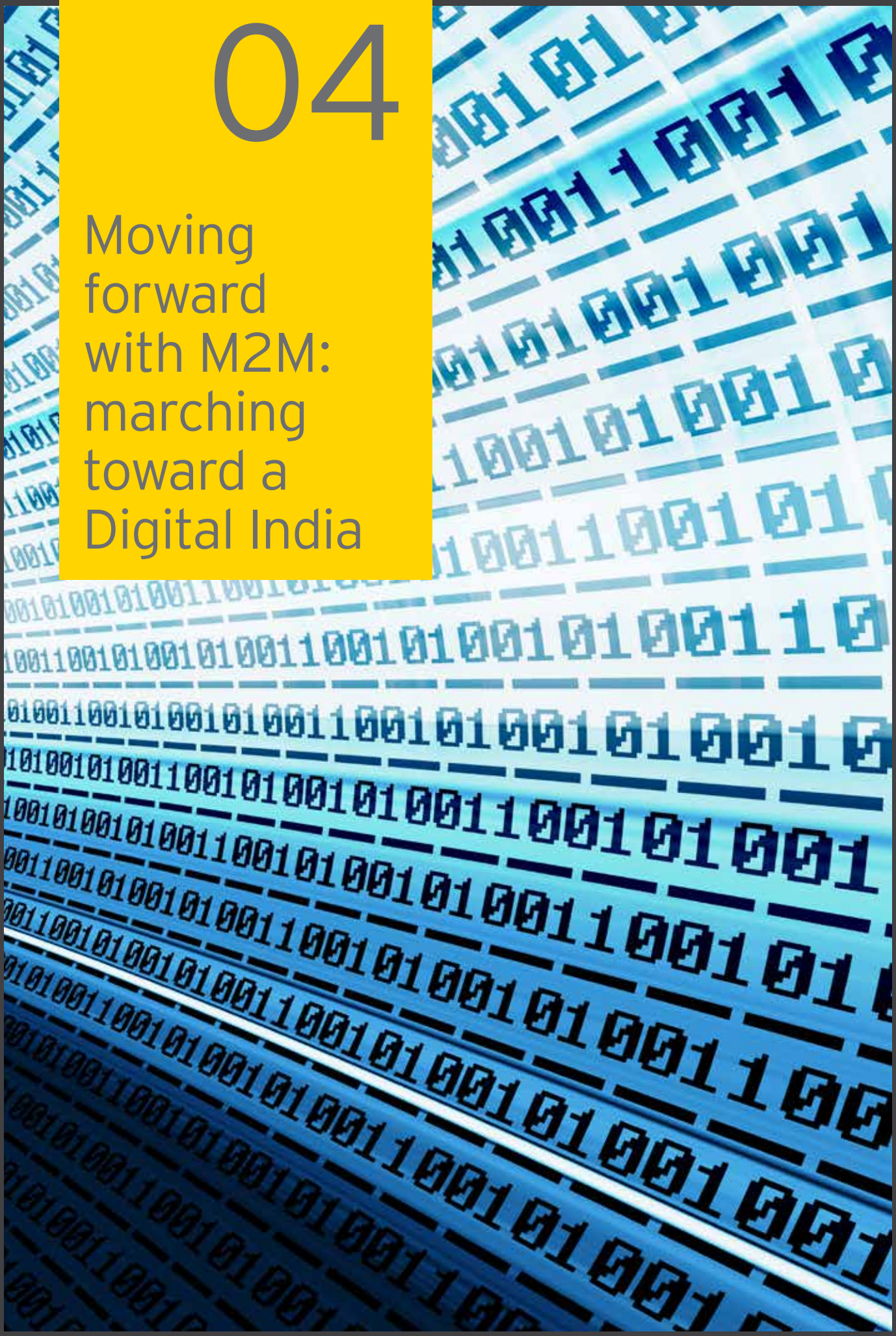
- In July 2017, the GoI announced that it is working on a new Telecom Policy, which is expected to be launched in 2018.

TRAI inputs on NTP-2018

- In February 2018, TRAI released "Inputs for Formulation of National Telecom Policy 2018" suggesting the following:
- M2M objectives: to enable access for connecting to 1b M2M sensors/ devices by 2020 and 5b by 2022
- Closely coordinating with stakeholders relating to agriculture, smart cities, intelligent transport networks, multimodal logistics, smart electricity meters and consumer durables to develop the market for M2M connectivity services
- Prescribing a simplified and enabling licensing and regulatory framework for M2M players
- Specifying suitable licensed and unlicensed spectrum for M2M services
- Identifying the numbering resources for M2M communication devices

04

Moving forward with M2M: marching toward a Digital India



4.1. M2M is expected to be a key enabler of the Digital India vision

The plethora of connected ecosystem unleashed by M2M would facilitate the digitization efforts currently underway in the country. M2M-specific applications and services in the fields of healthcare, agriculture, Smart Cities and e-governance have the potential to drive socio-economic development of India. In July 2015, as part of the Digital India initiative, the GoI launched the Centre of Excellence for IoT to accelerate the M2M ecosystem by capitalizing on the ICT strengths of the country. The initiative aims to help start-ups utilize the latest technologies to develop innovative M2M applications and services across Smart City, Smart Health, Smart Manufacturing, Smart Agriculture etc. This would help to develop talent, start-up community and entrepreneurial ecosystem for M2M. The Centre of Excellence is a platform that brings together industry, academia, Government and startups to collectively achieve the Digital India objective[16].

4.2. A critical role in the Smart Cities mission

M2M is expected to play an integral role in Smart Cities. Advancements in M2M communication technologies, platforms and services provide the necessary impetus to easily design, build and manage Smart Cities. A Smart City is an amalgamation of diverse systems and services tied together by technology that ultimately enriches the lives of its inhabitants. There are a number of different technologies and systems involved in the construction of a Smart City. A multitude of services and applications can be provided in a Smart City. Service providers may offer a selection of services based on requirements.

16. "About," COE-IoT website, http://coe-iot.com/about-us/, accessed 30 August 2017.



Exhibit 15: Services and applications for different Smart City pillars

Smart City pillars	Smart services and applications		
Physical infrastructures	Energy	Transportation	Water
	▸ Smart electricity management ▸ Smart power grid ▸ Smart metering for electricity and gas ▸ Smart gas pipeline management ▸ Smart lighting	▸ Smart transportation ▸ Route optimization ▸ Smart ticketing ▸ Smart signage ▸ Smart parking ▸ Interactive bus stops	▸ Smart water management ▸ Smart metering ▸ Water leakage detection ▸ Smart pipes and sensor networks ▸ Smart irrigation management
	Building	Waste management	Housing
	▸ Smart buildings ▸ CCTV surveillance	▸ Smart waste management ▸ Waste tracking systems	▸ Integrated building management ▸ Housing finder ▸ Housing plan management and tracker
	Disaster management		Public works
	▸ Integrated response and management for regional police headquarters, coastguard facilities (for coastal cities), fire headquarters, hospitals, ambulance and administrative departments		▸ Smart management of public works – dams, canals and subways ▸ Smart public lighting
Social infrastructure	Safety and security	Health care	Education
	▸ Smart physical safety and security ▸ City surveillance ▸ Remote monitoring	▸ Smart health care	▸ Remote education
	Entertainment	Environment	Homes and buildings
	▸ Open public access digitally	▸ Smart lighting ▸ Smart irrigation management	▸ Controlling appliances remotely ▸ Home security, climate control and lighting
Institutional infrastructures	Service delivery	Transparency and accountability	Citizen participation and advisory
	Smart digital transactions	Models, optimization, and decision-support tools	▸ Citizens interface to policy ▸ Direct voting
	Justice and judicial system		
	Transparent, integrated legal processes smarter court system		
Economic infrastructure	Job creation	Livelihood activities	Taxation
	▸ Remote education ▸ Smart evaluation	▸ Environmental information ▸ Access to experts	▸ Tax calculator and filer ▸ Claims management

Source: "Technical report: M2M and ICT enablement in Smart Cities," TEC, DoT, GoI, November 2015.

4.3. Deriving synergies from Make in India

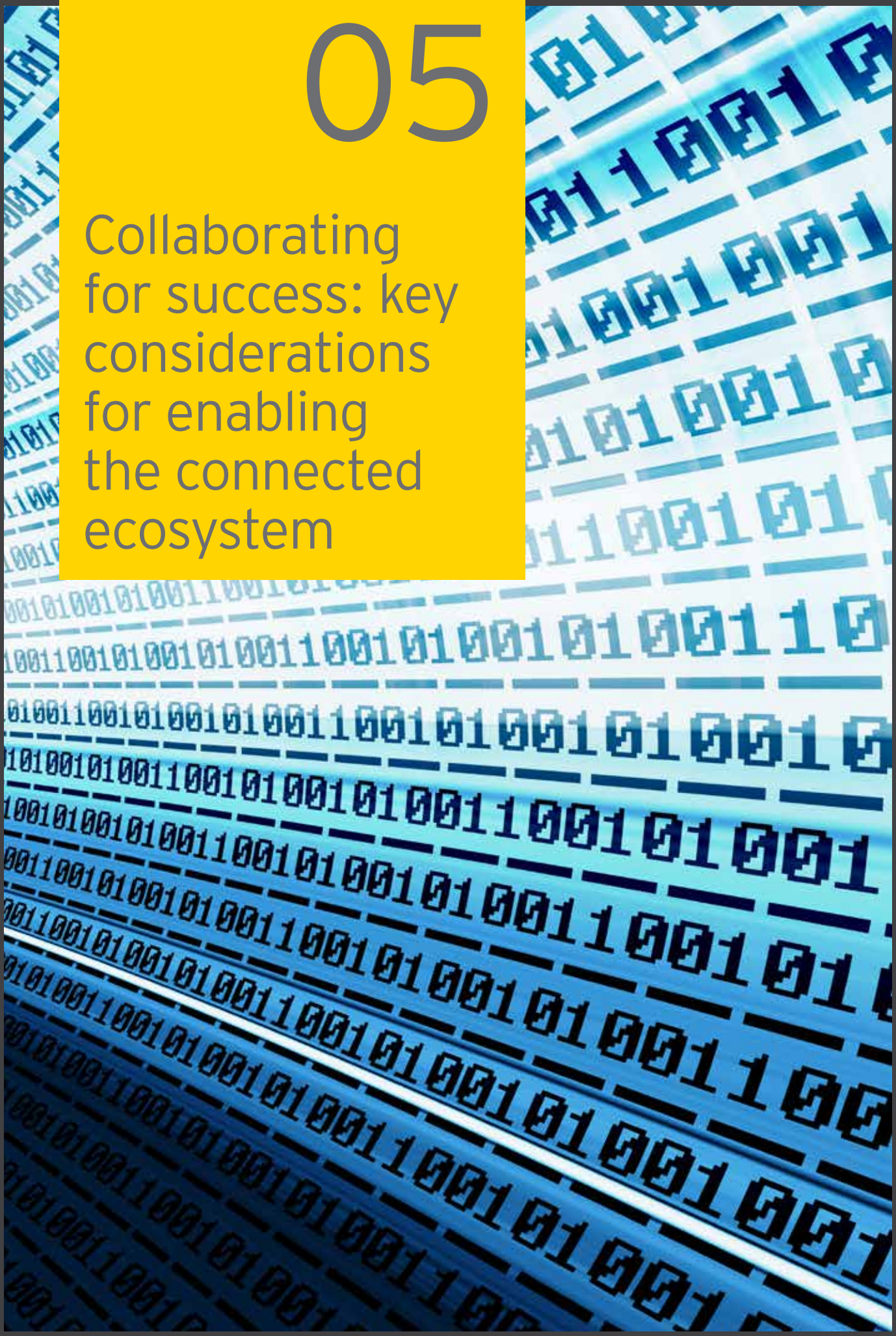
M2M applications require a large number of sensors and devices. The Make in India program is expected to boost M2M hardware manufacturing in India. The GoI has already initiated steps to promote indigenous manufacturing. Local manufacturing of components translates into a number of benefits, such as significant reduction in the cost of M2M sensors, modules and devices. It is also important keeping in mind the low-ARPU business model of M2M services. The cost of some of the sensors is so low that it may be unviable to import them and hence they have to be manufactured indigenously.

