"Reimagining the Digital Era"

DIGITAL TRANSFORMATION
AGENDAS & INITIATIVES
WITHIN THE ASIA PACIFIC ECONOMIES

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SEPTEMBER 2017

Supported by
WITSA
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ASOCIO
Reimagining the Digital Era

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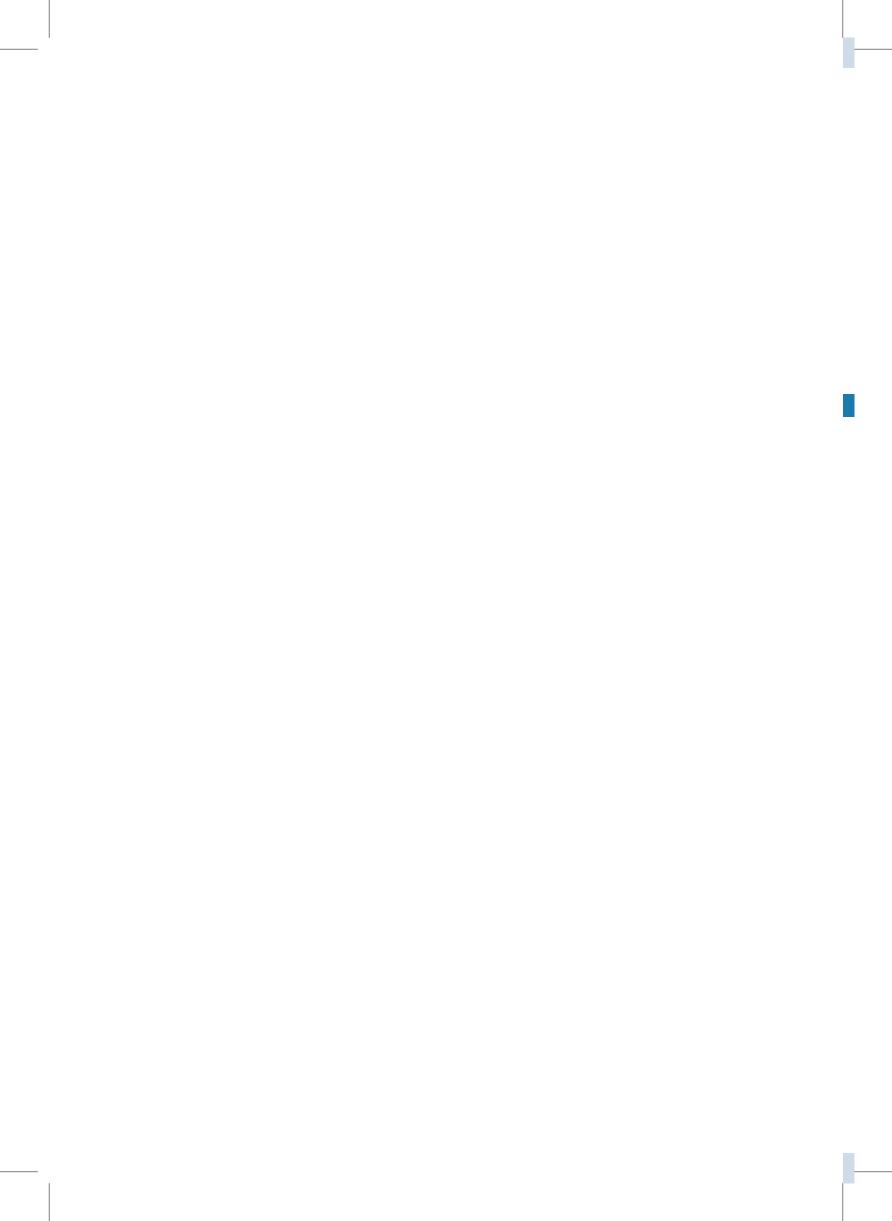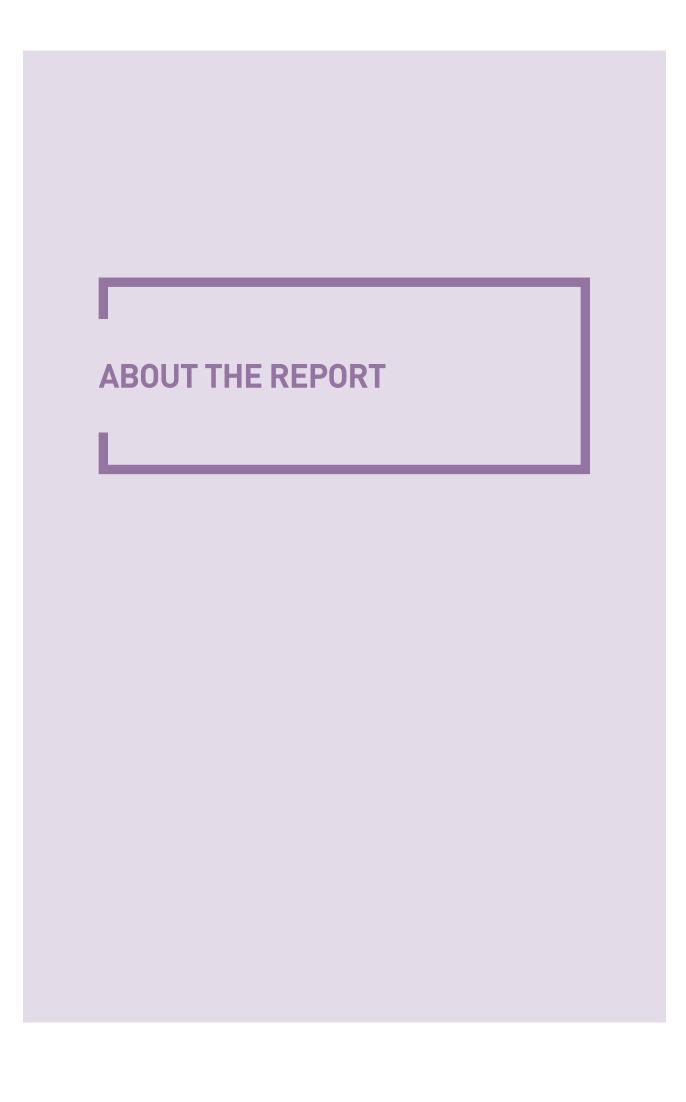
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ABOUT THE REPORT

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OBJECTIVE OF THE REPORT

ASOCIO and its research partner WITSA have together published this research paper named 'Digital Transformation Agendas & Initiatives within the Asia Pacific Economies'.

The objectives of this research paper are:

• To recognize the significance of digital transformation initiatives in some of the countries in the Asia Pacific region

• To identify and discover the learning from each country's digital transformation agenda and associated initiatives

• To suggest suitable objectives and collaborative action steps for countries in Asia Pacific towards transforming APAC into a truly digital region.

COVERAGE

This research paper which was developed over the course of three months primarily covers three core aspects:

1. Detailed overview of the Information and Communication Technology (ICT) industry in twelve identified countries in Asia Pacific. This includes the performance of ICT segments such as hardware, software, services, telecommunications, e-commerce, fintech, etc.

2. An assessment of the performance and plans with respect to digitalization in the select Asian economies. The report also throws light on some of the critical challenges in the region regarding areas such as digital infrastructure, digital security, and human resources, among others.

3. The research paper concludes with a set of strategically identified 8+1 core policy-level objectives and associated action steps that could be considered as the foundation towards developing a comprehensive digital agenda for the Asia Pacific region as a whole for the years to come.

The twelve countries covered as a part of this research are as follows:

1. Australia	5. Korea	9. Sri Lanka
2. Bangladesh	6. Malaysia	10. Taiwan
3. India	7. New Zealand	11. Thailand
4. Japan	8. Singapore	12. Vietnam

Published by

The Asian-Oceanian Computing Industry Organization (ASOCIO) is an ICT federation organized by ICT associations representing from 24 economies throughout Asia Pacific. ASOCIO was established in 1984 and it is the most time-honored and active international ICT trade organization in Asia and Oceania. Its influence covers more than 10,000 ICT companies and represents approximately US$ 350 billion of ICT revenue in the region. ASOCIO's objective is to promote, encourage and foster relationships and trade between its members, and to develop the computing industry in the region.

Presently, ASOCIO represents the interests of 31 economies, comprising 24 members from Australia, Bangladesh, Bhutan, Brunei, Cambodia, Chinese Taipei, Hong Kong, India, Indonesia, Japan, Laos, Macao, Malaysia, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Singapore, Korea, Sri Lanka, Thailand, Vietnam and 7 guest members from USA, UK, Canada, Spain, Russia, France, and Kenya. Under the ASOCIO umbrella, member economies are provided an opportunity to collaborate amongst the member economies for growth.

Partner

The World Information Technology & Services Alliance (WITSA) is a global consortium of leading ICT industry association members from over 80 countries/economies. As the leading recognized voice of the global ICT industry, WITSA aims to drive transformation and grow the industry, given that ICT is the key driver of the global economy:

WITSA's members and stakeholders comprise national associations, multinational corporations, institutions and organizations, researchers, developers, manufacturers, software developers, telecommunication companies, suppliers, trainers and integrators of ICT goods and services. As such, they represent a large and obviously vital constituent group for whom the effective balancing of concerns and rights affecting the security, privacy and information capability provided by ICT products and services underpins business development and economic activity.

Research Agency

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Partner: World Information Technology & Services Alliance (WITSA)

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MESSAGES
FROM ASOCIO and WITSA

ASOCIO CHAIRMAN'S MESSAGE

I am pleased to announce the release of the ASOCIO inaugural research report in conjunction with the launch of ASOCIO's new tagline titled 'Reimagining the Digital Era'.

Asia Pacific (APAC) strong and vibrant economy, favorable demographics, ICT investments, and ongoing economic integration have laid the foundation for the region to become a global leader in the digital economy. Countries in APAC have tremendous potential to embrace, transform and lead in the digital economy and a true digital revolution will transform the ICT development in the region in the near future.

Countries in APAC have the opportunities to equip employees with digital tools that can increase productivity and create a higher-skilled ICT workforce in the long run. Besides that, an increase in broadband penetration, higher worker productivity and ventures in new digital industries can uplift national GDP growth.

To bring APAC to a full digital revolution, barriers that will need to be addressed are the weak business case for building out broadband, regulations inhibiting innovation in mobile financial services and e-commerce, low consumer awareness and trust hindering the uptake of digital services, lack of a single digital market and a limited supply of local content, primarily due to the weak local digital ecosystem.

Despite all the challenges faced, it is still important for APAC countries to embrace this digital age as it will gives benefits such as an increasingly cashless society, Industry 4.0 – Digitizing product and service offerings, digitizing customer engagement and digitizing internal operations to increase productivity, increase efficiency in public services and implementation of smart cities.

Besides that, in line with ASOCIO new vision; to be the Catalyst of Asia Pacific Digital Transformation and Enablement, this report plays an important role to initiate the realization of the digital economy in APAC region.In this research, we will be sharing with you each economies digital transformation plan, key initiative strategies undertaken in each economy as well as the importance of digital initiative in the region. Readers would have the opportunity to understand in depth the digital agenda of various economies in APAC. At the end of the report, there are few policies recommendations for making APAC a truly digital region.

Lastly, I will like to take this opportunity to thank WITSA (World Information Technology and Services Alliance) for its support and all 12 target economies for your generous contribution to make this inaugural report a success.

David Wong Nan Fay
Chairman
ASOCIO

WITSA CHAIRMAN'S MESSAGE

"Fully leveraging ICTs requires a society-wide effort: the government, the business sector, and the population at large each have a critical role to play"

-The Global Information Technology Report 2016, WEF

The World Information Technology & Services Alliance (WITSA) is pleased to co-sponsor this important report with the Asian-Oceanian Computing Industry Organization (ASOCIO).

As Information and Communications Technology (ICT) impacts nearly every aspect of human life, there is perhaps no factor more important to the development of ICT than that of government commitment, together with the ICT industry to fully engage in the Digital Revolution.

Over the past several years a large number of nations have benefited and continue to benefit from ICTs. Communications, education, manufacturing, health care, transportation, urban development and resource management are but a few key sectors transformed by the incredible innovations we have witnessed. There is much more to come. Much can be learned from the enormous efforts and investments that these countries undertook and are presently undertaking to transform their societies into the Digital Age.

In order to continue the astonishing and beneficial growth of ICT, a number of factors need to be in place to include a quality regulatory environment, adequate infrastructure as well as reliable and dependable cyber security, affordability and a skilled workforce. There are however complex challenges inherent in each one of these factors.

Nations continually struggle with prioritizing resource allocations based on real-time, pressing societal needs. Embracing ICT development may not be perceived as one of them. However, it is proven that those countries that do make the decision to commit to ICT development benefit immensely from their decision.

It is our sincere desire that this work can be expanded around the globe in order to continue to accumulate and share information which will provide great value to nations so that they too will enjoy the benefits of ICT to the fullest. We welcome your feedback and hope you enjoy the report.

Yvonne Chiu
Chairman
WITSA

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Digital transformation is essential for economies to attain a sustainable growth. This can be observed in many APAC economies who have witnessed robust economic growth in recent years due to rapid adoption of internet and mobile technologies. Digital transformation in APAC is driven by a growing middle class, rising levels of urbanization, technological innovation and government support for the digital economy.

Most countries in the Asia Pacific region are continuing on their own journey towards a digital future. Several Asian countries are clearly seen as global leaders in different aspects of digitalization. Yet if one measures the overall progress, there is still a great deal of uncertainty. Countries in the Asia Pacific region are increasingly plagued by the rising incidents of cyber security and associated threats. Also, the adequate digital infrastructure which is considered to be the backbone of digital transformation is not in full place in many countries. The other most common challenge observed in Asia Pacific economies is the lack of availability of skilled ICT human resources.

In addition to the above, the other major hindrances for the growth of ICT in the region include lack of a robust ecosystem for start-ups, low usage of new and emerging technologies such as IoT, AI, 5G, Big Data, etc., lower cross-border trade and investments compared to the real potential..

Countries in Asia Pacific should take advantage of each country's inherent strengths in ICT or digital landscape to effectively collaborate. The ideal way ahead should be to corroborate successful policies / frameworks of one country by other countries in the region. Below are identified 8+1 objectives and associated action steps which have been discussed in detail later in this research paper.

1. **Promoting fast and ultra fast "Internet for All:** Countries in Asia Pacific must work towards providing 'high-speed internet for all' in today's digital era. For this, establishment of a strategic national broadband roadmap including defined targets with measurable goals is critical in achieving this goal.

2. **Robust digital ecosystem for start-ups and SMEs :** A robust digital ecosystem for start-ups and SMEs is needed through a common platform to nurture talent and encourage regional digital innovation. Developing an APAC Start-up Map to identify different entities in the ecosystem will enable better co-ordination between accelerators, incubators, investors, corporations, universities and public administrations.

3. **Addressing the needs of ICT human resources:** Countries should facilitate cross-border ICT learning through graduate exchange programs by enabling graduates to work in other Asian countries. To facilitate digital learning among Asian countries, focus should be on developing collaborative projects between educational institutes and companies.

4. **Fostering Cross border investment and digital trade:** Expanding the present ASOCIO AEC E-Commerce Alliance to the digital Asia market through the participation of the Asian economies will boost cross border trade. An APAC cross-border trade promotion initiative is also needed to frame standard regulations & policies. Similarly, an ICT Working Committee to discuss cross-border digital trade regulatory issues will be helpful.

5. **Providing an impetus to smart cities development:** Collaboration with successful economies is critical to identify and establish adequate standards necessary for smart city development. Also, country level standards and benchmarks need to be suggested for faster planning and implementation in other cities. A Smart City Alliance at regional level is needed to monitor the progress of implemented smart city initiatives and suggest best practices..

6. **Ensuring quicker adoption of new and emerging technologies:** For digital transformation, countries need to adopt and integrate new technologies into the existing ICT infrastructure. Fintech needs to be considered as one of the key national digital growth agendas to increase financial inclusion. IoT Alliance established at APAC level will support the creation of an industry-driven IoT ecosystem.

7. **Use ICT to enhance social welfare:** Countries should leverage digital technologies to solve social public issues and online delivery of government services. Similarly, to promote use of ICT in education, an online platform can be developed for disseminating educational e-resources. Agro industry can benefit from an APAC digital agriculture trading platform to bridge the gap between producer and direct buyer.

8. **Addressing the regional cyber security:** The countries should formulate strategies to address the regional cyber security needs by establishing a nodal cyber security agency in each of the APAC economies. Co-operation in areas of cyber security and training in deploying best practices in cyber security will also be helpful in achieving desired results.

Plus, Measuring regional digital progress by standardizing measurement metrics: Lastly, it is imperative to establish a monitoring mechanism to overlook the implementation of various regional initiatives by standardizing measurement metrics across all countries in the region. This will result in effective benchmarking, developing targeted policies and prioritizing reforms. Regional Digital Transformation Index, maturity modeling, certification, etc. should be implemented as well to help track and measure the impact of major ICT initiatives in different economies at the APAC level. This initiative will also be useful to develop and maintain an annual progress report for digitization at a regional level.

All the economies in the Asia Pacific region are making considerable efforts to overcome these challenges. However, the goal becoming a truly digital region can be realized for Asia Pacific region only if these efforts are focused and consistent for all the stakeholders at a regional level.

STATUS OF DIGITAL TRANSFORMATION IN ASIA PACIFIC ECONOMIES

STATUS OF DIGITAL TRANSFORMATION IN ASIA PACIFIC ECONOMIES

Every nation today understands the importance of digital transformation to improve information sharing, enhancing competitiveness of businesses and improving access to basic services, living standards and fast achieving economic prosperity.

Governments and organizations the world over are understanding the impact of digital transformation and are drafting policies which would help in the faster adoption of digital services.

- The Digital Transformation of Industries project was launched by the World Economic Forum in 2015. It focuses on the digital consumption, digital enterprise, societal implications and platform governance in the automotive, logistics, consumer goods, media, electricity, and health industries.
    - The Cybercrime project has produced "Recommendations for Public-Private Partnership against Cybercrime", to help establish domestic and international information sharing platforms for improved cyber security.
    - The Internet for All project published "Internet for All : A Framework for Accelerating Internet Access and Adoption", to help accelerate large-scale internet adoption by governments and businesses.
- The OECD launched "Going Digital: Making the Transformation Work for Growth and Well-being" project in 2017 to help policymakers better understand the digital revolution in different sectors. The project has three main pillars:
    - An integrated framework to understand how digital transformation will influence public policy in the long run.
    - An analysis of the digital transformation in specific policy areas such as science, tax and trade.
    - A set of modules focusing on key issues to understand the major challenges in the digital era and measure the digital transformation in a country.

Digital transformation has witnessed varying degrees of development across countries and there are many countries where it is still quite a recent phenomena along with a low awareness about its benefits. Successful digital transformation of any society presents several challenges in the way of its implementation.

- A key challenge in the way of digital adoption is ensuring government officials at all levels understand the importance of such a transformation in the development of the society. Adoption of digital services should not only be restricted to businesses but should be done by government authorities, universities, hospitals and also by citizens.
- International agencies and national policy makers who are aware of the underlying challenges have to ensure that the high level commitments effectively do get translated into concrete actions at the country and regional level to ensure successful outcome.
- Digitalization must address critical policy challenges related to security, infrastructure, and jobs, among others. Failure to effectively address these issues may lead to economic inefficiencies. Governments would be forced to come up with policies which would be reactive in nature. This may further affect the social fabric by impacting the already prevalent inequalities in the society, consequently resulting in slower growth.
- The challenge for policy makers is to identify the policy mix that will enable their economies to best maximize the benefits of an increasingly digitalized global economy and adequately address the resulting challenges.
- To do so, it is essential to ensure access to, and participation in, the digital economy for everyone in all countries in the region; maximize the contribution of technological and ICT innovations to productivity and inclusive growth, job creation and well-being; and build trust and resiliency for networks and users.
- The industry is constantly working on overcoming ICT needs / gaps through cross border trade but more can be done to improve the efficiency of cross-border procedures in many countries, particularly developing countries. .

"Digital transformation provides the ICT industry an unparalleled opportunity to assist businesses to enhance competitiveness by using powerful new disruptive technologies in innovative ways. Transformation of societies and governments for larger public good hold similar opportunities." - Mr. R. Chandrasekhar, Chairman, WITSA Global Public Policy President, NASSCOM.

APAC ICT SNAPSHOT

Rapid advances in digital technology are redefining the way of living and are revolutionizing businesses, industries, governments and society. And the 'combinatorial' effects of evolving technologies such as mobile, cloud, artificial intelligence, sensors and analytics – is accelerating progress exponentially.

ICT industry in the Asia-Pacific region is witnessing a rapid growth. A booming ICT sector is heightening risks across APAC as companies and governments are creating an industry worth billions of dollars to harness technology by building smart sustainable cities by improving transport, e-commerce, healthcare and education. The companies and government therefore need to ensure development of robust network control systems to ensure data security. The rapid growth of ICT also increases the probability of cyber attacks. Appropriate cyber security measures need to be implemented to protect data theft.

For countries like Japan, Korea, Taiwan, Singapore, Australia & Malaysia, IT hardware contributes a major chunk of their revenue. These countries have strong ICT infrastructure base consisting of high speed broadband networks and higher smartphone penetration making digital services much more accessible to its citizens. India has established itself as a leading global IT-BPM outsourcing destination with almost 45% share. ICT sector in Vietnam, Bangladesh, Sri Lanka, Thailand is still in nascent stage.

WHY IS DIGITAL TRANSFORMATION IMPORTANT IN APAC?

With 60% of the world's population and some of the world's fastest-growing economies, Asia Pacific region's ICT market is expected to increase exponentially. By 2019, APAC will be home to approximately half of the world's internet users. Due to such high potential, APAC actually leads in digital innovation & transformation initiatives.

There is a complex and growing ecosystem of start-ups, SMEs and MNC's focusing on using and developing large number of valuable ICT software applications. Introduction of e-business technologies has created a new channel for SME's to capitalize on global market opportunities. To stimulate higher usage of Internet by SMEs, developing countries are now focusing on creation and implementation of wide range of policy regulations and many sector specific initiatives. But for increased utilization of digital technologies, a more collective and co-ordinated approach at the regional level needs to be undertaken.

WHAT DRIVES APAC'S DIGITAL TRANSFORMATION?

Digital transformation in APAC is majorly driven by a combination of a growing middle class, rising levels of urbanization, technological innovation and government support for the digital economy. The ICT is experiencing double-digit annual growth in many countries in Asia-Pacific.

ICT LANDSCAPE
FOR KEY ASIA PACIFIC
ECONOMIES

AUSTRALIA

AUSTRALIA: EXECUTIVE SUMMARY

ICT OVERVIEW

- The Australian ICT industry is matured and was valued at AU$ 81.2 bn in 2016. IT Services is the fastest growing segment while telecommunications has the largest share (52%).
- Public cloud services and Exploration and Mining Software(EMS) are the most important segments of Australian IT services and software industry. They have highly skilled IT labour available and have established itself as early testing bed for IT services due to sophisticated market.
- Telecommunication sector has grown at 13% CAGR 2009-16 and has reached at saturation level. Customer focus has been shifting from voice to data based services with 98% 4G coverage in Australia. The National Broadband Network (NBN) aims to further increase this speed and achieve 25 Mbps data transfer rate by 2020.
- The Australian e-commerce market was 10th largest globally in 2015 due to large customer spending power and low entry barriers. M-commerce grew almost three times faster than online retail reaching 40% population in 2015.
- Fintech in Australia is growing due to wide acceptance of electronic payments. Digital currency has also has gained acceptance due to ease of regulations on transactions. Since implementation of regulatory sandbox, fintech start-ups are relived from regulatory pressure.

DIGITAL AGENDA

The three Priorities of Australian ICT Strategy with their strategic actions are:

- Delivering Better Services - Enabling better services and building capability.
- Engaging Openly - Creating knowledge and collaborating effectively.
- Improving Government Operations - Investing optimally and encouraging innovation.

Australian jurisdiction has their own ICT Strategies and future policies based on Federal ICT's theme. The Federal Government has not updated it's 2012 APS ICT strategy. Further, some of the jurisdictions have fully committed to public transparency and they regularly report their progress towards their digital transformation goals whereas some lack behind in developing a periodic report or not at all.

DIGITAL INITIATIVES

- The New South Wales government has invested significant resources into its digital agenda. NSW's comprehensive ICT Strategy 2012-2015 focuses on developing a data informed and agile public service and has three priority areas customer experience, data and digital on the inside. Areas like technology, cyber security, legislation and delivery capability are identified as the transformation agenda and support to the key priorities.
- Victoria released a Whole of Government 2016-2020 IT Strategy. It is an improvement to previous ICT program, the Victorian strategy focuses on improving project management and governance, increasing staff ICT skills, and reusing systems across agencies. The major priority areas of the jurisdiction's strategy are information and data reform, digital opportunity, technology reform and capability uplift. Major initiatives like:
  - GovHack, an initiative that brings citizens and government together to apply their creative skills to open government data.
  - New digital platforms will support open data initiatives to take advantage of tools driven by web services enabled by Application programming Interface (API) technology.

AUSTRALIA: EXECUTIVE SUMMARY

DIGITAL INITIATIVES

- Queensland released its ICT Strategy 2013-17 in the form of its ICT Modernization Plan. The policy calls for a more systematic approach to transitioning to as-a-Service and cloud solutions, as well as procurement reform towards the strategy's stated goals. However, all major ICT initiatives are now reported on Queensland's ICT Dashboard.
  - Open data portal to provide central access to Queensland Government data consistently published in reusable formats.
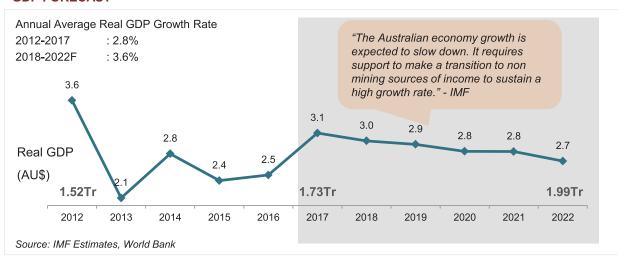
CHALLENGES

Some ICT strategies only articulate general principles, and lack clear, definable goals relating to digital transformation. Like the vision of the strategy raises justifiable expectations that its implementation will be transparent and that progress can be measured and monitored. But the goals framed are so general and without very specific performance targets make it difficult to assess.
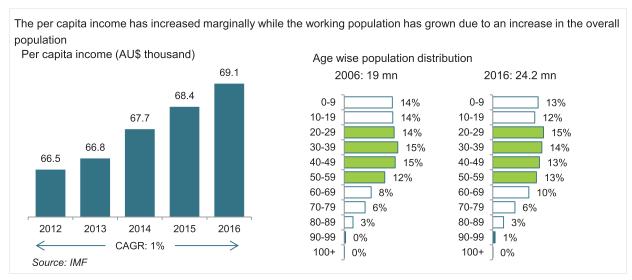
AUSTRALIA: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate
2012-2017   : 2.8%
2018-2022F   : 3.6%

"The Australian economy growth is expected to slow down. It requires support to make a transition to non mining sources of income to sustain a high growth rate." - IMF

Real GDP
(AU$)

1.52Tr   **1.73Tr**   **1.99Tr**

3.6
2.8
2.1   2.4   2.5
3.1   3.0   2.9   2.8   2.8   2.7

2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

Source: IMF Estimates, World Bank
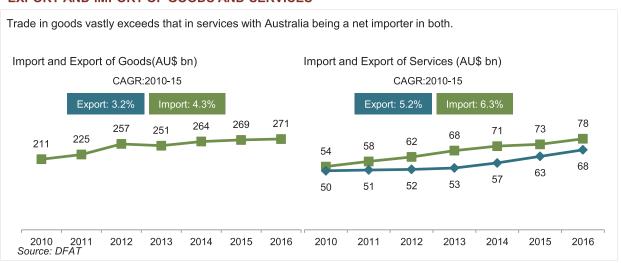
PER CAPITA INCOME AND AGE WISE POPULATION DISTRIBUTION

The per capita income has increased marginally while the working population has grown due to an increase in the overall population

Per capita income (AU$ thousand)

66.5   66.8   67.7   68.4   69.1

2012   2013   2014   2015   2016

CAGR: 1%

Source: IMF

Age wise population distribution

	2006: 19 mn	2016: 24.2 mn
0-9	14%	13%
10-19	14%	12%
20-29	14%	15%
30-39	15%	14%
40-49	15%	13%
50-59	12%	13%
60-69	8%	10%
70-79	6%	6%
80-89	3%	3%
90-99	0%	1%
100+	0%	0%

EXPORT AND IMPORT OF GOODS AND SERVICES

Trade in goods vastly exceeds that in services with Australia being a net importer in both.

Import and Export of Goods(AU$ bn)

CAGR:2010-15

Export: 3.2%   Import: 4.3%

211 225 257 251 264 269 271

2010 2011 2012 2013 2014 2015 2016

Import and Export of Services (AU$ bn)

CAGR:2010-15

Export: 5.2%   Import: 6.3%

54 58 62 68 71 73 78
50 51 52 53 57 63 68

2010 2011 2012 2013 2014 2015 2016

Source: DFAT

AUSTRALIA: ICT INDUSTRY OVERVIEW

THE AUSTRALIAN ICT INDUSTRY WILL GROW SLOWLY

ICT Industry Market Size(AU$ bn)

	2016	2019
Hardware	7.8	8.2
Software	9.4	10.5
Services	22.0	25.7

■ Services ■ Software ■ Hardware
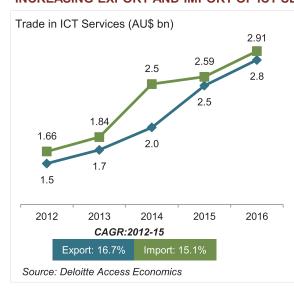
- The Australian ICT market is very developed and mature.
- Telecommunication is the largest subsector in the ICT market. The telecom market is highly saturated. Service providers are now focusing on data instead of voice to drive revenues.
- IT services is the fastest growing sector in the ICT industry. Increase in adoption of cloud services will drive the growth of the IT services sector.
- The software sector is expected to record a business application demand growth from SMEs as the software-as-a-service supply increases will be the main growth driver.

Source: Atradius Market Monitor

Note: The numbers for the telecommunication market were only available for 2016 (AU$ 42 bn) and not for 2019 on any public source.

CAGR: 2016-19
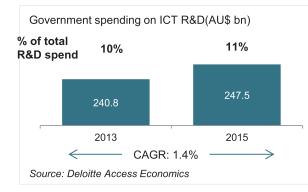
Services: 5.3%	Software: 3.8%	Hardware: 1.7%

INCREASING EXPORT AND IMPORT OF ICT SERVICES

Trade in ICT Services (AU$ bn)

Export: 1.66, 1.84, 2.5, 2.59, 2.91
Import: 1.5, 1.7, 2.0, 2.5, 2.8

2012 2013 2014 2015 2016

CAGR:2012-15

Export: 16.7%	Import: 15.1%

Source: Deloitte Access Economics

- The rise in ICT trade highlights the growth in international opportunities for businesses.
- ICT trade is focused on hardware and software consultancy services. Australia's largest ICT trading partner is the United States, representing around 30% of ICT services exports and imports in 2015.
- Australian ICT companies have access to a highly skilled workforce and comparatively low development costs if they wish to specialise in exporting high-value-add ICT services.
- Online platforms and marketplaces have allowed domestic and A rise in online platforms and marketplaces has facilitated greater interaction between Australian and international consumers and businesses.

INVESTMENT IN R&D IS A KEY FOCUS AREA FOR THE GOVERNMENT AND BUSINESSES ALIKE

Government spending on ICT R&D(AU$ bn)

% of total R&D spend

	2013	2015
% of total R&D spend	10%	11%
	240.8	247.5

CAGR: 1.4%

- Key focus areas for research are software development, cloud computing and artificial intelligence so that Australia remains a strong force in a highly competitive global market.
- Australian companies reinvest in ICT R&D to facilitate business growth.

Source: Deloitte Access Economics

AUSTRALIA: IT SERVICES AND SOFTWARE

A SOPHISTICATED MARKET HAS FUELED THE GROWTH OF THE SERVICE SECTOR

IT Services Market Size (AU$ bn)

25.7
22.0
2016   2019

CAGR: 5.3%
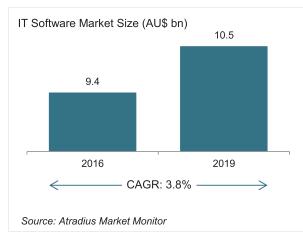
- Australia has established itself as a hub for early testing of products and services before a worldwide rollout due to the sophisticated and innovative nature of the market.
- Multinational organisations such as Alcatel-Lucent and Infosys have made Australia an important destination to test their risk reduction strategies.

Source: Atradius NV

ADOPTION OF CLOUD SERVICES INCREASING WITH AN INCREASING AWARENESS

Public Cloud Services Market Size (AU$ bn)

6.5
5.7
2016   2017F

YoY: 15%

- The growth of cloud services is being driven due to the fact that people now use multiple devices to access their content any time. More than 60% of the people in Australia use three devices or more to access their content.
- In the public cloud services market, Software as a Service (SaaS) is the fastest growing at 25.9% and is expected to grow from AU$ 1.5 bn in 2016 to AU$ 1.9 bn in 2017. Infrastructure as a service (IaaS) is expected to grow at 14.4% from AU$ 416 mn to AU$ 476 mn in 2017.
- Adoption of cloud services is increasing among businesses with more than 34% of enterprises have a cloud first policy as of 2016.