The Indian sensor-manufacturing segment is one of the fastest growing in Asia Pacific, primarily driven by increased demand for M2M connected devices across industry verticals. Going forward, the segment is expected to grow significantly due to requirement of sensors in automotive and consumer electronic products. In addition, increasing automation and security concerns would also help drive growth in the segment.



05

Collaborating for success: key considerations for enabling the connected ecosystem

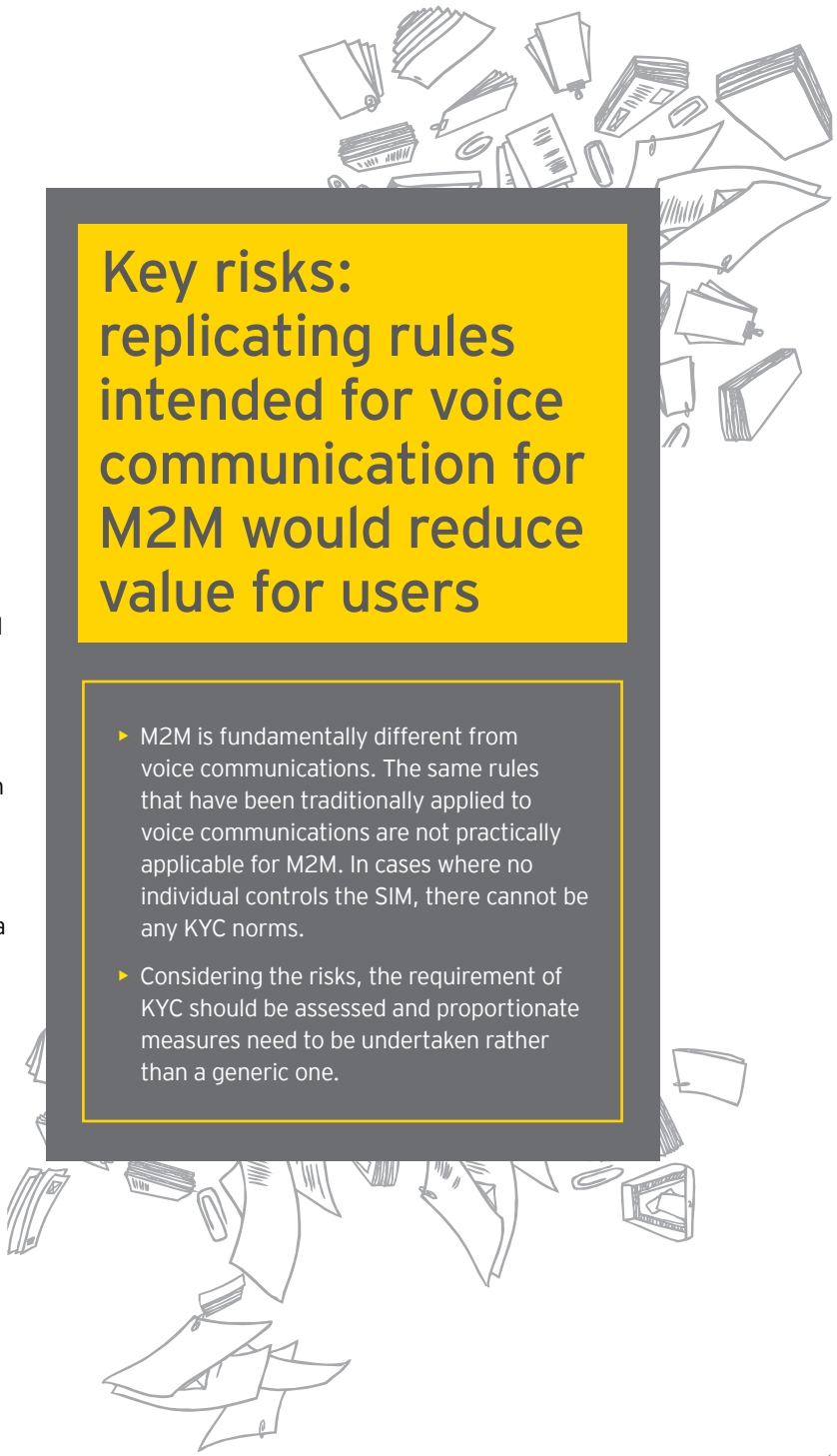


M2M in India faces a number of challenges, which, if unresolved, can hinder growth prospects. It is imperative to carefully reassess issues and develop a robust framework that promotes inclusive growth.

5.1. Standard consumer KYC norms do not apply to M2M

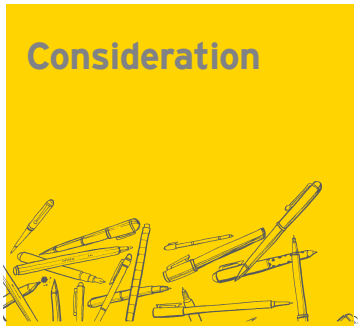
In the M2M context, individual KYC guidelines are not relevant and practical from an implementation perspective. There are significant challenges in authenticating M2M SIMs. Typically, M2M SIMs are sold by service providers on a business-to-business (B2B) operating model. Any intermediary or system integrator (SI) would in turn offer M2M solutions to end customers such as utilities and automobile companies. It is a cumbersome task to gather information on the device/machine and the user of that hardware. Further, to comply with KYC norms, service providers need to impose contractual conditions on intermediaries, which adds to the complexities.

In cases where a B2B2C model is employed, ownership of the end customer is a key consideration. It would determine the onus for fulfilling KYC obligations. With a number of diverse players in the ecosystem, assigning ownership is challenging. In M2M, customers have an indirect relationship with the SIM provider and the relationship can change hands after the original user undertakes a second-hand transaction – for example, an M2M service enabled white good being resold by its original buyer or a SIM-fitted car getting resold to another user. In such a scenario, it is difficult to ensure compliance with KYC norms.



Key risks: replicating rules intended for voice communication for M2M would reduce value for users

- M2M is fundamentally different from voice communications. The same rules that have been traditionally applied to voice communications are not practically applicable for M2M. In cases where no individual controls the SIM, there cannot be any KYC norms.
- Considering the risks, the requirement of KYC should be assessed and proportionate measures need to be undertaken rather than a generic one.



- KYC is relevant if a connected device is associated with a single user or if a single user has full control over it. However, in case of M2M solutions, which are pure B2B applications and a SIM cannot be referred to a specific user, KYC and SIM registration rules are not relevant.
- Alternatives to standard KYC requirements are needed for M2M applications, including potential exceptions under certain conditions. There should be a very light touch regulatory approach for M2M SIMs, which operate in a controlled and secure environment, i.e., where the M2M SIM can communicate with only a server or an emergency number

Ownership of M2M SIMs have to be defined

The obligations for M2M players as well as OEMs who provide the devices to the customers should be defined.

M2M players

- Allowing M2M players to have the ownership of all SIMs taken from telecom licensees
- Ensuring the KYC of the OEM who avails the services of the M2M service provider
- Maintaining details of all the customers of M2M services, such as physical custodian of machines fitted with SIMs
- Provisioning M2M device usage information to the Law Enforcement Agency (LEA) for traceability and monitoring purposes
- Protecting privacy of the human end users of M2M services
- B2B services sales contracts mandatorily containing requisite SLAs for the B2C KYC of the end user of M2M services

OEMs

- Ensuring the KYC of customers who avail M2M services after the sale or resale of a deviceof all security questions related to M2M.

Source: FICCI ICT & Digital Economy Committee.

5.2.No separate allocation of spectrum is required

Today, a wide range of communication technologies are available for deploying M2M services. Both licensed and unlicensed spectrum bands are used for M2M communication. The amount and choice of spectrum bands vary with specific M2M applications. Globally, operators have utilized a mix of harmonized licensed spectrum bands and popularly used unlicensed bands. Licensed bands are useful from an authentication and security perspective. In addition, they offer QoS guarantees over wide areas.