Source: Gartner

A HIGHLY SKILLED WORKFORCE HAS ATTRACTED LEADING SOFTWARE DEVELOPERS

IT Software Market Size (AU$ bn)

10.5
9.4
2016   2019

CAGR: 3.8%

- The Australian software industry has benefited from relatively low development costs and the availability of a highly skilled workforce.
- Leading software companies of the world such as Google and IBM who have set up software development centers there.
- Exploration and mining software (EMS) is an innovative and important segment of Australia's software development industry with more than a 100 firms contributing AU$ 600 mn and employing around 2500 people as of 2016.

Source: Atradius Market Monitor
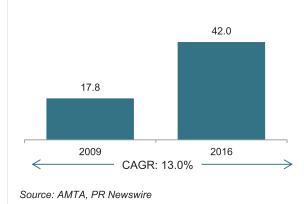
AUSTRALIA: TELECOMMUNICATION
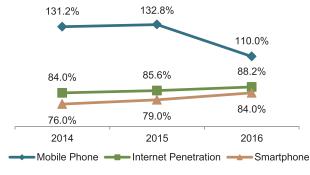
SOURCE OF TELECOM REVENUES IS CHANGING FROM VOICE TO DATA

- Telecommunication is the largest subsector in the ICT market. The telecom market is highly saturated. Service providers are now focusing on data instead of voice to drive revenues.
- A threat of customer churn and intense competition among existing operators have prevented operators from increasing the service pricing.
- A decline in fixed line telephone revenues is being offset by the steady growth of the mobile broadband market which is driving mobile data revenues. Data is expected to be the major revenue source for telecom operators.

Telecommunications Market Size (AU$ bn)

Mobile Phone, Internet and Smartphone Penetration

Source: AMTA, PR Newswire
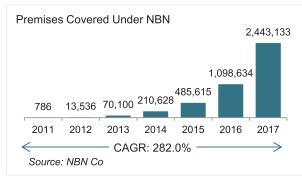
Source: World Bank, ITU, Deloitte

EARLY UPTAKE OF 4G AND NOW MOVING TOWARDS 5G

4G Penetration

Source: Telsyte

- Australia has a solid 4G infrastructure with 98% coverage and ranks 10th in the speed of its 4G networks, with an average speed of 33.76 Mbps.
- It has been early in upgrading to advanced data services. 4G trials started before other countries in 2012 by Telstra.
- 5G trials are already underway with one having taken place in September 2016 and a bigger trial scheduled during the 2018 Commonwealth Games.
- 2G is now obsolete in Australia. The largest telecom operator Telstra closed down its 2G services in December 2016, while Optus and Vodafone will do so by September 2017 thereby releasing spectrum and physical assets to be reused for LTE.

THE NATIONAL BROADBAND NETWORK IS INCREASING ACCESS TO DATA

Premises Covered Under NBN

Source: NBN Co
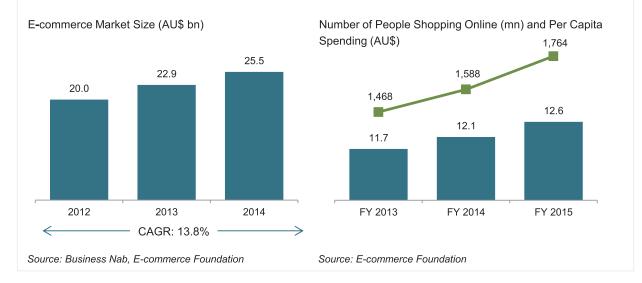
- The National Broadband Network (NBN) is a wholesale open-access data network project to provide 25 Mbps speed to all Australians by 2020. It is the largest infrastructure project in Australia's history.
- Voice traffic is more IP-based with the progress of NBN.
- Fixed line broadband on copper network has declined as fiber and wireless broadband services are more widely available.
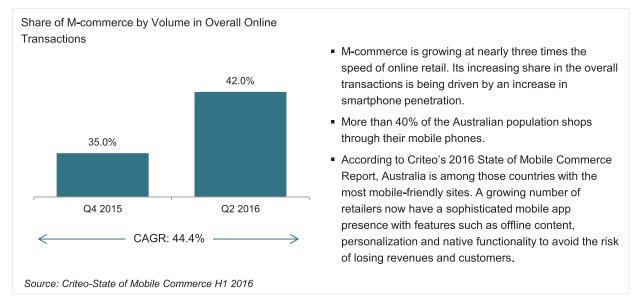
AUSTRALIA: E-COMMERCE

STEADILY GROWING OVERALL E-COMMERCE MARKET

- The Australian e-commerce market was the 10th largest in the world in 2015 fueled by a robust infrastructure, strong economy and large spending power.
- With a population of just 24 mn of which 89% is urban, e-commerce in Australia provides retailers the opportunity to grow their online business. 49% of the Australian businesses sold their products online in 2015.
- Entry barriers and bureaucratic hurdles for online retailers are low in Australia compared. This has helped in attracting investment in Australia from Global giants like Alibaba and Amazon.

E-commerce Market Size (AU$ bn)

2012	2013	2014
20.0	22.9	25.5

CAGR: 13.8%

Source: Business Nab, E-commerce Foundation

Number of People Shopping Online (mn) and Per Capita Spending (AU$)

FY 2013	FY 2014	FY 2015
1,468	1,588	1,764
11.7	12.1	12.6

Source: E-commerce Foundation

M-COMMERCE TRANSACTIONS ARE ON THE RISE

Share of M-commerce by Volume in Overall Online Transactions

Q4 2015	Q2 2016
35.0%	42.0%

CAGR: 44.4%

- M-commerce is growing at nearly three times the speed of online retail. Its increasing share in the overall transactions is being driven by an increase in smartphone penetration.
- More than 40% of the Australian population shops through their mobile phones.
- According to Criteo's 2016 State of Mobile Commerce Report, Australia is among those countries with the most mobile-friendly sites. A growing number of retailers now have a sophisticated mobile app presence with features such as offline content, personalization and native functionality to avoid the risk of losing revenues and customers.

Source: Criteo-State of Mobile Commerce H1 2016

AUSTRALIA: FINTECH

STEADY GROWTH IN THE NUMBER OF ELECTRONIC TRANSACTIONS

- The rise in electronic payments is being propelled by a high internet and smartphone penetration.
- Cheque transactions are declining as they are being replaced by conventional and upcoming electronic payment techniques.

Australia card transaction value (AU$ bn) and volume (mn)

Cheque transaction value (AU$ bn) and volume (mn)

	2013	2014	2015	2016
Volume (mn)	5,871	6,395	6,958	7,666
Value (AU$ bn)	607.9	642.0	672.6	703.1

CAGR FY2013-16

Value:3.7% Volume:6.9%

	2013	2014	2015	2016
Value (AU$ bn)	1,197.0	1,231.8	1,220.3	1,198.7
Volume (mn)	209	181	153	126

CAGR FY2013-16

Value:0.05% Volume:-15.5%

Source: Australian Payments Clearing Association

STRONG FOCUS TO PUSH THE ADOPTION OF DIGITAL CURRENCY

- The Roadmap for Blockchain Standards was published in 2017 by Standards Australia which has laid out the blueprint for Australia's leadership of the developing international blockchain standards.
- Digital currency usage has gained acceptance in Australia. The Australian Stock Exchange along with banks and other industry players have invested heavily in its development.
- The government has stopped the double taxation of digital currency since July 2017. This has made digital transactions cheaper and brought them at par with regular money transactions. This move is expected to significantly boost the growth of digital currency.

Source: Clifford Chance

FAVOURABLE ENVIRONMENT FOR FINTECH STARTUPS

- Australian Securities and Investments Commission (ASIC) implemented a regulatory sandbox in December 2016. The sandbox, allows fintech start-ups to test their product under reduced regulatory pressure:
- To be eligible, a fintech company must:
  - The company must not hold an Australian Financial Services License(AFSL) or Australian Credit License(ACL).
  - It should not be banned from providing financial services.
  - It must hold a minimum of AU$1 million of public interest insurance and should have implemented the required dispute resolution mechanisms.
- The 2017-18 budget has expanded the portfolio of the companies eligible for testing and extended the testing period from 1 year to 2 years.

Source: Department of the Treasury, Government of Australia

AUSTRALIA: DIGITAL TRANSFORMATION INITIATIVES

ICT STRATEGY

The Australian Strategy focuses on **better service delivery, improve government operations, drive productivity**, and to engage with people, the community and business. It supports better, more accessible government services for people when, where and how it suits them, so they can be more productive.

The two most influential models in Australian government ICT strategy and policy are the United States and the United Kingdom, they are both built around imperatives for greater efficiency and productivity.

Australian states have their own ICT Strategies of which New South Wales is well ahead of other jurisdictions. Victorian government has improved their ICT Strategy especially in project management and governance as they were lacking behind in those sections. Queensland comes in mid-range when compared to other states in ICT policy criteria. South Australia is comparable to Queensland whereas other states such as Tasmania and Australian Capital Territory had out dated ICT policies. Northern Territory had never released a comprehensive ICT Strategy.

Title	Jurisdiction
Australian Public Service Information and Communications Technology Strategy 2012-2015	Federal
Queensland Government ICT Strategy 2013-17	Queensland
Tasmanian Government ICT Strategy	Tasmania
Digital WA: Government ICT Strategy 2016-2020	Western Australia
NSW Government ICT Strategy (Digital+), Update 2016	New South Wales
Victorian Government IT Strategy 2016-20	Victoria
SA Connected	South Australia

Note: Latest available ICT Strategy for federal level is represented and State-wise ICT Strategy are consolidated and common initiatives are represented.

AUSTRALIA: DIGITAL TRANSFORMATION INITIATIVES

AUSTRALIAN PUBLIC SERVICE(APS) INFORMATION AND COMMUNICATIONS TECHNOLOGY STRATEGY 2012-2015

DELIVER BETTER SERVICES	
2012	**2015**
Building capability	
The APS understands its overall ICT capability and opportunities to improve services and reduce costs.	Agencies share and re-use common business processes, patterns and standards, increasing the consistency of services.
APS internet gateways are resilient and easier to manage.	Common business processes support sharing capability and better services to people and business.
ICT skills and career strategies effectively position the APS as a preferred employer.	Consideration of ICT implications improves policy and services. APS employees use the ICT to deliver professional advice to government.
Improving services	
Government websites are easy to use and navigate which makes it convenient to deal with the APS as more government services are delivered through mobile devices.	Personalized government online services reduces the time and effort of dealing with government. Government websites achieve Level AA compliance with WCAG 2.0 guidelines.
People and business have a safe, secure and easy way to access online government services.	Automated government services where possible provide seamless services and reduced compliance burden.

IMPROVE THE EFFICIENCY OF GOVERNMENT OPERATIONS	
Investing optimally	
APS decisions on ICT are informed by a clear understanding of its overall ICT investment to reduce duplication and costs.	Standard approaches are identified to reduce the cost of back-office functions.
The APS continues to build on approaches to use its buying power to procure technology at the best value for money.	The APS reduces the financial and environmental costs through better management of data centres and the use of cloud computing services.
APS increased the use cloud computing to improve operations and reduce costs.	
Encouraging innovation	
National Digital Economy Strategy Projects provide people with better services using the National Broadband Network.	Internal barriers to agencies using ICT for innovation have been removed, resulting in more ideas to improve services.
Partnerships with industry, academia and research org. deliver innovative solutions to government service delivery.	Use of new and emerging ICT delivers improved services and government operations.

ENGAGE OPENLY	
2012	**2015**
Creating knowledge	
The APS framework use location-based information to improve government services.	APS location-based information provides people and business with more targeted and need specific services.
Agency capability to analyse and use data is increased, providing new opportunities to inform service and policy decisions.	Better use of government data transforms service and policy development, results in more effective and targeted.
Collaborating effectively	
The widespread use of social media reflects the needs of local communities in service and policy development which can be harnessed to better target the policies.	The APS regularly engages with industry to improve the viability of ICT-enabled projects.
Increasing engagement with industry and other stakeholders improves APS ICT policy and projects.	

Source: Department of Finance and Deregulation

AUSTRALIA: DIGITAL TRANSFORMATION INITIATIVES

INFORMATION TECHNOLOGY STRATEGY FOR THE VICTORIAN GOVERNMENT 2016 TO 2020

INFORMATION AND DATA REFORM	DIGITAL OPPORTUNITY	TECHNOLOGY REFORM	CAPABILITY UPLIFT
PRIORITIES			
Open information and data Holistic management of information Systemic govt. approach for data sharing	Digital services Mobile delivery Digital engagement with citizens	Modern staff productivity systems Sharing corporate systems Shared technology services Cloud-based systems Improved security	Strengthening ICT project delivery and probity Strengthening ICT procurement Transform willingness to engage Increased awareness of contemporary technology approaches
KEY ACTIONS			
Create a data agency to improve policy making and service design Focus release of govt. data on value and quality Build data analytics capacity Develop an information management framework	Service Victoria's development of a digital distribution channel for simple, high volume transactions Consolidate Government's digital presence Develop a framework and standards for digital assets Develop government consultation and collaboration platform	Finalise CenITex's governance arrangements and establish a performance management framework Define the modern employee ICT workplace Determine the case for shared corporate systems Develop clearer advice for cloud and W of G procurement Develop a cyber strategy and develop a State Emergency Response plan for cyber security	Deliver targeted training to board executive's role on ICT projects Strengthen advice and guidance on ICT project delivery planning Launch a public dashboard of ICT projects over $1m Use the Public Sector Innovation Fund to build ICT capability Build VPS open data capability and understanding

Source: Department of Premier and Cabinet, Victoria

SOUTH AUSTRALIA CONNECTED

Initiative	Progress Update	Lead Agency	By
Electronic Court Management System (ECMS)	The project underway will replace its legacy case management systems with a modern court management system. The project's objectives is moving into electronic system and provide more online services to the public and practitioners.	CAA	2021
Open Data	DEWNR commits to deliver a new open data, licensed for commercial reuse, to ensure that the community has access to data managed by the agency. Recent releases include 70 new data sets.	DEWNR	Ongoing
Data Entry Tools for Field Work	Delivering mobile tools for capturing information in the field, including groundwater readings, asset assessment, and soil science.	DEWNR	2019
Modern Organisation	Continuing Cyber Security technical advances with workforce training and rollout of secure file sharing between DEWNR and external partner organisations.	DEWNR	2018
Advanced digital health solutions to the new RAH	The new RAH will be one of the most technologically-advanced hospitals in Australia, with patient records stored electronically and clinicians able to access test results from monitors within patient rooms.	SA Health	2017
Evidence-to-Export Dashboard	A live dashboard to help decision makers prioritise growth opportunities for the South Australian economy.	DPIRSA	Ongoing
ePlanning	An online planning service, accessible on a central portal with access to data in real time was developed. ePlanning streamlines the timeliness, efficiency and transparency of planning outcomes, to reduce costs and improve information-based interactions with the community, investors, construction sector and government.	DPTI	2019
Education Management System	This initiative will deliver a contemporary solution for government schools to manage administration, finance, child and student attendance, etc. The system will improve analysis of data to facilitate teaching and learning, and improve the communication between parents and teachers.	DECD	30 Sept 2018

Source: Department of Premier and Cabinet, South Australia

AUSTRALIA: DIGITAL TRANSFORMATION INITIATIVES

NSW DIGITAL GOVERNMENT STRATEGY ROADMAP

Three digital priorities will be embedded in service design, prioritisation and delivery.		
EXPERIMENT *Be bold - try new ways of delivering*	**START** *Change the way we think about*	**CONTINUE** *Build on what we have to enhance our digital presence*
CUSTOMER EXPERIENCE		
Test use of artificial intelligence (AI) to enhance service accessibility Design services focused on customer life events Multi-tiered Identity Management Framework	Whole of government service architecture and governance Develop a complete approach to manage digital identity and personal information Real time customer engagement and feedback solutions (Feedback Assist)	Continue migration of transactional services to Service NSW MyServiceNSW customer accounts Enhance front line digital Capabilities
DATA		
Use predictive self-learning tools to measure data quality Benchmark data quality across the sector	Create ecosystem to optimise lawful data sharing and use Visualisation and mapping tools across all clusters Enhance quality of data assets such as the single cadastre and address data	Building tools and services for sharing and analysis of data by citizens, industry and government Continue to open up government data while continuing to protect personal and health information
DIGITAL ON THE INSIDE		
Test AI/cognitive/machine learning for service improvement Full automation where appropriate Process simplification to eliminate duplication	Digital by design all new, and significant review of existing government processes Embed agile approach to process and system re-design Digital transformation of whole of government signature processes	Modernization and rationalisation of core operational systems Elimination of paper based processes