Globally, there are a number of unlicensed frequency bands reserved for industrial, scientific and medical (ISM) applications by the ITU-R. In India, two license-exempt frequency bands have already been identified in the 2.4 GHz and 5.8 GHz ranges. These are available for indoor as well as outdoor applications. Additionally, certain spectrum bands (5.15-5.25 GHz, 5.725-5.825 GHz, 433-434 MHz and 865-867 MHz) in India are license-exempt for indoor applications[17]. Short-range technologies, such as Wi-Fi and ZigBee, are expected to account for 69% of all M2M connections by 2024[18].

Exhibit 16: Prevalent practices on spectrum requirement for M2M

Countries/regulatory bodies	Description
UK	▸ According to the UK telecom regulator Ofcom, spectrum in the VHF ranges (55–68 MHz, 70.5–71.5 MHz and 80.0–81.5 MHz) is suitable for M2M applications. ▸ Ofcom has authorized the use of short-range devices (SRDs) in the 870–876 MHz and 914–921 MHz bands on a license-exempt basis.
Singapore and Belgium	▸ No spectrum has been allocated specifically for M2M and has been left to market forces.

Source: "Statement on the Authorisation of Short Range Devices in 870 to 876 MHz and 915 to 921 MHz," Ofcom, April 2014.



- Continue with the current spectrum allocation arrangements for M2M services. M2M services are data services and can continue to be provided over the licensed spectrum acquired by service providers.
- Given the interference faced in the existing licensed bands, it is not advisable to delicense any more bands for general public use. Instead, nominal charges recommended by TRAI for the usage of "E" and "V" bands should be implemented.Ownership of M2M SIMs have to be defined

Too early to use 700 MHz for M2M

- The 700 MHz spectrum should be treated holistically instead of prioritizing any specific usage for voice or data. This band is central to the future of widespread, affordable mobile broadband access in India and the revenues that can be accrued from it.

Source: FICCI ICT & Digital Economy Committee.

17. "Consultation Paper on Spectrum, Roaming and QoS related requirements in M2M Communications," TRAI, October 2016.
18. "Global M2M market to grow to 27 billion devices, generating USD1.6 trillion revenue in 2024," Machina Research press release, 24 June 2015.

5.3.Standardization continues to be a key issue in the M2M ecosystem

The complexities of the M2M ecosystem and a fragmented market have spawned issues around standardization and interoperability of devices. Although significant work is being done by global bodies and various standards organization toward a common standard, it remains a challenging proposition. Currently, a number of disparate and overlapping solutions are preventing seamless interconnection. Interoperability is essential to realize the overall benefits and economic value of M2M. Lack of interoperability would prevent development of innovative product offerings and bring in inefficiencies for device manufacturers. It is vital to have global coordination in developing standards for M2M communications for the mass adoption of M2M.

Lack of interoperability at the hardware and software level may prevent quicker upgrades in the future. At the network level, Internet Protocol Version 6 (IPv6) is emerging as the de facto protocol for end-to-end communication in M2M. The greatest need for standardization in M2M is in the application layer, where a plethora of different approaches, architectures and solutions exist today. Standards are essential for the horizontal integration of different applications in M2M. Moreover, dearth of cross-industry standards for M2M services is also a key issue.

Exhibit 17: M2M standardization activities

Standards organizations	Description
oneM2M partnership	▸ oneM2M aims to develop technical specifications to address the need for a common M2M service layer that can be readily embedded within various hardware and software. It would develop globally agreed M2M end-to-end specifications using common use cases and architecture across multiple M2M applications. ▸ Eight of the world's leading ICT Standards Development Organizations (SDOs) are part of oneM2M: ▸ Association of Radio Industries and Businesses (ARIB) ▸ Telecommunication Technology Committee (TTC) of Japan ▸ Alliance for Telecommunications Industry Solutions (ATIS) ▸ Telecommunications Industry Association (TIA) of the USA ▸ China Communications Standards Association (CCSA) ▸ ETSI ▸ Telecommunications Technology Association (TTA) of Korea ▸ Telecom Standards Development Society, India (TSDSI)
Focus groups by ITU	▸ ITU has established focus groups with the objective of developing recommendations relevant to M2M from a telecom/ICT perspective. The focus groups cater to smart sustainable cities, smart water management, disaster relief systems, network resilience and recovery, smart grid, cloud computing etc.

TSAG ITU-T Study Group-20	▸ Telecommunication Standardization Advisory Group (TSAG) has approved the creation of ITU-T Study Group-20 on M2M and its applications including Smart Cities and communities. The group will develop standards that leverage M2M technologies to address urban-development challenges. ▸ It will also focus on mechanisms for the interoperability of M2M applications and datasets employed by various vertically oriented industry sectors.
TSDSI M2M Study Group	▸ It aims to develop and promote research-based India-specific requirements, standardize solutions and maintain the technical standards. ▸ It is working with an objective to understand, develop and promote India-specific M2M requirements. ▸ It intends to promote R&D in India and safeguard the related IPR, helping create manufacturing expertise in the country.
GSMA guidelines	▸ The GSMA has issued "IoT Device Connection Efficiency Guidelines," which outline how devices and applications should communicate through mobile networks in the most intelligent and efficient way. ▸ The guidelines revolve around best practices for data aggregation within devices, non-synchronous network access, application scalability and guidance on how to manage signaling traffic from de-activated or out-of-subscription SIMs. ▸ GSMA has commissioned a project to develop a common set of acceptance tests for M2M devices and applications.

Source: "Consultation Paper on Spectrum, Roaming and QoS related requirements in M2M," TRAI, October 2016.

5.4.M2M-specific QoS should not be imposed

Any regulation that has a significant bearing on service providers' handling of network traffic is not desirable. Operators should have the flexibility to manage end-to-end QoS for consumers. Typically, in a competitive environment, consumers choose service providers on the basis of various performance measures such as pricing, coverage and network quality. This ensures that consumers get the best of services in a transparent manner. Only if there is evidence of market failures can regulators possibly intervene.

On the other hand, QoS needs vary widely between usage, devices, applications and industries in M2M. The vast array of connected devices makes it difficult to prescribe and monitor QoS measures. There are a number of communication technologies for the deployment of M2M services and each one has specific nuances and protocols. A combination of different technologies is used for end service provisioning. In addition, various industries have separate regulators, each with its distinct set of requirements. For M2M services, it would be difficult to adhere to individual guidelines, which may significantly differ from each other.

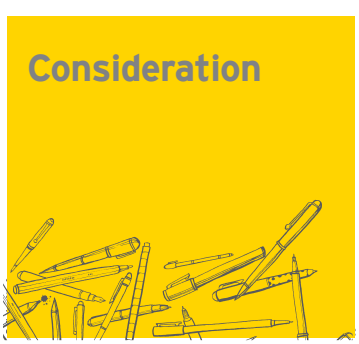
Exhibit 18: Different characteristics of M2M applications

Applications	Data volume	QoS	Amount of signaling	Time sensitivity
Smart energy meters				
Red charging				
eCall (emergency calling in cars)				
Remote maintenance				
Fleet management				
Photo frames				
Assets tracking				
Mobile payments				
Media synchronization				
Surveillance cameras				
Health monitoring				

Level of requirement

Very low | Low | Intermediary | High | Very high

Source: "Harnessing the IoT for global development," Cisco and ITU, February 2016.



QoS should not be imposed

- Service providers should have maximum flexibility to design their networks instead of defining SLAs at various points through regulatory mandates. Mandating any uniform QoS for M2M is not recommended. QoS is best left to a mutual agreement between stakeholders.

Source: FICCI ICT & Digital Economy Committee.

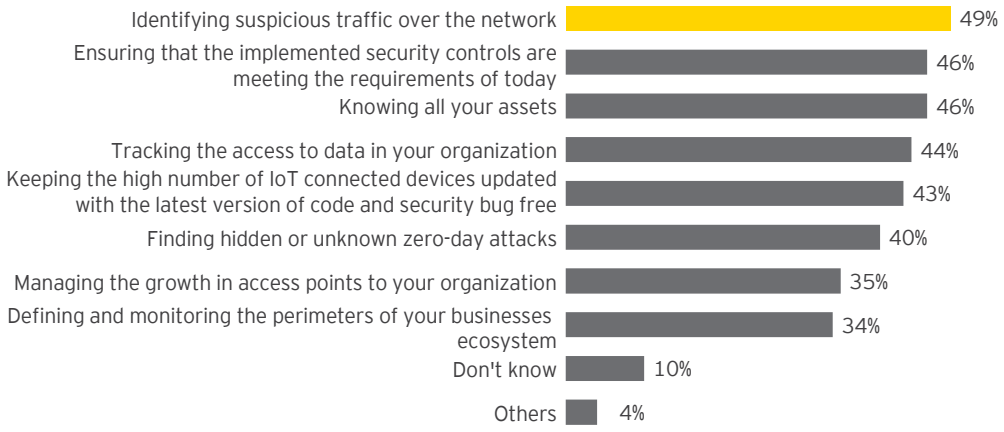
5.5.Security and privacy

5.5.1. Security: M2M devices face increased cyber-attack threats

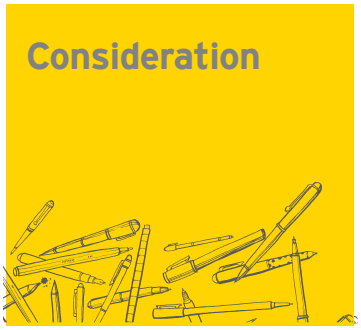
The growth in the number of connected devices is increasing security concerns for organizations and M2M players alike. Connected devices offer more avenues for attacks. Identification of security breaches in a M2M context becomes very challenging. The large-scale deployment of identical devices increases vulnerability. Moreover, due to the hyper-connectivity of the M2M ecosystem, any security breach has the potential to affect other systems globally. Typically, in M2M, devices that are deployed in remote and hazardous areas have a long shelf life and are difficult to upgrade with new security patches. As a result, these devices/sensors are potential targets for cyber-attacks.

When switching M2M players, managing the life cycle of security credentials stored with the service providers as well as on the M2M devices is a key challenge. Without the ability to remotely change security credentials, it would be a challenge to upgrade each device/sensor physically. At times, an M2M device is manufactured at a certain location and used in a different location. In this case, the initial security provisioning process has to be robust and compatible with the requirements of different M2M players. Most of the security parameters have to be embedded in the M2M device, which increases vulnerability to attacks. Organizations are struggling with the large number of devices that will become part of their networks in a very short period of time.