Four areas of work underpin the transformation agenda, and support key priorities.		
TECHNOLOGY		
▪ Innovative partnerships with nontraditional suppliers to improve contestability and commissioning	▪ Agile, federated delivery model to surface innovation ▪ Proof of concept shared communications/data networks ▪ Whole of government service-based integration approach	▪ ICT Assurance Framework for value for money ▪ Telecommunications, Software procurement, Service Management Reforms ▪ Complete the GovDC Strategy and embed whole of government ID Hub
CYBER SECURITY		
▪ Use ethical hacker services to expose vulnerability ▪ Conduct annual cyber event to test NSW	▪ Establish Government Chief Information Security Officer ▪ Whole of government capability	▪ Non-negotiable security standards ▪ Improved response and risk management
LEGISLATION		
▪ Legislation that is digital by design	▪ Ensure technological impacts of new legislative proposals ▪ Adopt clearer and consistent terminology in drafting new legislation	▪ Removal of legislative barriers to digital government where relevant
DELIVERY CAPABILITY		
▪ Whole of government ICT portfolio governance ▪ Incentivise digital transformation through agile funding models	▪ Support for agile ways of working ▪ Create networks of excellence ▪ Embed digital in leadership development	▪ Capability assessment across whole of government ▪ Strengthened collaboration with other jurisdictions to embed best practice
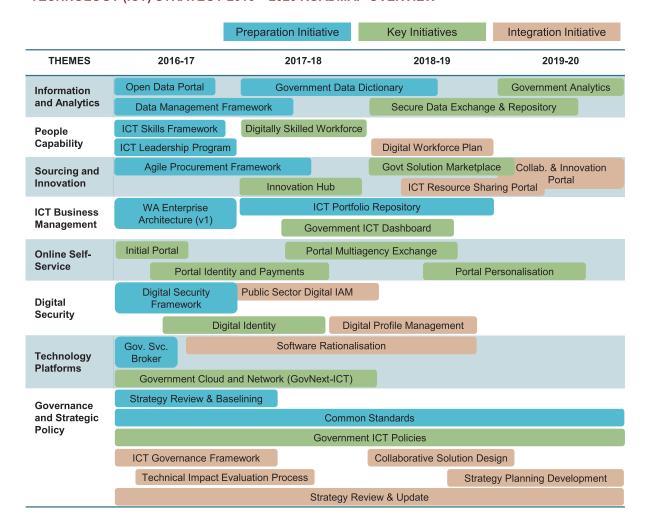
Source: NSW Government

AUSTRALIA: DIGITAL TRANSFORMATION INITIATIVES
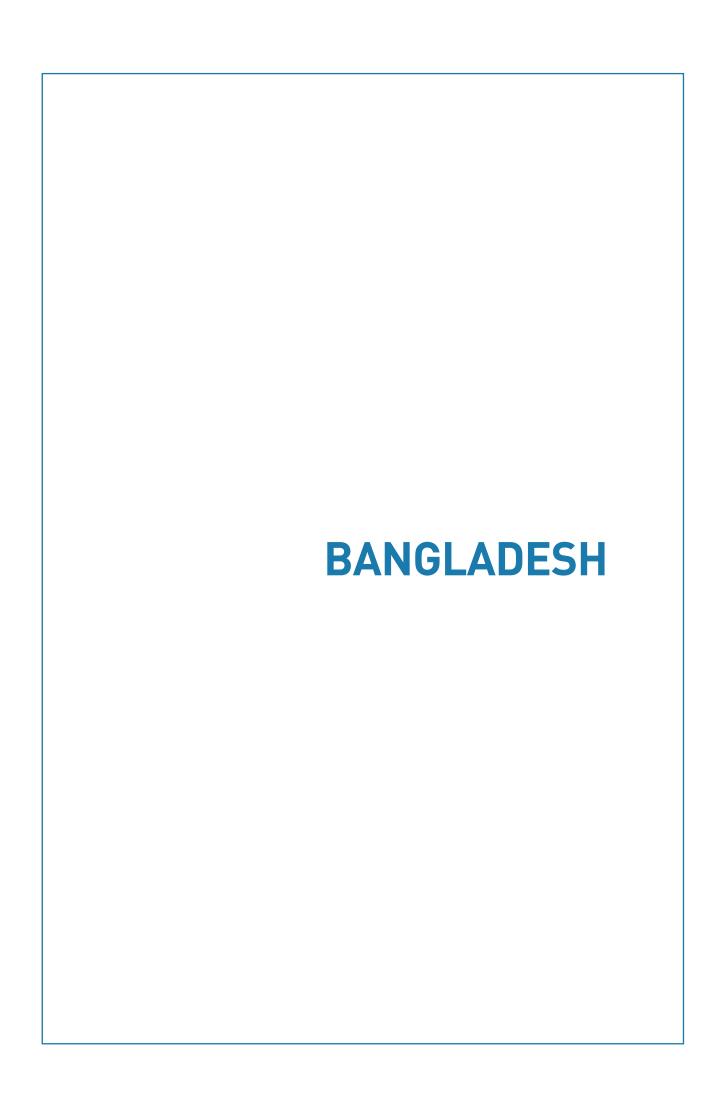
DIGITAL WA: WESTERN AUSTRALIAN GOVERNMENT INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) STRATEGY 2016 – 2020 ROADMAP OVERVIEW

	Preparation Initiative	Key Initiatives	Integration Initiative

THEMES	2016-17	2017-18	2018-19	2019-20
Information and Analytics	Open Data Portal	Government Data Dictionary		Government Analytics
	Data Management Framework		Secure Data Exchange & Repository	
People Capability	ICT Skills Framework	Digitally Skilled Workforce		
	ICT Leadership Program		Digital Workforce Plan	
Sourcing and Innovation	Agile Procurement Framework		Govt Solution Marketplace	Collab. & Innovation Portal
		Innovation Hub	ICT Resource Sharing Portal	
ICT Business Management	WA Enterprise Architecture (v1)	ICT Portfolio Repository		
		Government ICT Dashboard		
Online Self-Service	Initial Portal	Portal Multiagency Exchange		
	Portal Identity and Payments		Portal Personalisation	
Digital Security	Digital Security Framework	Public Sector Digital IAM		
	Digital Identity	Digital Profile Management		
Technology Platforms	Gov. Svc. Broker	Software Rationalisation		
	Government Cloud and Network (GovNext-ICT)			
Governance and Strategic Policy	Strategy Review & Baselining			
	Common Standards			
	Government ICT Policies			
	ICT Governance Framework		Collaborative Solution Design	
	Technical Impact Evaluation Process		Strategy Planning Development	
	Strategy Review & Update			

KEY PERFORMANCE INDICATORS *Whole of Government stretch targets for 2020 and beyond...*

Stability	Transparency	Efficiency	Capability
▪ >90% of the ICT components of major projects are completed on time and within budget ▪ >90% of government digital services meet or exceed agreed and published service levels	▪ >90% of agency chief executives are confident in the quality of their ICT governance to inform good decisions ▪ >75% of financial and information service transactions with the public are done through digital channels	▪ >10% overall reduction in the annual cost of delivering current (2016-17) ICT services by the end of the Strategy ▪ >90% of ICT reinvestment plans deliver the targeted return on investment	▪ >90% of agencies reach maturity level 3 or higher in all strategic core capabilities

Source: Office of the Government Chief Information Officer

BANGLADESH

BANGLADESH: EXECUTIVE SUMMARY

ICT OVERVIEW

- Increased regulations and taxes on the telecom industry has resulted in decline of growth in the past 3 years since it has affected the adoption of 3G services as well as penetration of smartphones.
- Exports have rapidly grown over the last 5 years. In 2015, exports contributed38% to total ITES revenue whereas domestic market contribution was 62%. Export revenue from ICT sector is targeted to cross US$ 1 bn by 2018.
- E-commerce was introduced in Bangladesh in the 90's but has failed capture a substantial market due to poor logistics, low internet & digital penetration.

DIGITAL AGENDA

Objective: Bangladesh's vision is to make the country a higher middle income country by 2021. "Digital Bangladesh" is an integral part of the government's Vision 2021. The philosophy of "Digital Bangladesh" is to ensure people's democracy and rights, transparency, accountability, establishing justice and ensuring delivery of government services in each door through maximum use of technology. The ultimate goal is to improve the daily lifestyle of general people.

4 key pillars of digital Bangladesh are:

- Developing human resources ready for the 21st century
- Connecting citizens in ways most meaningful to them
- Making a productive and competitive market through use of digital technology
- Taking services of the Government to citizens' doorsteps

DIGITAL INITIATIVES

- Increasing Internet Penetration - Within 2020 Bangladesh Telecommunication Regulatory Commission (BTRC) is planning to increase Internet penetration to 100% while broad band coverage to 50%. Till 2016, internet penetration has reached 36.71%.
- Increasing export revenue - Export revenue from ICT sector is expected to cross one billion dollars by 2018 with the Government's target to achieve $5 Billion ICT exports by 2021 while generating 2 million employments in the sector. The country's ICT export exceeded 150 million US dollars in the last fiscal year (FY16).
- ICT Master Plan - by 2021, the Government has planned to compulsorily introduce ICT courses in all the primary and secondary schools of the country. In 2016, it has been successful in implementation of ICT courses for secondary schooling.
- Multimedia Classroom - A plan for phase wise establishment of computer laboratories in Government primary schools is being initiated. First, with 5 computer sets in each school by 2014; then with 10 by 2017 and finally with 20 computer sets by 2021.
- Info-Sarker – Phase 3 of the project is to establish countrywide fiber connectivity by 2018. This will connect 2,600 Union Parishads (lowest administrative level) through fiber optic cables. The project scope also includes expansion of National Data Center, establishing Disaster Recovery Center, Wifi Network, distribution of Tablet PCs etc.

BANGLADESH: EXECUTIVE SUMMARY

DIGITAL INITIATIVES

- Leveraging ICT for Growth, Employment and Governance (LICT) – By 2018 the Government plans to achieve 34,000 skilled manpower for IT and ITES sector.
- Bangladesh Post Office - Under 7th five year plan ending in 2021, the Postal division aims to spread e-Commerce in rural areas through its offices. It will transform each post office into e-Commerce center and develop a postal transportation system to deliver goods from rural to urban and vice versa. By end of 6th five year plan, the Postal division introduced Track & Tracing for International postal items, Internet Based Inquiry system (IBIS), Global Monitoring System (GMS) and Mobile Money Order system, Postal Cash Card and Postal ATM Booths and Post e-pay (Mobile Banking).
- Set up e-shop in 64 districts - In July 2016, the Government announced to set up e-Shop in 64 districts by training 1000 entrepreneurs by 2021. These shops will be connected to a central website listing local businesses and their products. Using the website, they will be able to connect with buyers all over the country thus eliminating the middlemen.
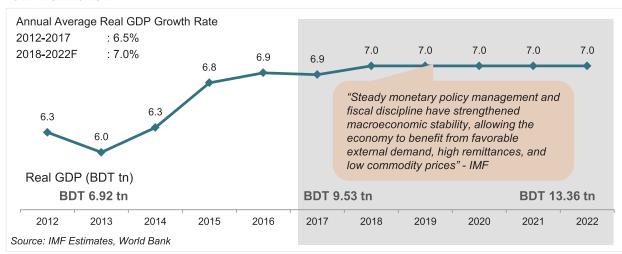
CHALLENGES

- Lack of telecom and digital payment infrastructure are the basic issue needed to be addressed.
- Poor logistics is another critical factor.
- Lack of skilled human resource and capital investment in infrastructure projects are the major issues stopping Bangladesh's ITES sector from achieving full potential at the regional level.
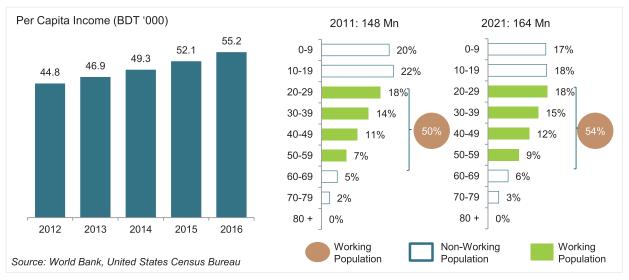
BANGLADESH: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate
2012-2017 : 6.5%
2018-2022F : 7.0%

6.3 6.0 6.3 6.8 6.9 6.9 7.0 7.0 7.0 7.0 7.0

Real GDP (BDT tn)

BDT 6.92 tn   **BDT 9.53 tn**   **BDT 13.36 tn**

2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

"Steady monetary policy management and fiscal discipline have strengthened macroeconomic stability, allowing the economy to benefit from favorable external demand, high remittances, and low commodity prices" - IMF

Source: IMF Estimates, World Bank

PER CAPITA INCOME AND WORKING POPULATION HAVE GROWN OVER THE YEARS

Per Capita Income (BDT '000)

44.8 46.9 49.3 52.1 55.2

2012 2013 2014 2015 2016

Source: World Bank, United States Census Bureau

2011: 148 Mn

Age	%
0-9	20%
10-19	22%
20-29	18%
30-39	14%
40-49	11%
50-59	7%
60-69	5%
70-79	2%
80 +	0%

50%

2021: 164 Mn

Age	%
0-9	17%
10-19	18%
20-29	18%
30-39	15%
40-49	12%
50-59	9%
60-69	6%
70-79	3%
80 +	0%

54%

Working Population   Non-Working Population   Working Population
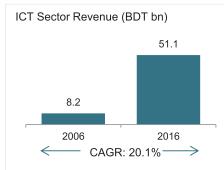
SHARE OF SERVICES & INDUSTRY IN GDP HAS INCREASED OVER THE LAST 10 YEARS

Sector Share of GDP (%)

	2006	2008	2010	2012	2014	2016
Services	55.6	55.6	56.0	56.2	56.3	56.5
Industry	25.4	26.0	26.1	26.7	27.6	28.8
Agriculture	19.0	18.5	17.8	17.1	16.1	14.8

■ Agriculture ■ Industry ■ Services

- Contribution of industries has increased at a modest pace, while share of agriculture has decreased. The increasing contribution of service sector in GDP growth has originated in those sub-sectors which are relatively less capital-intensive in nature .
- The largest employment sector in Bangladesh is agriculture. It employs 47% of the total labor force and contributes 14.8% of the country's GDP as of 2016..
- Garment exports is the backbone of Bangladesh's industrial sector. It accounted for more than 80% of total exports and surpassed US$ 25 bn in 2015.

Source: World Bank

BANGLADESH: IT SERVICES AND SOFTWARE

ITES SECTOR IS EXPECTED TO BE A MAJOR CONTRIBUTOR TO THE ECONOMY

ICT Sector Revenue (BDT bn)

```
           51.1
8.2
2006       2016
   CAGR: 20.1%
```

- ITES industry in Bangladesh is still in its infancy. But the robust growth rate represents an opportunity to build the next thrust sector for Bangladesh exports. With the right strategies, Bangladesh can become a key player in the huge global ITES market.
- Bangladesh ITES sector constitutes of IT services and software sub segments.
- In the future, companies need to focus on becoming export-orientated as the next logical step to drive ITES export growth.
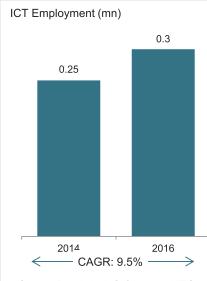
Source: BASIS Soft expo 2017, Leveraging ICT for growth and competitiveness in Bangladesh: IT/ITES industry development-2009

EXPORTS HAVE RAPIDLY GROWN OVER THE LAST 5 YEARS

ITES Exports (BDT bn)

```
                              11.8
                    10.3
          9.7
    8.3
5.1
2011  2012  2013  2014  2015
        CAGR: 23.2%
```

- Apart from the software export trends, in recent years, growing IT automation demand in the domestic market has been a major growth driver for the software sector.
- In terms of major export destinations, North America (Canada and the US) dominates, whereas European countries like the UK, Denmark, the Netherlands and Germany have emerged over the last few years.
- In 2015, exports contributed 38% to total ITES revenue whereas domestic market contribution was 62%. Export revenue from ICT sector is targeted to cross US$ 1 bn by 2018.
- Freelancers are playing a major role in IT outsourcing segment. Presently there are over 10,000 ICT freelancers active in Bangladesh as of 2015 and are expected to increase in the future.

Source: BASIS Soft Expo 2017

EMPLOYMENT IN ITES SECTOR EXPECTED TO INCREASE

ICT Employment (mn)

```
             0.3
   0.25
2014         2016
   CAGR: 9.5%
```
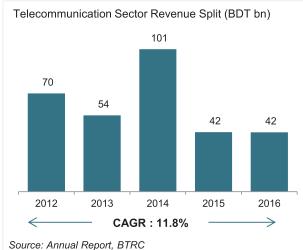
- Bangladesh faces a skill gap in ICT sector as ICT employment is growing at a faster rate. This trend is expected d to continue as the government has identified ICT as the "Thrust Sector" for economic development.
- The government has planned to train approximately 82000 candidates by 2021 under the Digital Bangladesh "Vision 2021" initiative.
- Labor cost in Bangladesh are lower than other countries like India and Sri Lanka which is a major advantage for ITES outsourcing business opportunities.
- To create 100,000 skilled ICT professionals, government has launched Leveraging ICT for Growth, Employment and Governance (LICT) project. Under LICT project, 34,000 individuals have been successfully trained. The government has appointed 'Ernst & Young' to provide top-up ICT training to 10,000 and foundation training to 20,000 candidates. After completion of the training, Ernst & Young will provide employment to 60% of the trainees.

Source: Bangladesh Software and IT Service Industry Recent Trends and Dynamics., BASIS
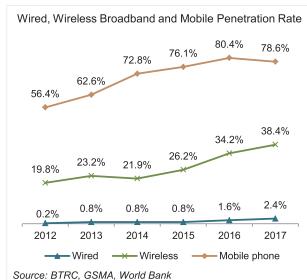
BANGLADESH: TELECOMMUNICATION

REVENUE IS EXPECTED TO REMAIN STAGNANT DUE TO INCREASED REGULATIONS AND TAXES

Telecommunication Sector Revenue Split (BDT bn)

101

70

54

42   42

2012   2013   2014   2015   2016

CAGR : 11.8%

Source: Annual Report, BTRC

- Bangladesh is one of the least developed telecom market in the Asia-Pacific region.
- Consistent increase in taxes on the telecom industry has resulted in decline of growth in the past 3 years since it has affected the adoption of 3G services as well as penetration of smartphones.
- Currently, 18% (2016) of the cost of owning and using a mobile phone in Bangladesh is due to taxation, raising barriers to affordability. It is expected to increase with the increase in taxes being proposed by the government.

MOBILE INTERNET PENETRATION EXPECTED TO INCREASE DUE TO NEW TECHNOLOGY ADOPTION

Wired, Wireless Broadband and Mobile Penetration Rate

56.4%   62.6%   72.8%   76.1%   80.4%   78.6%

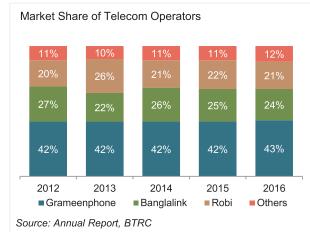19.8%   23.2%   21.9%   26.2%   34.2%   38.4%

0.2%   0.8%   0.8%   0.8%   1.6%   2.4%

2012   2013   2014   2015   2016   2017

Wired   Wireless   Mobile phone

Source: BTRC, GSMA, World Bank

- The mobile phone penetration in Bangladesh has been above 75% for past 3 years but has decreased in the past year as the Government has mandated fingerprint re-registration for all SIMs.
- Internet penetration in Bangladesh has increased by 17% in the past 5 years to approx. 67mn subscribers of which nearly 96% are mobile users.
- At 10 mn users penetration of smartphone of penetration is relatively low in the country but is expected to increase due to availability of cheaper smartphones and rapid rise in social networking.
- The Government is planning to roll out 4G services by early next year with the 4G spectrum auction planned to be held in the 3rd quarter of FY-18
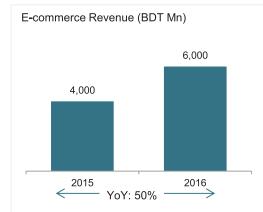
INCREASED COMPETITION LEADING TO SECTOR CONSOLIDATION

Market Share of Telecom Operators

	2012	2013	2014	2015	2016
Others	11%	10%	11%	11%	12%
Robi	20%	26%	21%	22%	21%
Banglalink	27%	22%	26%	25%	24%
Grameenphone	42%	42%	42%	42%	43%

Grameenphone   Banglalink   Robi   Others

Source: Annual Report, BTRC

- In 2016, Airtel Bangladesh merged it's operations with Robi Axiata as it exited the country's telecom sector while the country's oldest operator, Citycell has remained out of service since the 3rd quarter of FY-17 due to its inability to pay outstanding fees.
- Foreign investors like Airtel and NTT DoCoMo shrank their businesses as they failed to achieve their revenue and get rid of deficit.
- Government has been trying to bring in foreign firms to boost competition ahead of the 4G spectrum auction.

BANGLADESH: E-COMMERCE

E-COMMERCE MARKET IS EXPECTED TO WITNESS A MAJOR BOOST IN NEXT 5-10 YEARS

E-commerce Revenue (BDT Mn)

- It is a fast growing sector and employs around 50,000 people in Bangladesh. No official study has been conducted to ascertain the e-commerce market size. However as per estimates it is worth no less than BDT 6,000 mn and is increasing at 50% per year.
- Compared to other countries, Bangladesh is a late entrant in E-Commerce. Yet, this sector observed tremendous growth within a short time.
- E-Commerce can be the next major driver of Economic development but there are some issues that need to be addressed. Otherwise, this sector would never reach its full potential.
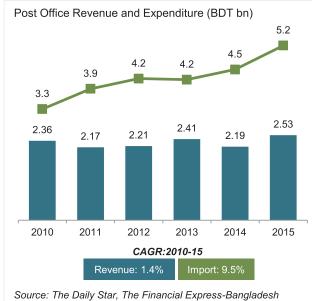
Source: The Daily Star, Light Castle Partners

POOR LOGISTICS, LOW INTERNET AND DIGITAL PENETRATION HINDERING E-COMMERCE GROWTH

- E-commerce was introduced in Bangladesh in the 90's but has failed capture a substantial market due to 3 major challenges:
  - Logistics reach in rural area: The logistics network was unable to service the rural areas and was mainly focused on urban and metro markets.
  - Low internet penetration: Low penetration level of high speed broadband and wireless internet is restricting growth of e commerce in Bangladesh. The government is aggressively working on building the broadband network. The plan is to extend broadband network coverage 30% by 2015 and 40% by 2021.
  - Cash dominates e-commerce transactions: Majority of e-commerce payments are in cash instead of electronic payments as customers prefer Cash on Delivery payments.
- Major international e-commerce players may think of entering the market if these major challenges are worked out.

Source: The Daily Star, The Financial Express-Bangladesh, BD News 24

POST OFFICE HAS THE POTENTIAL TO EMERGE AS THE MARKET LEADER IN E-COMMERCE

Post Office Revenue and Expenditure (BDT bn)

CAGR:2010-15
Revenue: 1.4%   Import: 9.5%

- A pilot project has been launched at 20 post offices in Dhaka to establish partnerships with domestic and international e-commerce companies. The government aims to utilize the vast network consisting of 8,500 post offices to offer e-commerce services and become an e-commerce market leader by 2021.
- E-commerce sector in Bangladesh is growing at a decent rate of 8-10% a year.
- Postal cash cards were launched in 2011. They are like any debit card and can be used at 1,446 post offices. Currently, there are approximately 73,000 postal cash card holders in Bangladesh.
- The postal department has been suffering losses and entry into e-commerce may turn out to be a major revenue generator.
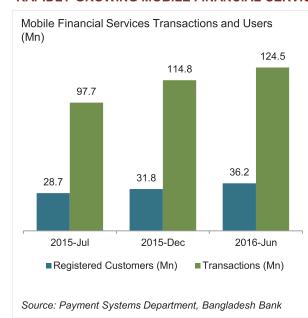
Source: The Daily Star, The Financial Express-Bangladesh

BANGLADESH: FINTECH
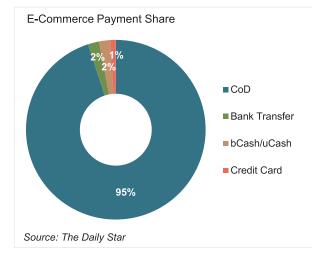
RAPIDLY GROWING MOBILE FINANCIAL SERVICES AND ELECTRONIC PAYMENT INFRASTRUCTURE

Mobile Financial Services Transactions and Users (Mn)

	2015-Jul	2015-Dec	2016-Jun
Registered Customers (Mn)	28.7	31.8	36.2
Transactions (Mn)	97.7	114.8	124.5

■ Registered Customers (Mn) ■ Transactions (Mn)

Source: Payment Systems Department, Bangladesh Bank

- The sudden growth in mobile users and increase in network coverage has made mobile banking services available to unbanked population. This has also reduced the time taken for delivery of remittances.
- As of Jun-16, 25 banks were given permission for mobile financial services, whereas 18 banks/subsidiaries were in operation. From legal and regulatory perspective, only banked model is allowed to operate in Bangladesh.
- Number of ATM's and POS systems have increased which will play a major role in increasing digital transactions.

Technology	Dec-2014	Apr-2016
ATM's	6,202	8,320
POS	22,123	30,363

COD IS STILL THE MAJOR MODE FOR E-COMMERCE PAYMENT IN BANGLADESH

E-Commerce Payment Share

- CoD 95%
- Bank Transfer 2%
- bCash/uCash 2%
- Credit Card 1%

Source: The Daily Star

- Bangladesh economy is heavily reliant on cash. With adult population over 100 mn, only 8 mn people use debit cards, and less than 1 mn people use credit cards.
- The major challenge for migration towards electronic payments for e-commerce websites lies in the customers preference towards cash.
- Low financial literacy, lack of friendly user interface and security concern are some of the other factors that are acting as a hurdle for mass adoption of electronic payments by e-commerce consumers in Bangladesh.
- With the rise in m-commerce, a robust infrastructure is required that facilitates and encourages consumers to shift towards innovative payment solutions.

ENTRY OF PAYPAL IS A MAJOR INITIATIVE TO BOOST DIGITAL FINANCIAL TRANSACTIONS

সোনালী ব্যাংক লিমিটেড
Sonali Bank Limited

BANGLADESH BANK
Central Bank of Bangladesh

PayPal

Source: BD News-24, Dhaka Tribune

- PayPal's introduction in Bangladesh will enable hassle-free digital money transfer, increase access to international consumers and simplify inflow of earnings and remittance from global companies.
- Freelancers in Bangladesh are unable to bring in their earnings in the country due to lack of government authorized and trusted payment gateway. There are approximately 0.55 mn freelancers in Bangladesh and their number is expected to increase.
- PayPal in Bangladesh will ease the transfer of earnings and remittances earned from international clients. It will also help in differentiation between earning and remittance.

BANGLADESH: DIGITAL TRANSFORMATION INITIATIVES

"Digital Bangladesh" is an integral part of the government's Vision 2021. The philosophy of "Digital Bangladesh" comprises ensuring people's democracy and rights, transparency, accountability, establishing justice and ensuring delivery of government services in each door through maximum use of technology-with the ultimate goal to improve the daily lifestyle of general people

DIGITAL BANGLADESH – NATIONAL VISION

The Government is working to make Bangladesh a higher middle income country by 2021

4 KEY PILLARS OF DIGITAL BANGLADESH

Developing human resources ready for the 21st century	**Make the best use of new technologies to build world-class skills in all areas of study especially mathematics, science and English Language.**
Connecting citizens in ways most meaningful to them	**Ensuring access to the Digital Bangladesh for all citizens, poor or rich, literate or illiterate, urban or rural through development of a sustainable channel.**
Making a productive and competitive market through use of digital technology	**Using ICT to provide access to market, ICT export through e-transactions, e-commerce and e-procurement, and empowering business to support the development of the ICT industry**
Taking services of the Government to citizens' doorsteps	**Using ICT to execute authority and function to enforce laws, regulations, or rules with the ultimate objective is to serve the citizen.**

CHALLENGES

Shortage of trained teachers	**Limited access to scientific sources**	**Electricity and power instability**	**Lack of coordination among ministries**

Source: ACHIEVING DIGITAL BANGLADESH BY 2021 AND BEYOND

BANGLADESH: DIGITAL TRANSFORMATION INITIATIVES

The Government of Bangladesh declared 'Vision 2021' with a target to make Bangladesh a middle income country using ICT and development of favorable business environment for innovative companies. Key points of the vision are -

DIGITAL BANGLADESH VISION 2021 - TRANSFORM TOWARDS DIGITAL BANGLADESH

PILLARS

Connecting the Citizens	Human Resource Development
Digital Government for Pro-Poor Services	ICT in Business

ENABLERS

Institutional Framework	Policy and Legal Framework	Banking and Financial Transactions
Delivery Channels for taking Services to Citizens' Doorsteps		Financing Strategies and Public-Private Partnership Framework

IMPACT SECTORS

Agriculture	Health	Land
Administration	Local Government	Social Safety Nets
Parliament	Commerce and Investment	Civil Service
Disaster Management, Environment and Climate Change		Law Enforcement and Judiciary

Source: ACHIEVING DIGITAL BANGLADESH BY 2021 AND BEYOND

BANGLADESH: DIGITAL TRANSFORMATION INITIATIVES

KEY INITIATIVES AND IMPLEMENTATION TOWARDS DIGITAL BANGLADESH (1/2)

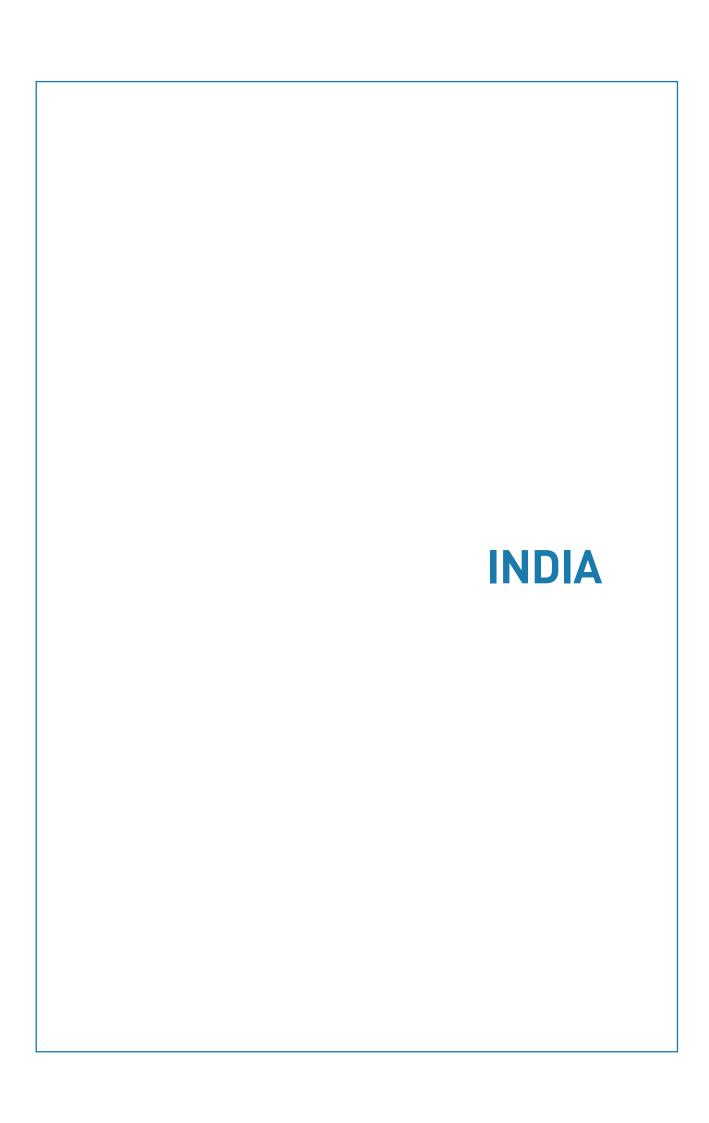| Description	Target
Increasing Internet Penetration	
In 2008, Internet penetration in Bangladesh was 2.67% which increased to 36.71% in 2016. Out of which 90% of the Internet users access Internet via mobile phone network.	Within 2020 Bangladesh Telecommunication Regulatory Commission (BTRC) is planning to increase Internet penetration to 100% while broad band coverage to 50%.
ICT Master Plan	
As per the Government's ICT Master Plan (2012-2021), youth of the country will receive education in science and technology and would eventually become human resources.	ICT courses for secondary schooling has been already introduced and by 2021, it is being planned to compulsorily introduce ICT courses in all the primary schools of the country.
Multimedia Classroom	
To make learning more entertaining and interactive, the Government has developed multimedia class rooms. To manage and monitor these classrooms online, a dashboard (mmc.e-service.gov.bd) has been made.	A plan for phase wise establishment of computer laboratories in Government primary schools is being initiated. First, with 5 computer sets in each school by 2014; then with 10 by 2017 and finally with 20 computer sets by 2021.
Info-Sarker	
Being implemented by Bangladesh Computer Council (BCC), Bangla-GovNet project built the ICT Backbone Network upto the district headquarters. Info-Sarker extends this network up to the sub-district level, connecting the government offices at each level.	In this phase, countrywide fiber connectivity will be established by 2018 by connecting 2,600 Union Parishads (lowest administrative level) through fiber optic cables. The project is expected to cost $155 Million. The project scope also includes expansion of National Data Center, establishing Disaster Recovery Center, Wifi Network, distribution of Tablet PCs etc.
Leveraging ICT for Growth, Employment and Governance (LICT)	
The LICT project was launched in January 2013 aiming to develop a vibrant and healthy Information Technology (IT) and Information Technology-Enabled Services industry in five years.	By 2018 the Government plans to achieve: i. 34,000 skilled manpower for IT and ITES sector. ii. Global market exposure to local IT and ITES leading to improved global awareness iii. Shared IT hosting and remote conferencing facilities for use by GOB agencies