Exhibit 19: What do you consider to be the information security challenges of M2M for your organization?



Source: Path to cyber resilience: Sense, resist, react - EY's-19th Global Information Security Survey 2016-17, EY, December 2016; N = 1,735 C-suite leaders and information security and IT executives/managers.



No specific security measures required for M2M

- Well tried, existing measures and provisions, as mandated under the licensing and policy regime, should be used to ensure security of networks and data.

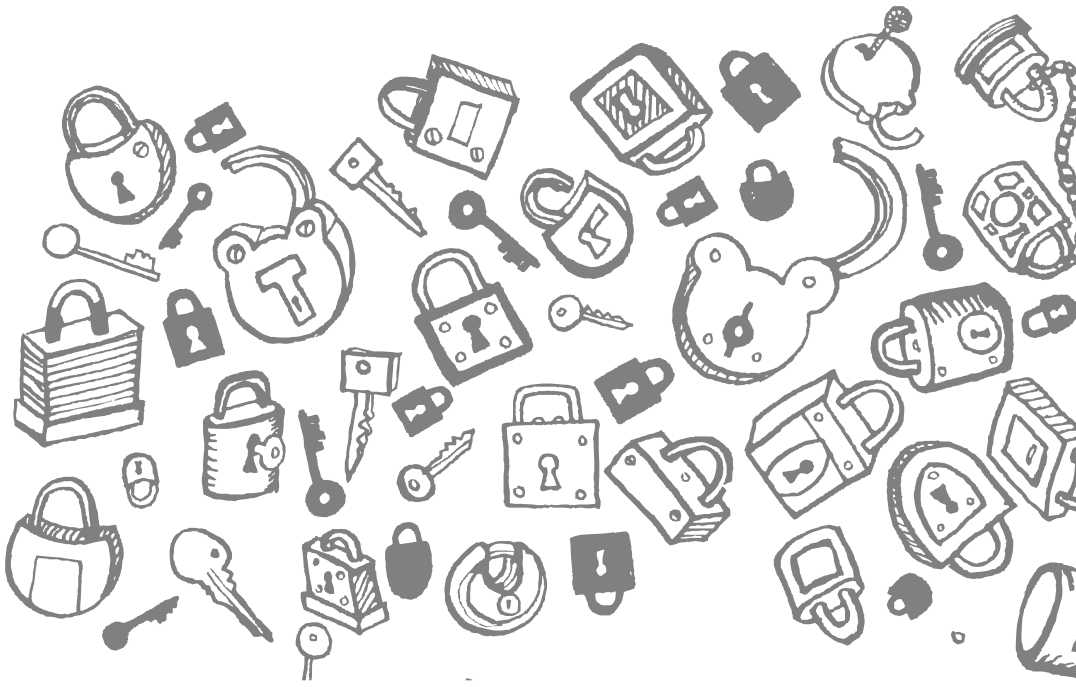
Adhere to existing security best practices followed in the industry

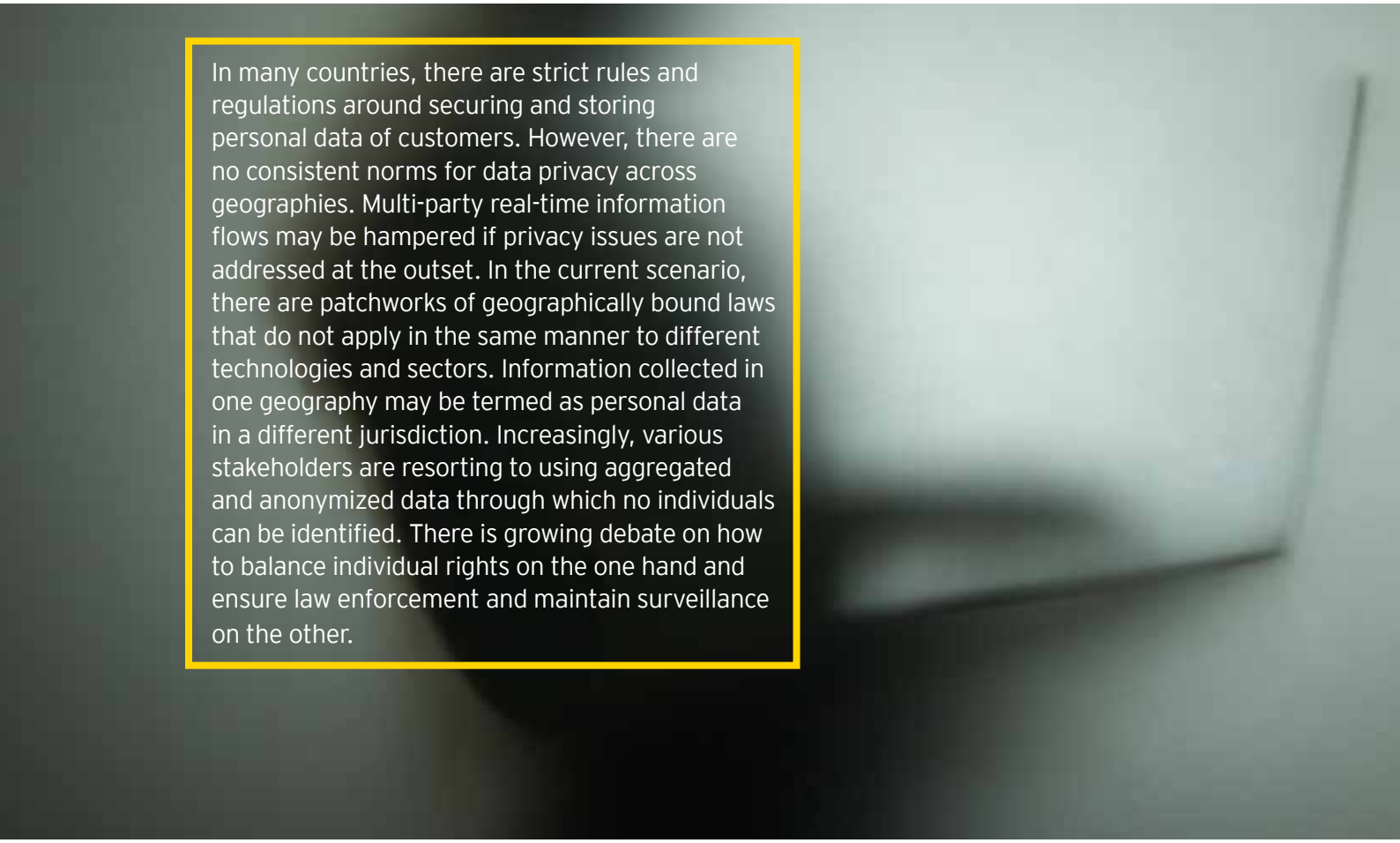
- The GSMA IoT Security Guidelines, which explain how an entity providing a cellular M2M service can secure its service end-to-end from most cyber-attacks, can be used as a reference set for security and privacy best practice guidelines.
- The NIST Cybersecurity Framework can be used as the starting point of all security questions related to M2M.

Source: FICCI ICT & Digital Economy Committee.

5.5.2. Privacy: a growing concern for end users, but no M2M specific measures are desired

The very benefits that M2M provides – monitoring, collecting, analyzing and transforming data into meaningful information – are giving rise to privacy concerns. In M2M, where most of the communication happens without human intervention, intrusion of privacy is a tricky aspect. There are challenges in determining whether a specific information is personal in nature or not. This distinction gets blurred when more stakeholders are involved, increasing data sharing interfaces. With M2M, the reach and feasibility of surveillance and tracking mechanisms are enhanced.





In many countries, there are strict rules and regulations around securing and storing personal data of customers. However, there are no consistent norms for data privacy across geographies. Multi-party real-time information flows may be hampered if privacy issues are not addressed at the outset. In the current scenario, there are patchworks of geographically bound laws that do not apply in the same manner to different technologies and sectors. Information collected in one geography may be termed as personal data in a different jurisdiction. Increasingly, various stakeholders are resorting to using aggregated and anonymized data through which no individuals can be identified. There is growing debate on how to balance individual rights on the one hand and ensure law enforcement and maintain surveillance on the other.

Some guidelines on privacy already exist and there is ongoing dialog in India on various privacy aspects. The need of the hour is to take appropriate steps that balance international best practices with that of India's unique needs.

Exhibit 20: Prevalent practices for M2M privacy

Country/association	Description
Body of European Regulators for Electronic Communications (BEREC)	▸ Personal data may be collected by a number of connected devices. ▸ There is no need for special treatment with regard to EU Data Protection Principles (e.g., consent-based data collection and processing also apply in M2M context). ▸ Careful adaptation or evolution is required in the M2M context (e.g., user-friendly information and consent procedures for smart homes).
Singapore	▸ Governed by the Personal Data Protection Act (PDPA 2012) that comprises various rules governing the collection, use, disclosure and care of personal data.

Source: Legislation and guidelines," PDPC Singapore.



Remove overlaps

- The telecom licensing conditions in terms of privacy should be amended to bring it in line with the IT Act 2000.

No specific regulations on privacy, but a multi-stakeholder approach is desired

- Specific privacy regulations should be avoided. Industry stakeholders are proactively engaged in voluntary and collaborative processes to provide appropriate privacy protections for M2M applications.
- International best practices need to be followed.
- Privacy-by-design should be followed as a guiding principle.
- A common M2M-wide framework that relies on multi-stakeholder efforts should be encouraged for privacy approaches instead of onerous regulations.starting point of all security questions related to M2M.

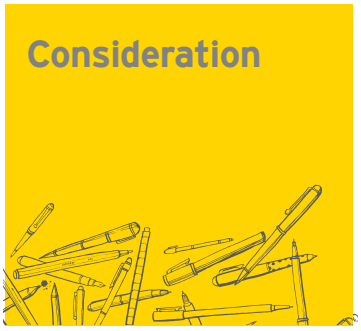
Source: FICCI ICT & Digital Economy Committee.

5.6. Center–State coordination is a key aspect of M2M service rollout; harmonized approach between various departments is necessary

The proliferation of M2M is dependent on key policy and regulatory measures of the GoI. As such, the State Governments play a key role in implementing Central Government schemes. A very close coordination is essential for the success of specific projects. In Smart Cities, both the Center and States have an equally important role to play. If there is no coordination, then Smart City implementation would be significantly delayed and the timelines would not be met.

19. "National telecom M2M roadmap," GoI, DoT, May 2015.

Further, M2M encompasses a wide range of industries and involves close coordination between different Government Departments. Without coordinated standards and policies, many of the M2M initiatives would not see the light of day. For example, rollout of smart grids is one area in M2M that requires close coordination between the Ministry of Power, the Ministry of New and Renewable energy, the Ministry of Heavy Industries and the MeitY[19]. Consensus on policy matters, common standards development and achieving end-user objectives should be the key priority for the various departments. The various standard bodies under the different Ministries need to work on mutually beneficial, open and scalable networks.



Need for close coordination

- Focused and inclusive coordination between Center and States should be encouraged to steer implementation of projects (e.g., Smart Cities) and create an enabling environment for faster decision making.
- Relevant sector players and Government departments should be involved to speed up coordination between State Governments and the Central Government.
- A "Policy & Implementation Committee" should be set up with the DoT representatives to outline the policy and regulatory concerns of the GoI, and all relevant stakeholders as appropriate should be involved.
- M2M adoption should be promoted in local and Central Government.

Source: FICCI ICT & Digital Economy Committee.



Summary of key recommendations



Broad regulatory approach to M2M

- Follow light-touch regulations currently working in countries that lead M2M deployments

KYC norms, roaming and global SIM

- Rely on international best practices for roaming and global SIM
- KYC is relevant if a connected device is associated with a single user or a single user has full control over it. However, in case of M2M solutions, which are pure B2B applications and a SIM cannot be referred to a specific user, KYC and SIM registration rules are not relevant
- Define obligations for M2M players as well as OEMs that provide devices to the customers
- Allow M2M players to have the ownership of all SIMs taken from telecom licensees. Details of all the customers of M2M services, such as physical custodians of machines fitted with SIMs, should be maintained by the M2M players

Spectrum requirements

- Continue with the current spectrum allocation arrangements for M2M services. M2M services are data services and can continue to be provided over the licensed spectrum acquired by service providers
- Treat the 700 MHz spectrum in a technology and service neutral way instead of prioritizing any specific usage for voice or data. This band is central to the future of widespread, affordable mobile broadband access in India and the revenues that can be accrued from it



QoS in M2M

- Allow maximum flexibility to service providers to design their networks instead of defining SLAs at various points through regulatory mandates. Mandating any uniform QoS for M2M is not recommended. QoS is best left to the mutual agreement between stakeholders



Security

- Use well-tried, existing measures and provisions as mandated under the licensing and policy regime to ensure security of networks, data, device, cloud service and the entire ecosystem
- Rely on GSMA IoT Security Guidelines as a reference set for security and privacy best practice guidelines. These guidelines explain how an entity providing a cellular M2M service can secure its service from most cybersecurity attacks end-to-end
- Use the Cybersecurity Framework of the National Institute of Standards and Technology (NIST) as the starting point on all security questions related to M2M services and the IoT



Privacy

- Follow international best practices for privacy measures
- Amend telecom licensing conditions to bring them in line with the IT Act 2000 on the confidentiality and privacy aspects
- Avoid specific privacy regulations; industry stakeholders are proactively engaged in voluntary and collaborative processes to provide appropriate privacy protections for M2M applications
- Follow privacy-by-design as a guiding principle
- Encourage a common M2M-wide framework that relies on multi-stakeholder efforts for privacy approaches instead of onerous regulation



Center-State coordination and coordination between various Government departments

- Undertake focused and inclusive Center-State coordination to steer implementation of projects (e.g., Smart Cities) and create an enabling environment for faster decision making
- Involve relevant sector players and Government departments to speed up coordination between State Governments and the Central Government
- Set up a Policy & Implementation Committee with the DoT representatives to outline GoI side policy and regulatory concerns. Involve all relevant stakeholders as appropriate
- Promote M2M adoption in local and Central Government



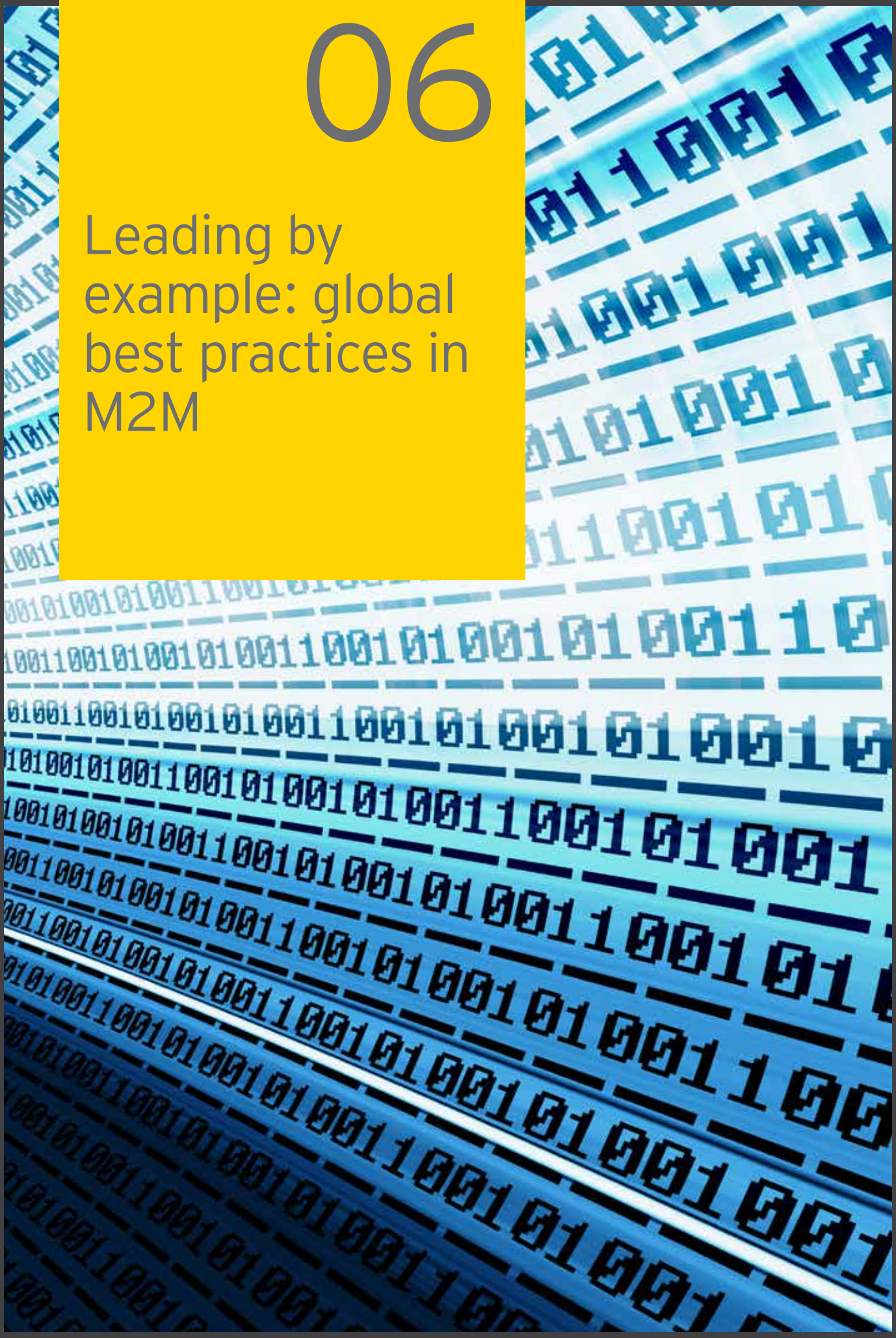
Overall

- The DoT can be a central department for coordination, but also involve industry and relevant Government departments for security, QoS, privacy etc.
- Start discussing the legal framework for futuristic use cases

Source: FICCI ICT & Digital Economy Committee.

06

Leading by example: global best practices in M2M



Globally, the proliferation of M2M services has been largely possible due to lack of specific regulatory measures. An unregulated market has worked so far. The existing global technology platform for M2M services has supported the growth well. M2M requires an optimum regulatory framework that benefits all stakeholders without being too premature or overbearing. Growing usage and adoption of embedded SIMs bodes well for the M2M ecosystem. In addition to overcoming challenges with using multiple SIMs, it provides a common standard for connectivity service provisioning and a host of benefits.

M2M roaming is on the rise and in a few years' time would be equivalent to consumer roamers. In certain instances in M2M, the roaming is on a permanent basis. Allowing permanent roaming for M2M services would facilitate businesses operating on a global scale. The global nature of M2M necessitates cross-border data transfer. Existing regulatory mechanisms allow transfer of personal data if specific requirements are met. However, no M2M-specific guidelines and regulations are currently in place.

6.1. Getting started with a progressive and supportive regulatory framework

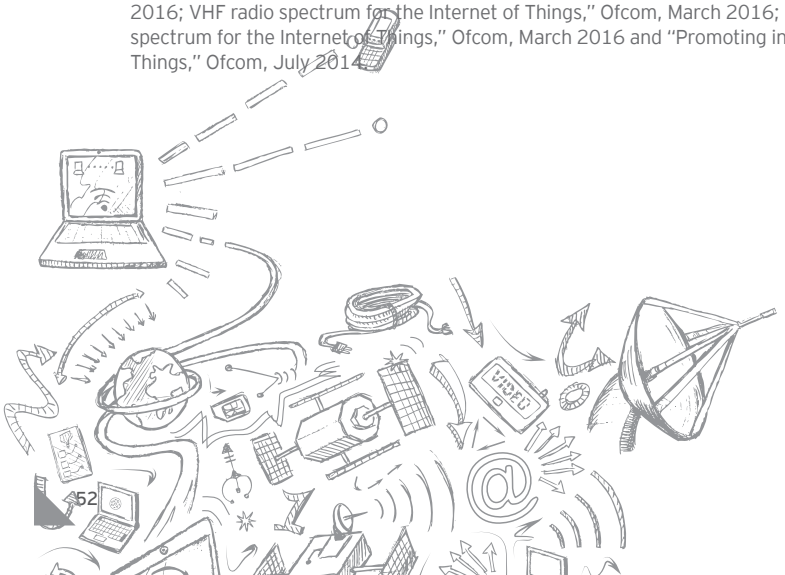
Regulatory frameworks for M2M services are in their early stages worldwide, with very few countries formalizing any specific roadmap. Increasingly, regulators in many countries are focusing on M2M as a key priority and looking at it in a comprehensive way. Challenges arise in terms of identifying the feasibility of the framework, as the scope of M2M is diverse that involves different sectors, multitude of players and wide ranging technologies. The primary objective of any framework should be to safeguard the interests of consumers and end users.