Source: ACHIEVING DIGITAL BANGLADESH BY 2021 AND BEYOND

KEY INITIATIVES AND IMPLEMENTATION TOWARDS DIGITAL BANGLADESH (2/2)

Description	Target
Union Digital Center (UDC)	
Union Digital Centers (UDCs) were established to ensure availability of Information and Communication Technology (ICT) enabled services for citizens living in rural areas. Till 2015, a total of 5,275 Digital Centers have been established all over the country.	As of December 2015, through these UDCs: i. 102 types of public and private services are available. ii. Tk.2 billion revenue earned iii. 75 million online birth registrations have been completed. iv. 4,50,000 applications received for Porcha (Certified copies of land records). v. 100,000 youths and adolescents received computer literacy training vi. 2,88,000 life insurance services issued in rural areas. vii. 3.5 million mobile banking transactions carried out
Bangladesh Post Office	
Bangladesh Post Office has 9,886 offices all over the country. Under 6th five year plan, Bangladesh Postal Division planned to achieve automation and introduce Post e-Center in its post offices.	The Postal division has introduced Track and Tracing for International postal items, Internet Based Inquiry system (IBIS), Global Monitoring System (GMS) and Mobile Money Order system, Postal Cash Card and Postal ATM Booths and Post e-pay (Mobile Banking). Under 7th five year plan, the Postal division aims to spread e-Commerce in rural areas through its offices. It will transform each post office into e-Commerce center and develop a postal transportation system to deliver goods from rural to urban and vice versa.
Set up e-shop in 64 districts	
In July 2016, the Government announced to set up e-Shop in 64 districts. These shops will be connected to a central website listing local businesses and their products. Using the website, they will be able to connect with buyers all over the country thus eliminating the middlemen.	For the e-Shop, the Government has planned to train 1000 entrepreneurs by 2021 who will then train rural people how to use the shop.
Increasing export revenue	
ICT sector is expected to be the next largest sector for exports from Bangladesh overtaking the garments sector in the near future. The country's ICT export exceeded 150 million US dollars in the last fiscal year (FY16)	Export revenue from ICT sector is expected to cross one billion dollars by 2018 with the Government's target to achieve $5 Billion ICT exports by 2021 while generating 2 million employments in the sector.

Source: ACHIEVING DIGITAL BANGLADESH BY 2021 AND BEYOND

INDIA

INDIA: EXECUTIVE SUMMARY

ICT OVERVIEW

- ICT Industry has grown at 7.4% CAGR 2013-17 to reach at US$ 196 bn. IT Services and BPM is the major contributor at 34% to overall ICT market.

- India's IT hardware manufacturing market is quite underdeveloped compared to some of the other Asian economies due to lack of R&D infrastructure and ecosystem. This US$ 13.5 bn industry is one of the fastest growing electronics & IT hardware market but does not possess any major hardware manufacturing capability.

- India has established itself as a leader in IT services and BPM, its software product development market (~US$ 7bn as of 2016-17) is still in the infancy stage. As per the estimates from NASSCOM, the Indian software product industry accounts for 1.6% of global market.

- E-Commerce market stands at US$ 20 bn in 2016 and it is expected to reach US$ 300 bn in 2030 showing 15 times growth.

DIGITAL AGENDA

- In 2015, the government launched the 'Digital India' program with a aim to close the gap between metropolitan hubs and rural areas by fostering investment in digital infrastructure, improving digital literacy, and increasingly providing online services to citizens.
  - This program is centered on three vision areas:
    - o Digital infrastructure as a utility to every citizen.
    - o Governance and services on demand.
    - o Digital empowerment of citizens.
  - It aims to provide a thrust to the nine pillars of growth areas: broadband highways, universal access to mobile connectivity, public internet access, e-governance, electronic delivery of services, information for all, electronic manufacturing, IT for jobs and early harvest programs.

DIGITAL INITIATIVES

- Improve Governance and Digital Inclusion
  - One of the most successful initiatives as a part of Digital India has been the implementation of Aadhar, world's largest biometric-based digital identity system to ensure authentication anywhere, anytime.
    - o Total number of Aadhaar holders reached 1.13 billion as of March 2017 which is nearly covering 99.9% of the country's adult population.
  - The government is also keenly pursuing JAM (JanDhan-Aadhaar-Mobile) Trinity for financial inclusion. More than 0.43 billion bank accounts have been linked with Aadhaar cards of Indians as of March 2017, to plug the leakages of government subsidies.
    - o A total of approximately US$ 27-28 bn have been disbursed through Aadhaar-based Direct Benefit Transfers to beneficiaries of various government schemes. This led to a saving of US$ 7-8 bn in the last 3 years by eliminating middlemen and fictitious claimants.
  - Additionally, the government has also launched a Digital Literacy program the focuses to make at least one adult e-literate (digitally literate) in every household.

INDIA: EXECUTIVE SUMMARY

DIGITAL INITIATIVES

- Increase Digital Payments:
  - One of the strong focuses of the government is to move the country towards a more cashless model. With this in mind, the Reserve Bank of India, in 2016 launched the unified payments interface (UPI), a payment system that allows money transfer between any two bank accounts by using a smart phone.
    - o The move comes as the number of ecommerce and mobile wallet players are increasing. UPI will not only make e-commerce transactions easier but also facilitate micropayments and person-to-person payments.
  - The government's strong thrust on increasing cashless transactions has led to a tremendous growth in fintech during 2016. This growth is likely to continue in the future since India has a huge underpenetrated market. Currently there are over 600 fintech startups in India and government approach seems positive driven by initiatives such as 11 payment bank licenses granted in 2015.
  - Growth in fintech will have a direct positive impact on the already fast growing e-commerce market in India, which is projected to reach US$ 300 billion market by 2030. India's e-commerce penetration as a share of total retail is still very low at less than 1%, presenting ample untapped opportunity.

CHALLENGES

The biggest challenge faced by Digital India program is the slow / delayed infrastructure development. While the government has sped up the projects related to it, there is still a long, long way to go.

- BharatNet's slow progress
  - The government aims to bridge the digital divide in rural and remote areas by providing affordable broadband at a minimum speed of 100 Mbps through a robust network infrastructure (BharatNet initiative), previously called the National Optical Fibre Network.
  - Under the BharatNet initiative, the government had planned to connect 250,000 villages with the National Optical Fibre Network (NOFN) by 2016. The deadline has been revised several times; with only around 9% of villages (22, 333) having been provided active broadband connectivity, as of July 2017. Last-mile connectivity will continue to be a challenge in forthcoming years owing to its unaffordability for most Indians.
- Other Major challenges
  - For Digital India to have a large scale impact on citizens across the nation the digital divide needs to be addressed through last mile connectivity in remote rural areas, as currently, over 55,000 villages remain deprived of mobile connectivity.
  - Spectrum availability in Indian metros is about a tenth of the same in cities in developed countries. This has put a major roadblock in providing high speed data services.
  - India also needs over 80 lakh hotspots as against the availability of about 31,000 hotspots at present to reach the global level of one Wi-Fi hotspot penetration for every 150 people.

INFRASTRUCTURE DEVELOPMENT – A MAJOR CONCERN FOR THE SUCCESS OF 'DIGITAL INDIA'

- Possible steps to improve speed of infrastructure development
    - PPP models must be explored for sustainable development of digital infrastructure, as has been the case for civic infrastructure projects like roads and metro.
    - The government should try to make additional spectrum available to telecom service providers for deployment of high speed data networks.
    - Moreover, startups need to be incentivized for the development of the last mile infrastructure and localized services and applications.

INDIA LAGS BEHIND IN LOCAL HARDWARE AND SOFTWARE PRODUCTS MANUFACTURING

- Hardware
    - India is a huge consumption market for ICT hardware; however its local hardware manufacturing market is quite underdeveloped compared to some of the other Asian economies due to lack of R&D infrastructure and ecosystem.
    - 'Make in India - Net Zero Import in Electronics' is a positive step in this direction through which the government is creating favorable policies to attract foreign companies to set up their base in India. The mobile assembly / manufacturing market has responded well to this. With 72 new mobile manufacturing units set up since 2015, India has emerged as a mobile manufacturing hub.
    - Further, the focus is also towards developing electronics manufacturing clusters, IT incubators, and electronics academies, etc. to boost local electronics manufacturing activities. But India still has a long way to go in this sector.
- Software
    - Although India has established itself as a leader in IT services and BPM, its software product development market (~US$ 7bn as of 2016-17) is still in the infancy stage. As per the estimates from NASSCOM, the Indian software product industry accounts for 1.6% of global market.
    - In 2016, the government issued the draft of first ever National Software Policy with an aim to increase share of Indian software products in global market by 10 fold by 2025.

INDIA: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate
2012-2017   : 6.9%
2017-2022F   : 7.8%

5.5   6.5   7.2   7.9   6.8   7.2   7.7   7.8   7.9   8.1   8.2

Real GDP (US$)

$1.86Tr $2.45Tr $3.93Tr

As per IMF estimates, if India continues to expand annually at an average of 7.8%, it will become the third largest economy by 2030.

2012   2013   2014   2015   2016   2017   2018   2019   2020   2021   2022

Source: IMF Estimates, World Bank
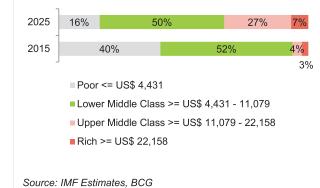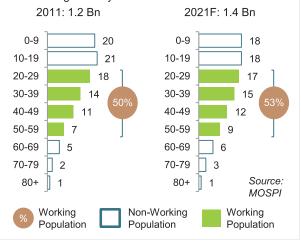
RISING PER CAPITA INCOME LEVELS

India's per capita income has grown more than 3x times from US$580 in 2006 to US$1,450 in 2016. Rising income levels is leading to the emergence of a strong middle class segment, with a much higher consumption demand. The Indian upper middle segment is expected to grow from 4% in 2015 to 27% by 2025.

| 2025 | 16% | 50% | 27% | 7% |
| 2015 | 40% | 52% | 4% | |

3%

- Poor <= US$ 4,431
- Lower Middle Class >= US$ 4,431 - 11,079
- Upper Middle Class >= US$ 11,079 - 22,158
- Rich >= US$ 22,158

Source: IMF Estimates, BCG

SHARE OF YOUNG AND WORKING POPULATION

India's growth story is driven by domestic consumption. The country is blessed with a unique demographic situation where 50-55% of the total population has been under the age of 30 years.

2011: 1.2 Bn   2021F: 1.4 Bn

	2011		2021F
0-9	20	0-9	18
10-19	21	10-19	18
20-29	18	20-29	17
30-39	14	30-39	15
40-49	11	40-49	12
50-59	7	50-59	9
60-69	5	60-69	6
70-79	2	70-79	3
80+	1	80+	1

50%   53%

Source: MOSPI

% Working Population   Non-Working Population   Working Population

SERVICES SECTOR IS THE LARGEST CONTRIBUTOR TO INDIA'S GDP

Although service sector has been the most dominant one, the government is increasingly focusing on growing it's share of the manufacturing segment and is taking adequate measures. In 2011, India announced its National Manufacturing Policy and its objective of increasing manufacturing sector growth to 2-4% more.

GDP Segmentation (%)

	FY06	FY08	FY10	FY12	FY14	FY16
Services	53.7	54.5	57.1	57.4	51.0	53.4
Industry	28.0	28.7	28.3	28.2	31.6	31.3
Agriculture & Allied Services	18.3	16.8	14.6	14.4	17.5	15.4

- Agriculture & Allied Services - Industry - Services

Major reforms / initiatives launched by government in the past 2-3 years:
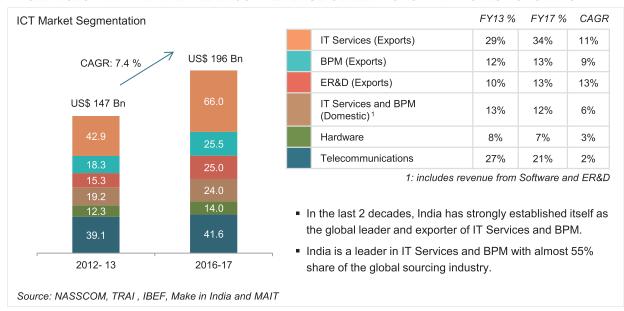
- Implementation of GST: One Nation, One Tax
- Demonetization of Old Currency
- Digital India and Make in India : Changing India's Global Image

Source: MOSPI

INDIA: ICT INDUSTRY OVERVIEW

IT SERVICES AND BPM ARE THE MAJOR REVENUE GENERATORS AND FASTEST GROWING

ICT Market Segmentation

CAGR: 7.4 %

US$ 196 Bn

US$ 147 Bn

2012- 13	2016-17
42.9	66.0
18.3	25.5
15.3	25.0
19.2	24.0
12.3	14.0
39.1	41.6

		FY13 %	FY17 %	CAGR
	IT Services (Exports)	29%	34%	11%
	BPM (Exports)	12%	13%	9%
	ER&D (Exports)	10%	13%	13%
	IT Services and BPM (Domestic)[1]	13%	12%	6%
	Hardware	8%	7%	3%
	Telecommunications	27%	21%	2%

1: includes revenue from Software and ER&D

- In the last 2 decades, India has strongly established itself as the global leader and exporter of IT Services and BPM.
- India is a leader in IT Services and BPM with almost 55% share of the global sourcing industry.

Source: NASSCOM, TRAI , IBEF, Make in India and MAIT

SERVICES EXPORTS HAVE OUTPACED DOMESTIC SALES OVER THE PAST FIVE YEARS

IT Services, BPM, Software and ER&D (US$ Bn)

2012-13	2013-14	2014-15	2015-16	2016-17(E)
19.2	19.0	21.0	21.7	24.0
76.5	87.3	97.8	107.8	117.0

Domestic CAGR (2013-17) : 5.7%

Export CAGR (2013-17) : 11.2%

Exports: IT Services, BPM, Software and ER&D (US$ Bn)

2012- 13	2013- 14	2014-15	2015-16	2016-17(E)
15.3	17.7	20.0	22.4	25.0
18.3	20.4	22.5	24.4	26.0
42.9	49.2	55.3	61.0	66.0

Software and ER&D CAGR (2013-17): 13.1%

BPM CAGR (2013-17): 9.2%

IT Services CAGR (2013-17): 11.4%

Source: NASSCOM

EXPORT SPLIT OF IT SERVICES, BPM AND ER&D SERVICES

IT Services Exports (2016-17)

- 47%
- 12%
- 13%
- 8%
- 20%

- CADM
- IS Outsourcing
- Software Testing
- Others
- High End Services

BPM Exports (2016-17)

- 40%
- 13%
- 1%
- 1%
- 2%
- 21%
- 22%

- CIS
- Finance & Accounting
- Knowledge Services
- Human Resource Outsourcing
- Procurement & Logistics
- Other Horizontals
- Vertical Specific

Source: NASSCOM

INDIA: IT SERVICES, BPM AND ER&D SERVICES

WHILE TRADITIONAL SPEND IS DECLINING, DIGITAL IS RAPIDLY ACCELERATING

Global IT Services and BPM Spend Share By Segments

US$1.5Tr   US$1.6Tr

	2014	2016
Digital Spend	10%	20%
Traditional Spend	90%	80%

Digital spend 2X growth

- Traditional Spend
- Digital Spend

India IT Services and BPM Exports Revenues Share By Segments

US$ 87Bn   US$ 108Bn

	2014	2016
Digital Spend	4%	14%
Traditional Spend	96%	86%

Digital spend 4X growth

However, according to NASSCOM, in terms of workforce deployed, only about 10% of the 3.7 million IT workers have digital skills. This is a major challenge in front of the Indian IT companies.