Exhibit 21: Prevalent practices for M2M regulatory framework

Countries/ regulatory bodies	Position
BEREC	No special treatment is necessary or appropriate for M2M communication, except for the following areas: ▸ Roaming ▸ Switching ▸ Number portability
Europe	Some countries have issued Mobile Virtual Network Operator (MVNO) licenses for M2M players.
UK	▸ Ofcom observed that the industry is best placed to drive the development, standardization and commercialization of new technologies such as M2M. ▸ Ofcom plans to launch a new business radio (BR) license product that would specifically have provisions for M2M applications. ▸ The current licensees would continue to operate under the existing framework; however, specific changes to particular licenses on a case-by-case basis would be made.

Singapore	▸ Operators are required to have a license to offer M2M services under the framework of the regulator, Info-communications Media Development Authority (IMDA). ▸ Licensees have to ensure that SIM cards used for M2M services are only used for automated communication. Licensees shall list out the following: 1. The range of International Mobile Subscriber Identity (IMSI) numbers and Mobile Station International Subscriber Directory Number (MSISDN) to be used 2. Working with any local operator partner in relation to the provision of M2M services 3. Identification of M2M equipment importer 4. Registration of all SIM cards used to provide M2M services in Singapore 5. The records to be maintained in Singapore for a minimum of 12 months from the date of termination of the service ▸ The M2M license enables the licensee to provide M2M services using equipment with embedded SIM cards.
Brazil	The M2M players are registered in the MVNO category and brought under the regulatory framework.
US	▸ In January 2017, the US Department of Commerce published guiding principles and outlined an approach to support the advancement of M2M. The key highlights are as follows: ▸ Enabling infrastructure availability and access: Physical and spectrum related assets; IPv6 adoption ▸ Crafting balanced policy and building coalitions: Cyber security, privacy, intellectual property and free flow of cross-border data ▸ Promoting standards and technology advancement ▸ Encouraging markets: Public private partnerships, Government procurement and workforce issues (education, training and civil liberties)

Source: "BEREC Report on Enabling the Internet of Things," BEREC IoT Workshop, 1 February 2017; "Fostering the advancement of the IoT," The Department of Commerce Internet Policy Task Force & Digital Economy Leadership team, January 2017; "Guidelines for submission of application for services based operations license," IMDA, December 2016; VHF radio spectrum for the Internet of Things," Ofcom, March 2016; ," Ofcom, July 2014. around: "VHF radio spectrum for the Internet of Things," Ofcom, March 2016 and "Promoting investment and innovation in the Internet of Things," Ofcom, July 2014.





Key risk: premature or over bearing regulations can impact M2M market

- Regulation plays a very important role in any new businesses. As such, lack of necessary regulation or too strict regulations can be a key risk. In case there is no basic framework, the M2M market would mushroom unregulated, which would have serious ramifications across the already fragmented ecosystem.
- On the contrary, too many regulatory hurdles may stem the growth of the market. For example, stringent QoS measures may force M2M players to allocate redundant resources for applications that do not require high performance. It would increase cost and put pressure on profitability.
- Specific regulations can be in place, as and when evidence of market failures emerges.

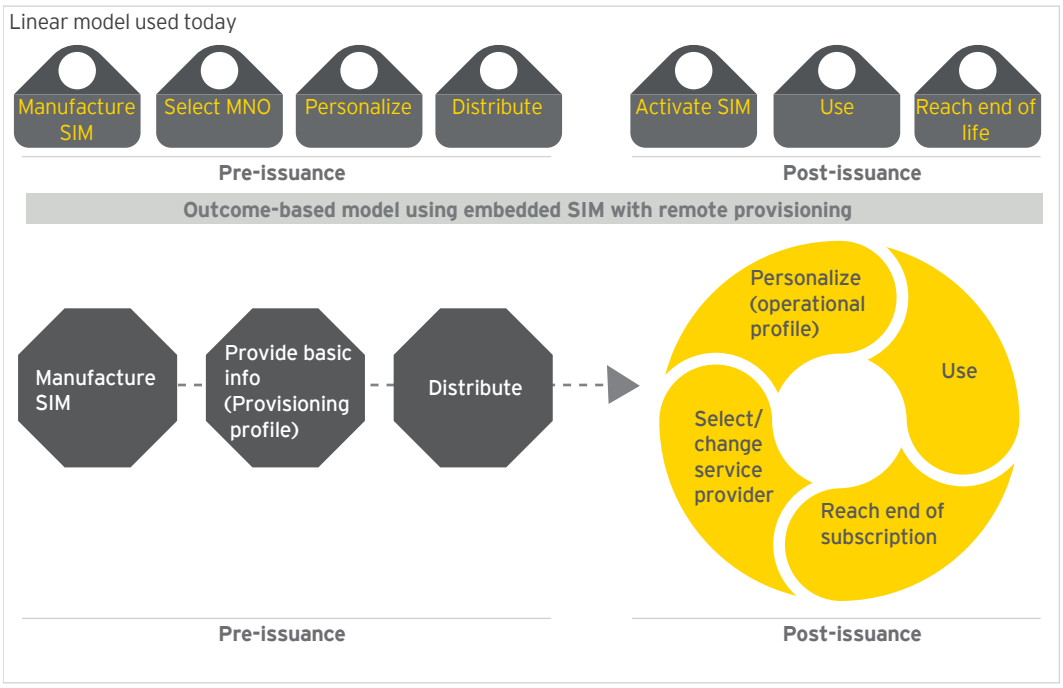
6.2.Going global with M2M

6.2.1. Increasing usage of Global SIMs for M2M

Increased globalization and companies transcending geographic boundaries to offer their services are the norm today. Companies are focusing on expanding beyond their country of origin to capitalize on new revenue opportunities arising out of liberalized trade agreements. Ubiquitous connectivity of devices across geographies is a prerequisite for offering certain M2M services. The very global nature of M2M requires the use of a SIM that can be used in multiple countries. Using an embedded SIM or eUICC overcomes some of the key challenges associated with using multiple local SIMs for M2M services. It reduces the complexity of service delivery and simplifies the supply chain. An embedded SIM also removes the hassles of changing service providers, leading to operational efficiencies.

For the connected car market, M2M offers a global dimension, production and distribution model. It would allow remote provisioning of connectivity over the air to vehicles for automakers by selecting any local service provider of their choice. In addition to driving a number of in-vehicle services, it removes any geographic barriers posed by the manufacturing location of the car. By February 2016, 22 mobile service providers had commercially launched connected car solutions based on the GSMA Embedded SIM specification, with more operators planning to adopt it in the future[20]. Further, in November 2016, the GSMA, in partnership with European Smart Metering Industry Group (ESMIG) and SIMalliance, published a report on how the GSMA Embedded SIM specification benefits the utilities sector. The key benefits include improving reliability and reducing site visit, enhancing security and trust, reducing cost and complexity, and offering commercial flexibility[21].

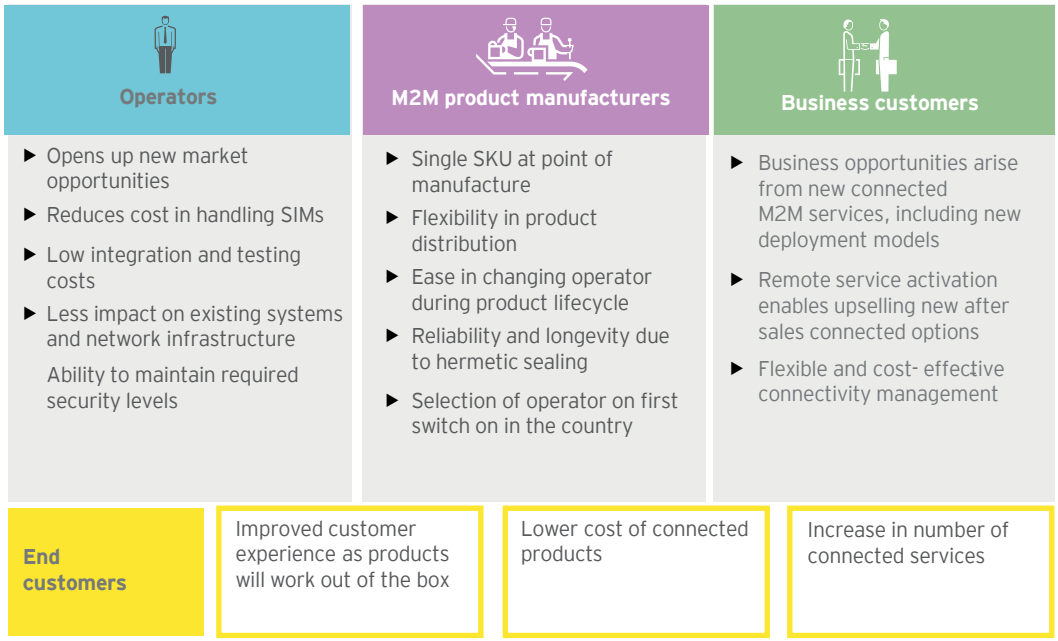
Exhibit 22: GSMA embedded SIM: shift from linear to outcome-based model



Source: "GSMA embedded SIM specification: remote SIM provisioning for M2M," GSMA, October 2014.

20. "Automotive industry adopts GSMA Embedded SIM Specification to accelerate connected car market," GSMA press release, 10 February 2016.
21. "ESMIG, GSMA AND SIMALLIANCE Call on Utilities sector to Adopt GSMA Embedded SIM Specification to Develop Internet of Energy Market," GSMA press release, 15 November 2016.

Exhibit 23: Key benefits of embedded SIMs for M2M



Source: "GSMA Embedded SIM Specification - Remote SIM Provisioning for M2M," GSMA, October 2014.

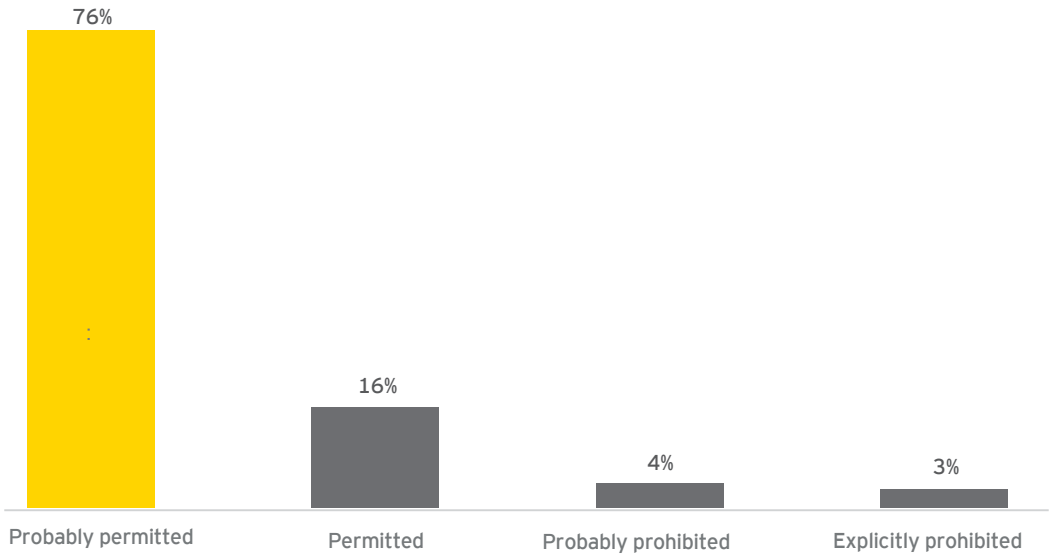
6.2.2. Permanent roaming is allowed in majority of countries

One of the critical aspects of M2M is the ability to offer services on a global scale. Lack of specific regulations on permanent roaming in most countries has benefitted the M2M market so far. However, M2M roaming is growing exponentially. In 2015, the number of instances of M2M roaming devices increased by 100%, accounting for 7% of total roamers. The numbers are only going to increase, with industry projections of equal machine and people roamers by 2020[22]. Permanent roaming offers key benefits, ranging from supply chain simplicity to wider coverage. For instance, many multinational companies like to avail services from a single M2M player. The cost of M2M services increases significantly on account of switching M2M players. Absence of permanent roaming in M2M acts as a significant barrier to businesses.

22. "The inexorable rise of M2M roaming," Machina Research press release, 11 January 2016.

Exhibit 24: Regulation of permanent roaming around the world

% of respondents



Source: "The impact of regulation on the Internet of Things," Machina Research, January 2015; N = 68.

Commercially negotiated bilateral roaming arrangements have been in place between various operators globally to facilitate roaming outside the home country. The rates for international roaming charges are based on a mutual agreement between the parties. Typically, the networks of local MNOs are used for international roaming purposes. As such, regulators do not have any role in determining tariffs for M2M roaming. This mechanism has worked so far and has benefitted M2M players.



BEREC's observations on permanent roaming

- "Permanent roaming appears to be a key factor for the success of certain M2M business models being used."
- "Whether the Roaming Regulation is applicable to permanent roaming in the M2M context, depends mainly on the elements "periodically travelling in the Union" and "mobile device".
- "BEREC considers that M2M connected devices used on permanent roaming and not travelling at all should not be considered in the scope of the Roaming Regulation (i.e., the Roaming Regulation should not apply to them, while agreements concerning permanent roaming could still be commercially negotiated)."
- "Considering that M2M services might be a global market which goes beyond European borders, BEREC notes that permanent roaming is currently used for the provision of a number of M2M services and might facilitate the creation of such a market. Apart from that, the rationale for permanent roaming differs in the case of, on the one hand, person-to-person communication and, on the other hand, M2M communication."

Source: "Enabling the IoT," BEREC, February 2016.

Exhibit 25: Prevalent practices for M2M roaming

Countries/ regulatory bodies	Position
BEREC/ European Commission (EC)	▸ The European roaming regulatory framework applies in general to mobile connectivity in M2M services. However, certain exemptions have been made for M2M roaming services that are applicable to retail data roaming: ▸ Roaming providers need not send any automatic messages to M2M devices to inform the customer that roaming is ongoing, and provide information about prices. ▸ There is no obligation to provide M2M customers accumulated consumption of data or any maximum financial limits for specified periods of use. ▸ The EC roaming regulation do not obligate operators to offer permanent roaming.
Germany	▸ The telecom regulator, German Regulatory Authority for Industries: Telecommunications, Postal Services, Railways, Electricity (BNetzA), introduced new numbering rules in June 2016 to facilitate M2M services and to enable exterritorial use of numbers. ▸ The regulator has allowed the use of German IMSIs for M2M services in other countries. In addition, use of extraterritorial IMSIs is allowed in Germany.
Belgium	▸ In August 2015, the Belgium telecom regulator, Belgian Institute for Postal Services and Telecommunication (BIPT), recommended that there should be more flexibility in the general extraterritorial use of Belgian numbering resources. ▸ For M2M services in particular, it recommended that permanent roaming be allowed for Belgian numbers abroad as well as for foreign numbers roaming in Belgium.
UK	▸ Ofcom has not taken any position on permanent roaming for M2M.
France	▸ The telecom regulator, Regulatory Authority for Electronic Communications and Posts (ARCEP), favors leaving prices to commercial negotiation for M2M roaming.
Australia	▸ Currently, there are no restrictions on permanent roaming.
Singapore	▸ In January 2016, IMDA embarked on a trial to see how an open GSMA standard (over-the-air subscription management) can enable embedded SIM (eSIM) chips to switch between different MNOs. The interoperable standards are expected to lead to a more competitive environment for the deployment of M2M devices, by reducing costs and increasing adoption. ▸ In January 2017, one of the leading operators in Singapore announced the availability of embedded SIMs across its 4G network. These SIMs are currently installed in select consumer wearables.

Source: "German telecommunications regulator enacts new rules to facilitate M2M communication," Bird & Bird press release, 23 June 2016; "M2M Case Study | Belgium Allows M2M Permanent Roaming," AT&T, August 2015; "Enabling the IoT," BEREC, February 2016; "Bundesnetzagentur promotes machine-to-machine communications using public mobile networks," Bundesnetzagentur, 15 June 2016; ZDNet.



Key risk: opportunity loss – businesses would lose out on innovative M2M services without Provisions for global SIMs and permanent roaming

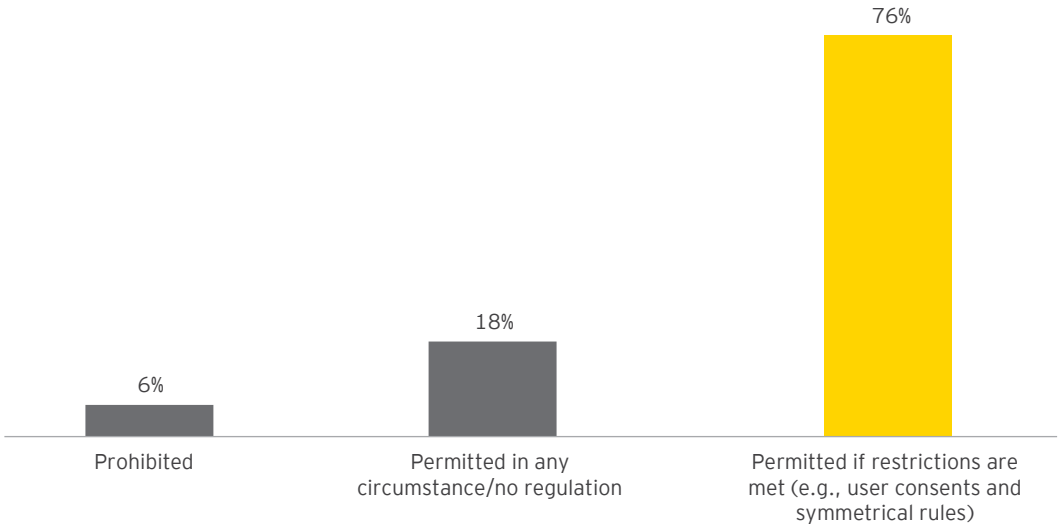
- M2M services may not be available in a country, leading to loss of revenue for M2M players.
- Businesses that have a global distribution model are expected to face issues if permanent roaming is not allowed.
- Specialized and innovative services using global SIMs would also be impacted and customers would lose out on such services.

6.3.Cross-border data flow aids economic prosperity and supports innovation

M2M communication relies largely on the global telecom network and internet. It routinely involves cross-border data flow. Various governments and regulators are increasingly focusing on this aspect and have taken initiatives to frame specific rules on data management. Criticality of data sovereignty has assumed greater significance. Laws and regulations on cross-border data transfer are evolving, but the exact impact on M2M communications is not clear. In the majority of instances, regulators allow personal data to be transmitted only after explicit user consent. In an M2M context, the distinction between communication and content or for that matter between private and machine gets blurred.

Exhibit 26: Country regulation on sending personal data across borders

% of respondents



Source: "The impact of regulation on the Internet of Things," Machina Research, January 2015; N = 67

In communication parlance, cross-border data flow is equivalent to international long distance voice calls. Therefore, any measures to stem M2M cross-border data flow are akin to stopping voice calls across borders, which is impractical. Data transfer is at the heart of communications and business transactions. It is important to note that in M2M, no personal information about the data user is typically shared. It is necessary to distinguish between law enforcement and security needs in M2M to facilitate cross-border data transfer. Overall, the economic ramifications of restricting cross-border data flow are significant.