- Traditional Spend
- Digital Spend

Source: NASSCOM

FIGURES OF INDIAN IT COMPANIES ALSO CLAIM TO SUPPORT THE TREND TOWARDS DIGITAL

Share of Digital Business – Leading IT Companies[2]

TCS US$ Bn

31.5%
3.0

53.2%
2.3

2015-16   2016-17

WIPRO[1] US$ Mn

Jan-Mar 2017   432

28%

Apr-Jun 2016   338

1 - Wipro started disclosing its digital revenue from Apr-June'16 quarter and hence a year-over-year comparison cannot be drawn

- Disruptive technologies such as social media and data analytics, cloud computing and IoT are offering new avenues of growth across verticals for IT companies.
- TCS claims its digital business grew 31.5% in 2016-17 and now generates US$3 bn in business.
- Wipro claims its digital business grew 28% to US$432 mn in January-March from US$338 mn in the April-June period in 2016-17.
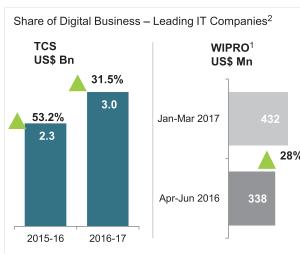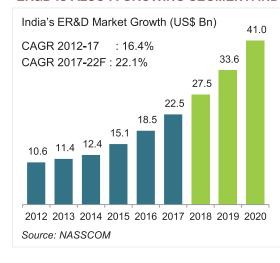- Infosys claimed 45% of its revenue(both digital and non-digital) stems from new offerings and is growing at about 20% year-over-year (y-o-y) in constant currency terms.
- However, these claims by Indian companies are doubted by many industry experts. They have questioned if existing traditional contracts are merely getting re-batched as digital.

2 - TCS, Infosys and Wipro account for ~26% of total Indian IT Services and BPM market (excluding telecom and hardware).
Source: Company Reports, Press Releases, IBEF

ER&D IS ALSO A GROWING SEGMENT. INDIA IS POISED TO MAINTAIN IT'S GLOBAL DOMINANCE

India's ER&D Market Growth (US$ Bn)

CAGR 2012-17   : 16.4%
CAGR 2017-22F : 22.1%

2012	2013	2014	2015	2016	2017	2018	2019	2020
10.6	11.4	12.4	15.1	18.5	22.5	27.5	33.6	41.0

Source: NASSCOM
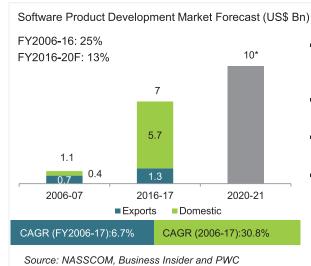
- According to NASSCOM, Indian ER&D services market expected to reach US$40-45 bn by 2020 with exports revenues at about US$35-40 bn and domestic revenues at US$4-6 bn.
- India is projected to account for 35-40% of the global ER&B business by 2020.
- India today is a home to over 600 local and 400 global ER&D organizations with most being the second largest centre outside their home location employing over 200,000 engineers.
- By 2025, NASSCOM predicts that India's ER&D segment will grow 3X to reach anywhere between US$70-90 bn, at a CAGR of 15%. Numerous opportunities exist across business sectors particularly in the areas of electrical / electronics, embedded systems, cybersecurity.

INDIA: SOFTWARE PRODUCT DEVELOPMENT
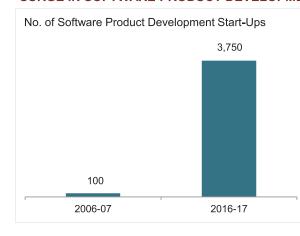
SOFTWARE PRODUCT DEVELOPMENT MARKET – STILL IN NASCENT STAGES

Software Product Development Market Forecast (US$ Bn)

FY2006-16: 25%
FY2016-20F: 13%

10*

7

5.7

1.1

0.7
0.4
1.3

2006-07   2016-17   2020-21

■ Exports   ■ Domestic

CAGR (FY2006-17):6.7%   CAGR (2006-17):30.8%

Source: NASSCOM, Business Insider and PWC   ** Includes both exports and domestic. Split was not available.*

- The global software product industry is estimated to be around US$411 bn as of 2016 and is expected to reach around $1 trillion by 2025.
- However, Indian software product industry is still in its infancy stage.
- As per the estimates from NASSCOM, the Indian software product industry accounts for 1.6% of global market.
- The total revenue of software product industry in India in 2016-17 stood at US$ 7 bn, out of which US$1.3 bn is from exports and US$ 5.7 bn is from domestic market.
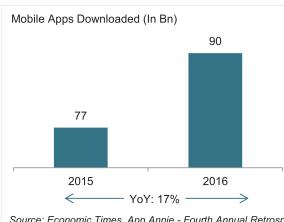
SURGE IN SOFTWARE PRODUCT DEVELOPMENT START-UPS OVER THE YEARS

No. of Software Product Development Start-Ups

3,750

100

2006-07   2016-17

- In 2016, the government issued the first draft of National Software Policy which aims to increase share of Indian software products in global market by 10 fold by 2025.
- The aim of the policy is to create conducive environment for creation of 10,000 technology start-ups to develop software products that are globally competitive.
- The policy targets to create 1mn jobs by the end of 2017, and additional 2.5mn by 2025.

Source: NASSCOM

INDIA IS THE FASTEST GROWING MOBILE APPLICATION MARKET IN THE WORLD

Mobile Apps Downloaded (In Bn)

90

77

2015   2016

← YoY: 17% →
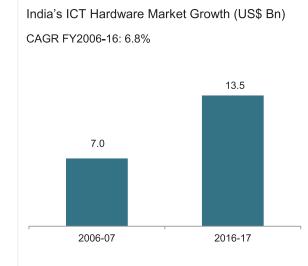
- Mobile Application Development is the major growth driver in software products segment. It is rapidly growing due to increase in number of smart phones users in India.
- Smartphone users are demanding better applications and want to update existing ones, which in turn created a huge scope for Android application development in India.

Source: Economic Times, App Annie - Fourth Annual Retrospective Report, 2016

INDIA: ICT HARDWARE

HUGE CONSUMPTION MARKET FOR HARDWARE BUT STAGNATED LOCAL PRODUCTION

India's ICT Hardware Market Growth (US$ Bn)

CAGR FY2006-16: 6.8%

13.5

7.0

2006-07   2016-17
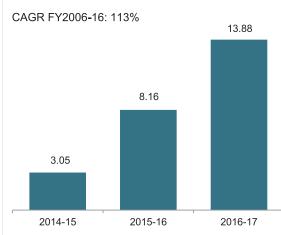
- India is one of the fastest growing electronics and IT hardware market but does not possess any major hardware manufacturing capability .
- Lack of R&D infrastructure facilities is the major issues for under developed hardware sector in India. In order to build robust ecosystem and boost local manufacturing,
- India needs to invite global hardware manufacturers to set up R&D and production facilities in India. Make in India is a positive step taken in this direction.

Source: NASSCOM

CURRENT POLICIES FAVOURING MOBILE HANDSET ASSEMBLY / MANUFACTURING

To promote local manufacturing of mobile handsets, the government has exempted parts, components and accessories for making mobile devices from basic customs duty and excise duty. This has led to a slew of overseas and local device makers make a beeline to set up factories in India. Some have also started local assembly, the first step towards full-scale manufacturing.

Value of Mobile Phones Assembled / Manufactured in India (US$ Bn)

CAGR FY2006-16: 113%

13.88

8.16

3.05

2014-15   2015-16   2016-17

- Foxconn announced a US$ 5 bn investment to set up mobile manufacturing plant. Foxconn plans to make India a parallel manufacturing hub to China for export to key markets such as Europe and the US.
- Lenovo Group Ltd. started assembly of smart phones at its facility in Chennai run by Singapore-based contract manufacturer Flextronics International Ltd.
- In July 2015, Karbonn Mobile India Pvt. Ltd set up a 150,000 sq. ft plant in Noida .
- Lava International Ltd plans to invest US$ 0.4 Bn to set up one more factory in the country by 2017.
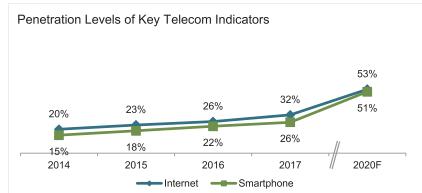
But for PC manufacturers, in addition to the state's value-added tax that varies from 4 to 12%, there is 16% tax that manufacturers need to pay, while for PC imports, only 17.42% tax is applicable, discouraging domestic manufacturing.

Source: MEITY, MAIT

INDIA: TELECOMMUNICATIONS

SIGNIFICANT GROWTH EXPECTED ACROSS THE KEY TELECOM INDICATORS

Penetration Levels of Key Telecom Indicators

- Increasing rural network coverage is expected to be a major growth driver for telecom companies in India, who are focusing on building support infrastructure and innovative service delivery models.
- Mobile internet users in India is estimated to reach around 420mn by June 2017 with the rural India growing at a much higher rate than urban India.
- Growth in Urban India is expected to decline due to higher penetration (51%) while rural India with 16% penetration is the future high growth market.

Parameters	FY14	FY15	FY16	FY17	FY20f
Overall Teledensity (%)	75	79	83	93	96
Urban (%)	145	149	154	172	182
Rural (%)	44	48	51	57	62
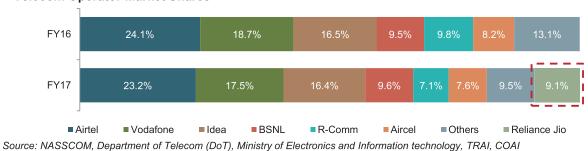
Source: Telecom Regulatory Authority of India (TRAI), Internet and Mobile Association of India (IAMAI)

IMPACT OF PRICE WAR INITIATIED BY RELIANCE JIO
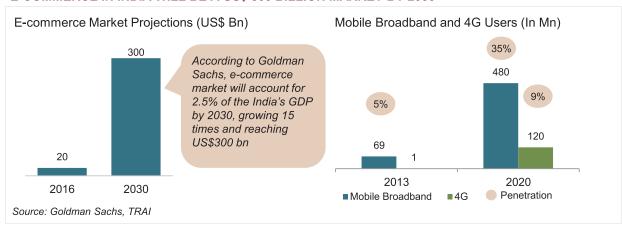
- The aggressive pricing of Reliance Jio Infocomm Ltd has forced other telecom firms to cut prices. The Department of Telecom (DoT) has predicted that the industry's revenue is expected to further decline.
- Analysts and government officials believe that the free offers and continuation of data and voice tariffs for promotional purpose by Reliance Jio has forced rivals to respond with bundled voice and data plans. Price cuts on data are in the range of 45-65%, besides free local and STD calls.
- This has led to a slowdown in revenues which is expected to adversely impact the capacity of the operators to invest in capex, in turn impacting investments in network and technology.
- The DoT projected that an investment of around US$ 380bn would be required over the next 3-4 years in expansion of VoLTE and 4G, which appears difficult looking at the stretched balance sheets of telecom companies.

Telecom Operator Market Shares

Source: NASSCOM, Department of Telecom (DoT), Ministry of Electronics and Information technology, TRAI, COAI
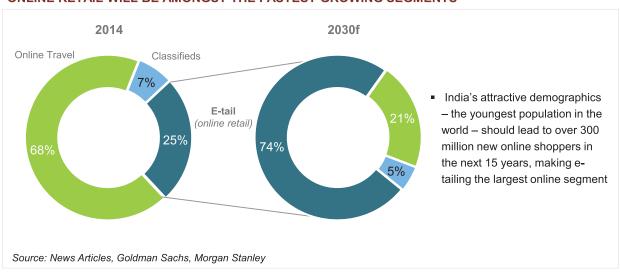
INDIA: E-COMMERCE
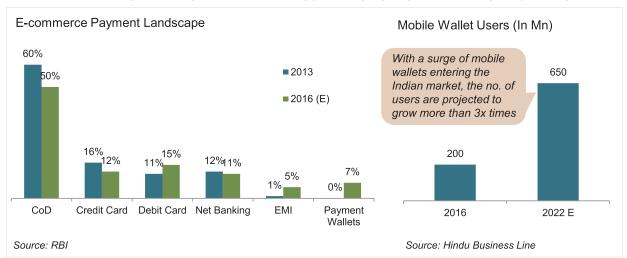
E-COMMERCE IN INDIA WILL BE A US$ 300 BILLION MARKET BY 2030

E-commerce Market Projections (US$ Bn)

300

20

2016   2030

According to Goldman Sachs, e-commerce market will account for 2.5% of the India's GDP by 2030, growing 15 times and reaching US$300 bn

Mobile Broadband and 4G Users (In Mn)

35%

480

5%

9%

69   120

1

2013   2020

■ Mobile Broadband   ■ 4G   ● Penetration

Source: Goldman Sachs, TRAI

ONLINE RETAIL WILL BE AMONGST THE FASTEST GROWING SEGMENTS

2014   **2030f**

Online Travel   Classifieds

7%

E-tail
(online retail)

68%   25%   74%   21%

5%

■ India's attractive demographics – the youngest population in the world – should lead to over 300 million new online shoppers in the next 15 years, making e-tailing the largest online segment

Source: News Articles, Goldman Sachs, Morgan Stanley

PAYMENT WALLETS HAVE DOMINATED THE E-COMMERCE SPACE IN THE LAST 2-3 YEARS

E-commerce Payment Landscape

60%
50%

16%
12%   11%   15%   12%   11%

1%   5%

0%   7%

CoD   Credit Card   Debit Card   Net Banking   EMI   Payment Wallets

■ 2013
■ 2016 (E)

Source: RBI

Mobile Wallet Users (In Mn)

With a surge of mobile wallets entering the Indian market, the no. of users are projected to grow more than 3x times

650

200

2016   2022 E

Source: Hindu Business Line

INDIA: FINTECH

GOVERNMENT'S STRONG AMBITION TO GO CASHLESS IS DRIVING THE FINTECH INDUSTRY

The Government of India along with regulators such as SEBI and RBI are aggressively supporting the ambition to become a cashless digital economy and emerge as a strong fintech ecosystem via both funding and promotional initiatives. Triggered by the demonetization of old currency notes in Nov'16, the traditional cash-driven Indian economy is responding well to the fintech opportunity.

Fintech Sector Transaction Value (US$ Bn)

- 2016: 33
- 2022 E: 109

Fintech Software Market (US$ Bn)

- 2016: 1.2
- 2022 E: 3.4

Transaction Volume of Mobile Payment (Bn)

- 2016: 2.9
- 2022 E: 460

Source: KPMG-Fintech in India, ASSOCHAM Value Notes Analysis
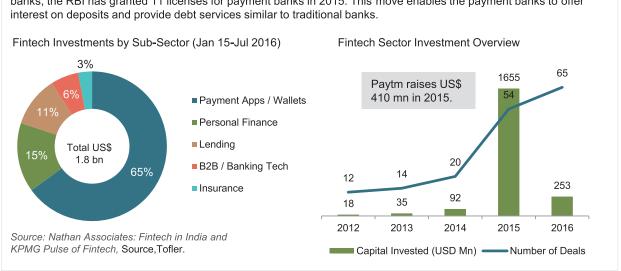
INDIA STILL PRESENTS A HUGE UNTAPPED OPPORTUNITY

M-Wallet Market :(US$ Bn)

CAGR: 216.7%

- 2016: 0.02
- 2022: 22.9

M-Wallet Transaction Volume and Value

Volume CAGR: 175.1%
Value CAGR: 231.8%

- 2016: Volume 0.6, Value 3.1
- 2022: Volume 260, Value 4,155

Volume (Bn) / Value (US$ Bn)

Source: ASSOCHAM, RBI

Debit and Credit Card Penetration (%)

Debit Cards:
- 2012: 22%
- 2013: 26%
- 2014: 31%
- 2015: 43%
- 2016: 51%
- 2017: 64%

Credit Cards:
- 2012: 1%
- 2013: 2%
- 2014: 2%
- 2015: 2%
- 2016: 2%
- 2017: 2%

Debit Cards / Credit Cards

Mobile wallets market is relatively underpenetrated in India but is gaining popularity in a very short time span. It has a huge scope to grow further since card penetration in India is relatively low compared to global standards.

FINTECH SECTOR IS EXPECTED TO CAPTURE MAJOR SHARE IN DIGITAL PAYMENTS MARKET

Currently, India has over 600 Fintech startups in the space. Due to the growing popularity and acceptance of payment banks, the RBI has granted 11 licenses for payment banks in 2015. This move enables the payment banks to offer interest on deposits and provide debt services similar to traditional banks.