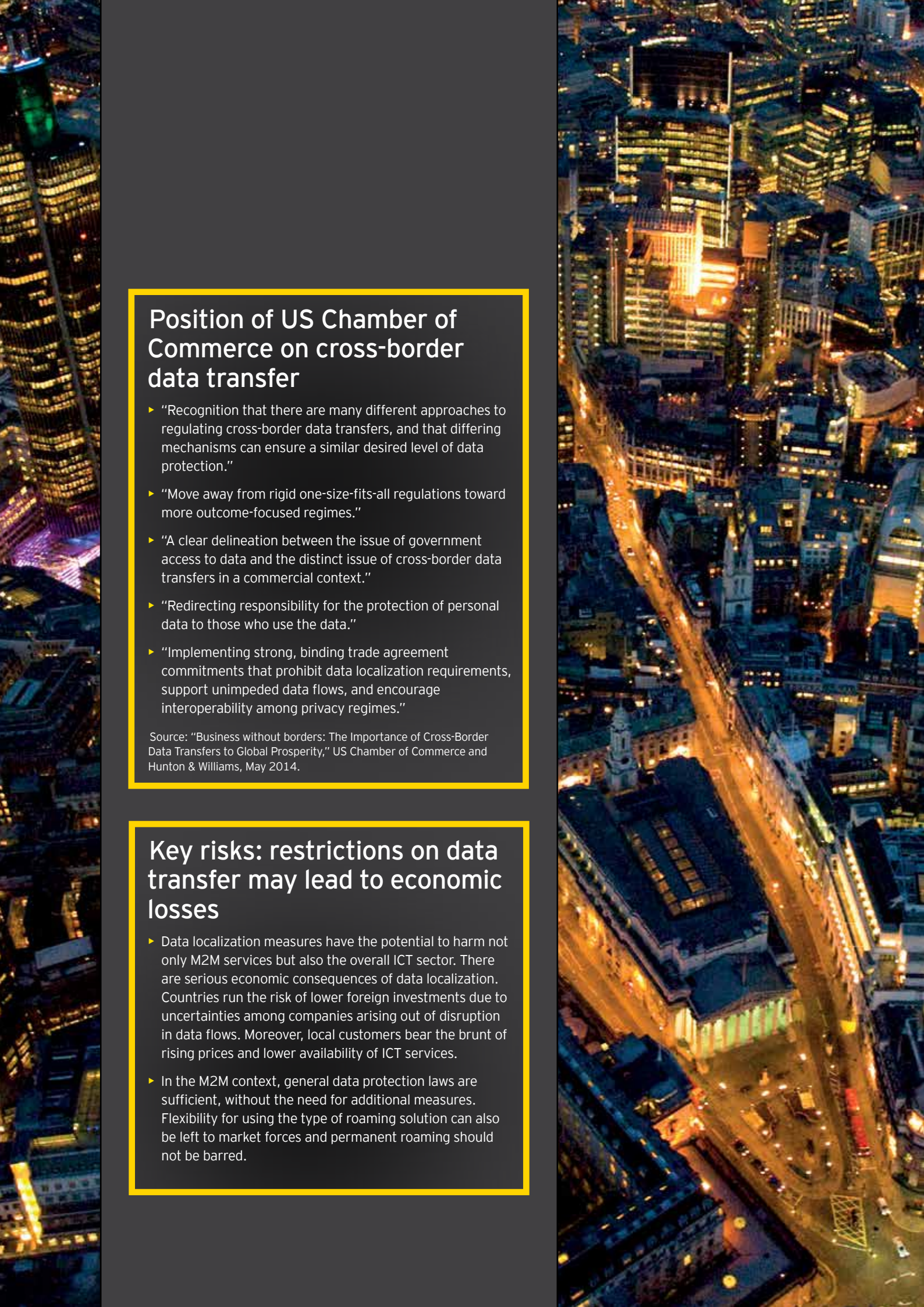
Increase in globalization and cross-border data transfer is giving rise to data localization measures in many countries. In the M2M context, data localization is an impediment to its global nature. It is difficult to bifurcate data that has to be stored locally and data that has to be transferred to other locations. Setting up local data centers is likely to increase cost for companies and impact their competitiveness. It would deeply affect ICT as well as other industries that use data and domestic industries hosting data outside India. Since ICT laws and regulations are at varied maturity levels in different countries, it poses a challenge regarding the security and safety of the data.



Exhibit 27: Prevalent practices for cross-border data transfer

Countries/ regulatory bodies	Position
Organization for Economic Co-operation and Development (OECD)	▸ The OECD's approach on cross-border data flow relies on the controller remaining responsible for personal data regardless of where the data processing occurs. It highlights the need to enhance data protection at a global level through improved interoperability. ▸ Data transfer restrictions should be proportionate to the associated privacy risk considering the sensitivity of the personal data and the purpose and context of the data processing. Move away from a one-size-fits-all approach to a more individual data flow based approach that minimizes the country-specific assessments or restrictions on transfer of data.
UK and Ireland	▸ The UK and Ireland's approach to cross-border data transfer balances data protection with free flow of data for businesses. ▸ Data protection laws in the UK empower data controllers to make their own adequacy findings when transferring personal data abroad, taking into account specific parameters ranging from nature of data to country of origin to duration to existing law of recipient country. The responsibility of compliance lies with the data controller.
APEC cross-border privacy rules	▸ In 2012, the Asia-Pacific Economic Cooperation (APEC) published a list of Cross-Border Privacy Rules (CBPRs) aimed at protecting personal data across the Asia Pacific region. ▸ As part of the CBPR framework, companies are supposed to adopt internal privacy rules based on the nine Privacy Principles set out in the 2004 APEC Privacy Framework. The internal programs are in turn ratified by APEC-recognized "Accountability Agents." Each country needs to have a Privacy Enforcement Authority that coordinates with the Cross-Border Privacy Enforcement Arrangement. ▸ The CBPR mechanism allows transfer of cross-border data within entities in the same corporate group. In addition, data controllers can transfer data to a controller or processor outside the corporate group and located in another country.
Australia, New Zealand and Philippines	▸ These countries have adopted the accountability model for cross-border data transfers. In Australia, data controllers or exporters are allowed to make cross-border data transfers once they have made own adequacy decisions.

Source: "Business without borders: The Importance of Cross-Border Data Transfers to Global Prosperity," US Chamber of Commerce and Hunton & Williams, May 2014; "The OECD privacy framework," OECD, September 2013.



Position of US Chamber of Commerce on cross-border data transfer

- "Recognition that there are many different approaches to regulating cross-border data transfers, and that differing mechanisms can ensure a similar desired level of data protection."
- "Move away from rigid one-size-fits-all regulations toward more outcome-focused regimes."
- "A clear delineation between the issue of government access to data and the distinct issue of cross-border data transfers in a commercial context."
- "Redirecting responsibility for the protection of personal data to those who use the data."
- "Implementing strong, binding trade agreement commitments that prohibit data localization requirements, support unimpeded data flows, and encourage interoperability among privacy regimes."

Source: "Business without borders: The Importance of Cross-Border Data Transfers to Global Prosperity," US Chamber of Commerce and Hunton & Williams, May 2014.

Key risks: restrictions on data transfer may lead to economic losses

- Data localization measures have the potential to harm not only M2M services but also the overall ICT sector. There are serious economic consequences of data localization. Countries run the risk of lower foreign investments due to uncertainties among companies arising out of disruption in data flows. Moreover, local customers bear the brunt of rising prices and lower availability of ICT services.
- In the M2M context, general data protection laws are sufficient, without the need for additional measures. Flexibility for using the type of roaming solution can also be left to market forces and permanent roaming should not be barred.

07

Glossary

Term	Description
API	Application programming interface
ARIB	Association of Radio Industries and Businesses
APEC	Asia Pacific Economic Cooperation
ARP	Allocation and retention priority
ARCEP	Regulatory Authority for Electronic Communications and Posts
ATIS	Alliance for Telecommunications Industry Solutions
ATM	Automated teller machine
BEREC	Body of European Regulators for Electronic Communications
BIPT	Belgian Institute of PoWstal and Telecommunications Services
BR	Business radio
BIPT	Belgian Institute for Postal Services and Telecommunication
BNetzA	German Regulatory Authority for Industries: Telecommunications, Postal Services, Railways, Electricity
B2B	Business-to-business
CAGR	Compound annual growth rate
CCSA	China Communications Standards Association
CSS	Centrally Sponsored Scheme
CEPT	Conference of Postal and Telecommunications Administrations
DeitY	Department of Electronics and Information Technology
DoT	Department of Telecom
ECC	European Communications Committee
EMEA	Europe, Middle East and Africa
ESMIG	European Smart Metering Industry Group
ETSI	European Telecommunications Standards Institute
EU	European Union
eUICC	Embedded universal integrated circuit card
eSIM	Embedded SIM
GDP	Gross domestic product
GoI	Government of India
IDA	Infocomm Development Authority
IMSI	International Mobile Subscriber Identity
IoE	Internet of everything
IoT	Internet of things
IP	Infrastructure providers

Term	Description
IPv6	Internet Protocol Version 6
ISP	Internet service provider
ISM	Industrial, scientific and medical
ITU	International Telecommunication Union
KYC	Know your customer
LEA	Law enforcement agency
LPWA	Low-power wide area
M2M	Machine-to-machine
MeitY	Ministry of Electronics and Information Technology
MNC	Mobile network codes
MNO	Mobile network operator
MSISDN	Mobile Station International Subscriber Directory Number
MVNO	Mobile virtual network operator
NIST	National Institute of Standards and Technology
NTP	National Telecom Policy
OECD	Organization for Economic Co-operation and Development
OEM	Original equipment manufacturers
OFCOM	Office of Communications
PDPA	Personal Data Protection Act
PoS	Point-of-sale
QoS	Quality of service
SBO	Service-based operators
SDO	Standards Development Organizations
SI	System integrator
SRD	Short-range devices
TEC	Telecom Engineering Centre
TIA	Telecommunications Industry Association
TRAI	Telecom Regulatory Authority of India
TSAG	Telecommunication Standardization Advisory Group
TSDSI	Telecom Standards Development Society – India
TTA	Telecommunications Technology Association
TTC	Telecommunication Technology Committee
UL	Unified License
VNO	Virtual network operator
VHF	Very high frequency



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