Fintech Investments by Sub-Sector (Jan 15-Jul 2016)

Total US$ 1.8 bn

- Payment Apps / Wallets: 65%
- Personal Finance: 15%
- Lending: 11%
- B2B / Banking Tech: 6%
- Insurance: 3%

Source: Nathan Associates: Fintech in India and KPMG Pulse of Fintech, Source,Tofler.

Fintech Sector Investment Overview

Paytm raises US$ 410 mn in 2015.

Capital Invested (USD Mn):
- 2012: 18
- 2013: 35
- 2014: 92
- 2015: 1655
- 2016: 253

Number of Deals:
- 2012: 12
- 2013: 14
- 2014: 20
- 2015: 54
- 2016: 65

Capital Invested (USD Mn) / Number of Deals

INDIA: DIGITAL TRANSFORMATION INITIATIVES

DIGITAL INDIA PROGRAMME OVERVIEW

Digital India, a flagship program of the Government of India with a vision to transform India into a digitally empowered society and knowledge economy.

Nine Pillars of Digital India

Broadband Highway	*e-Governance*	*IT for Jobs*
Universal access to Internet	*Information for All*	*Electronics Manufacturing*
Public Internet Access Programme	*e-Kranti - Electronic delivery of services*	*Early Harvest Programmes*
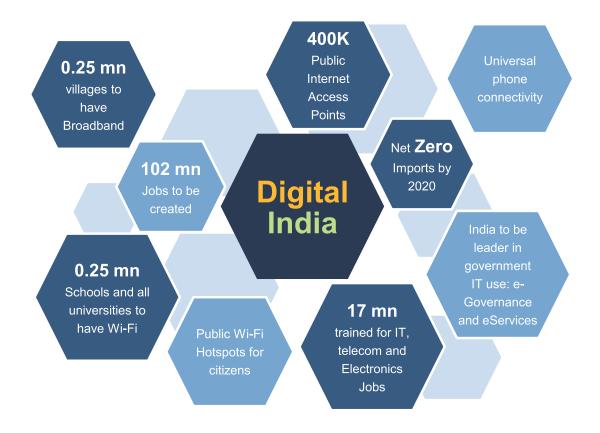
How Digital India will benefit people?

Digital India

- **0.25 mn** villages to have Broadband
- **400K** Public Internet Access Points
- Universal phone connectivity
- **102 mn** Jobs to be created
- Net **Zero** Imports by 2020
- India to be leader in government IT use: e-Governance and eServices
- **0.25 mn** Schools and all universities to have Wi-Fi
- Public Wi-Fi Hotspots for citizens
- **17 mn** trained for IT, telecom and Electronics Jobs

"We want to have one mission and target: Take the nation forward – Digitally, and Economically "

– Narendra Modi, Prime Minister of India

Source: Digital India Website

INDIA: DIGITAL TRANSFORMATION INITIATIVES

IndiaStack is a set of APIs that allows governments, businesses, startups and developers to utilize an unique digital Infrastructure to solve India's hard problems towards presence-less, paperless, and cashless service delivery.

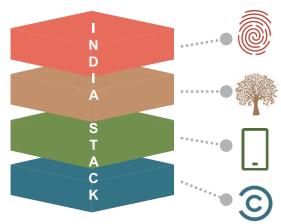## INDIA STACK – TECHNOLOGY PLATFORM TO TRANSFORM INDIA INTO A CASHLESS ECONOMY

Technology Layers and Key APIs for India

INDIA STACK

Presenceless Layer
Unique digital biometric identity with open access from anywhere in India

Aadhaar
(Unique digital identity)

Paperless Layer
Digital records move with an individual's identity

Digilocker, eSign, eKYC

Cashless Layer
Single interface to all bank accounts and wallets in India

Unified Payments Interface (UPI), IMPS

Consent Layer
Free and secure movement of data

Open Personal Data Store

INDIA STACK ECOSYSTEM

1 Digital Locker Provider

4 eSign ESPs

23 KSA **216** KUA
Aadhaar eKYC

AADHAAR

25 ASA **293** AUA
Aadhaar Authentication

127 Banks (AEPS)

830 Banks (APB)

32 Banks (UPI)

ESP: eKYC eSign Service Providers
KSA: eKYC Service Agency
KUA: eKYC User Agency
ASA: Authentication User Agency
AUA: Authentication Service Agency
APB: Aadhaar Payment Bridge
AEPS: Aadhaar Enabled Payment System

INDIA STACK BY NUMBERS

1.064 Bn Aadhaars issued in 6 years	**339 Mn** Aadhaar-linked bank accounts
2.98 Bn Aadhaar authentications	**150 Mn** eKYC in 3 years

Source: IndiaStack, UIDAI Website, News Articles

INDIA: DIGITAL TRANSFORMATION INITIATIVES

IndiaStack is being implemented in stages. Key enablers of this initiative which are implemented in different stages are shown below-

AADHAAR - "WORLD'S LARGEST BIOMETRIC IDENTIFICATION SYSTEM"

- Aadhaar is the world's largest biometric ID system, with over 1 bn Indian citizens enrolled as of June 2017.
- Over 99% of Indians aged 18 and above had been enrolled in Aadhaar. World Bank Chief Economist Paul Romer described Aadhar as "the most sophisticated ID programme in world".
- Mr. Nandan Nilekani, co-founder of Infosys and an Information technology pioneer was appointed to lead this transformational initiative.
- Indian government is ramping up the use of Aadhaar for the delivery of subsidies and other social welfare benefits, and there is also evidence that Aadhaar is playing a key role in India's migration to a cashless economy. It has the potential to spur enterprise and consumer applications.
- (UIDAI) has launched 'mAadhaar app', giving a further boost to the government's Digital India initiative. mAadhar app aims to let users carry their Aadhaar identity on their smartphones.
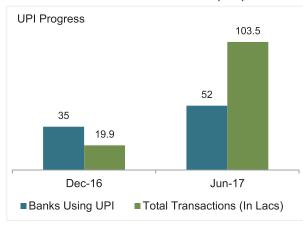
SMART CITIES MISSION

- Smart Cities Mission is an urban renewal and retrofitting program by the Government of India with a mission to develop 100 cities all over the country making them citizen friendly and sustainable. The Union Ministry of Urban Development is responsible for implementing the mission in collaboration with the state governments of the respective cities.
- Smart city mission envisions of developing an area within 100 cities in the country as model area based on an area development plan, which is expected have rub-off effect on other areas of the city and near by cities and towns.
- It is five-year program, where all of the Indian states and Union territories are participating except West Bengal by nominating at-least one city for the smart city challenge. Financial aid will be given by the central and state government between 2017 - 2022 to the cities and mission starts showing results from 2022 on wards.
- 100 Smart Cities Mission" was launched by Prime Minister Narendra Modi in June 25, 2015. A total of INR 98,000 crore (US$15 billion) has been approved by the Indian Cabinet for development of 100 smart cities and rejuvenation of 500 others. INR 48,000 crore (US$7.5 billion) for the Smart Cities mission.
- As of Jun 23, 2017 - 90 cities out of planned 100 cities have been selected. But, New Town Kolkata has withdrawn, so 89 cities are part of the Smart city mission.
- Many states have exceeded the number of slots allocated to them by winning the challenge ahead of other states. Most of the states have exhausted their quota by 4th round.
- In the final round around 20 cities will compete for the remaining 10 slots.

DIGITAL EDUCATION

- "Pradhan Mantri Gramin Digital Saksharta Abhiyan" has been approved to make 60 mn rural households digitally literate by Mar'19. 10 mn rural people will be educated on e-payments through government's digital financial literacy programme "Digi Dhan Abhiyan". Government has introduced ICT initiatives such as:
- eGyanKosh (National Digital Repository for digital learning resources)
- e-Pathshala (Web-site containing education books and audio-visual files)
- Gyan Vani (educational FM radio station), GyanDarshan (satellite based TV channel) and 32 live telecast educational channels through collaboration with DTH operators.
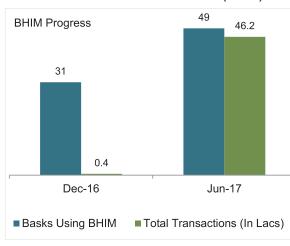- Swayam: platform with at least 350 online courses

INDIA: DIGITAL TRANSFORMATION INITIATIVES

UNIFIED PAYMENTS INTERFACE (UPI)

UPI Progress

- Unified Payments Interface (UPI) is a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing and merchant payments into one hood. It also caters to the "Peer to Peer" collect request.

Source: NPCI, Digital India

BHARAT INTERFACE FOR MONEY (BHIM)

BHIM Progress
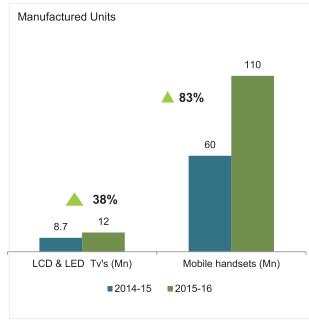
- Bharat Interface for Money (BHIM) app makes payment transactions simple and quick using Unified Payments Interface (UPI).
- It enables instant bank to bank payments and collects money using a Mobile number or Payment address.
- 14.54 million BHIM apps were downloaded as of May 2017.

Source: NPCI, Digital India

ELECTRONICS AND HARDWARE MANUFACTURING

Manufactured Units
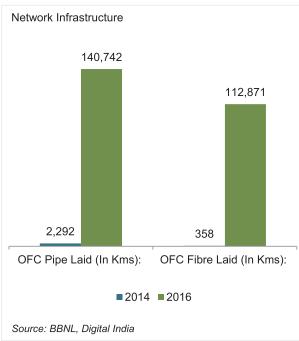
- The government is focusing on establishing robust ecosystem to boost local manufacturing. Electronics sector has been considered as a priority by government under its "Make in India" program and announced several policy initiatives.
- 38 new mobile manufacturing units have been set up since Sept'15 with combined monthly capacity of 20 mn units also generating 38,300 employment opportunities.

Product	2014-15	2015-16
Mobile Handsets (INR Crore)	18,900	54,000
LED Products (INR Crore)	2,172	3,590

Source: Ministry of Electronics & Information Technology

INDIA: DIGITAL TRANSFORMATION INITIATIVES

BHARATNET - BROADBAND

Network Infrastructure

140,742

112,871

2,292   358

OFC Pipe Laid (In Kms):   OFC Fibre Laid (In Kms):

■ 2014 ■ 2016

- The Government has taken a step forward to connect nearly 2,50,000 Gram Panchayats under the National Optical Fibre Network (NOFN) by December 2016.
- 600 million rural citizens to be connected.
- The original target set by the government for laying down OFC in 1 lakh gram panchayats was March 2015, but was later advanced to March 2017. As of June-2017 , Total 1,00,076 gram panchayats were connected with 2,19,477 km of OFC.
- Phase II will seek to connect remaining 150,000 gram panchayats by Sep-2018.
- By the end of 2017-18, high-speed broadband connectivity on optical fiber will be available in more than 1,50,000 gram panchayats, with wifi hot spots and access to digital services at low tariffs.

Source: BBNL, Digital India

PRADHAN MANTRI JAN DHAN YOJANA

Number and Share of Beneficiaries (In mn)

	Jan-15	Jun-17
Private Banks	5.2	9.4
Rural Regional Bank	21.8	47.3
Public Sector Bank	98.4	234.2

■ Public Sector Bank ■ Rural Regional Bank ■ Private Banks

- PMJDY is a National Mission on Financial Inclusion encompassing an integrated approach to bring about comprehensive financial inclusion of all the households in the country.
- The plan envisages universal access to banking facilities at least one basic banking account in every household and channeling all Government benefits directly to the beneficiaries' accounts.
- Private sector bankers say there are several reasons why account opening by them has been disproportionate to the assets they hold.
- Private banks control approximately 21% of all assets in the banking system.
- Another major reason was that distribution of territory to open accounts is not at par with penetration of the bank's branches.

- • 1.26 lakh Mitras delivering branchless banking service in sub-service areas.

- • INR 64,922 cr balance in beneficiary accounts as of (June-17).

Source: PMJDY, Digital India, The Hindu Business Line

JAPAN

JAPAN: EXECUTIVE SUMMARY

ICT OVERVIEW

- Japan's ICT industry was estimated at JPY 60.5 tn in 2015 driven by ICT Hardware sector. Software segment has grown the fastest at 10% CAGR during 2011-15.

- ICT Hardware production contributes 13% to global production of electronics. Japan was the global leader in hardware but lost its dominance to international competition in segments like computers, consumer electronics, smartphones etc.

- Software sector is large, second to US in sales, has strong process capabilities in software development. Japanese prefer custom software packages which covers almost 75% of the market. IT Services plays a vital role in Japan's economy in which data processing services covers half of the IT services sales.

- Japan's telecommunication sector boasts of being one of the most developed markets with highest high-speed fibre-optic broadband penetration in the world. They have begun 5G trials in a bid to launch 5G by Olympic Games 2020.

- Japan's e-Commerce market takes advantage of the advanced logistical systems and infrastructure. The market is dominated by Amazon, Rakuten and Yahoo Japan.

DIGITAL AGENDA

- Japan's digital economy and ICT strategic policy agenda is based on a number of policies presented by various Japanese ministries. Japan had been ahead of the curve in ICT related technology and has created strategies such as 'ICT growth strategy' and 'Japan Revitalization Strategy'. These strategies along with others have helped Japan to declare itself as the 'World's most advanced IT nation'.

- However, the country has been battling with several issues including economic growth, a super-ageing society, employment, resource problems, town development and cyber security among others.

- The country's digital and ICT strategic agenda largely revolves around addressing three core objectives –
  - building "a knowledge- and information-based nation" by 2020
  - utilize ICT to resolve complex social problems
  - create new value-added industries.

DIGITAL INITIATIVES

- The government is looking into their immigration policy which is a critical step in meeting the country's population goal of 100 million people in 2065.
  - Some of the key development areas as per Japan's vision of utilizing ICT innovation for the ageing society include e-health, new elderly friendly traffic systems (e-mobility), e-government / e-administrative solutions, elderly smart housing, life-long digital literacy to encourage senior citizens to participate in the knowledge-based society, and safety & security systems, amongst others.

- In terms of adoption of emerging ICT technologies. Japan has been one of the global front runners in the implementation of IoT. IoT has been experiencing great momentum in Japan since the formation of the IoT Acceleration Consortium. According to the Japan External Trade Organization (JETRO), domestic IoT revenue is forecast to reach US$130 bn by 2017.

JAPAN: EXECUTIVE SUMMARY
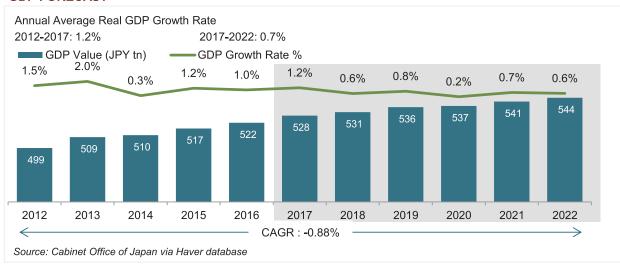
DIGITAL INITIATIVES

- Cyber security is a growing concern in Japan, where over 12 bn cyber attacks were reported in 2014 by the National Institute of Information Technology. Secondly, Japan is also concerned with the shortage of people trained to do the work needed to secure networks – 'Cyber Security'.

  - With only three years left before the Tokyo Summer Olympic Games in 2020, Japan is facing a shortfall of cyber security manpower. According to the Ministry of Economy, Trade and Industry (METI), the current shortfall of IT professionals to available opportunities is 132,060, which will further increase to 193,010 in 2020.

  - In 2017, the government has plans to issue a new cyber security strategy for human resources development. To enhance IoT security the Japanese Ministry of Internal Affairs and Communications (MIC) released the IoT Cyber Security Action Program in January 2017.

- Although Japan has the highest mobile phone penetration in the world, the country's fintech market lags behind considerably. Japanese people prefer paying in cash over any other medium due to their risk averse nature and transaction security concerns. Also, net banking penetration in Japan stands at 16% in 2015.

  - However, Fintech in Japan will grow due to expansion of block chain technology, growing users of virtual currencies, and sufficient support from government and private entities.

  - Fintech investments are likely to get a boost in coming years owing to various government initiatives and growing interest of private investors. The investments saw a 160% jump since the government amended the Banking Act in 2016 allowing banks upto100% ownership in fintech startups from earlier 5% to reduce entry barriers.

- Japan ranks among the most advanced ICT nations worldwide. It has made advances in robotic computing power, image and voice recognition and machine learning. These advances are expected to help then in addressing the problems that come with a shrinking workforce due to an ageing demographic.

- Japan is already a robotics powerhouse, but Prime Minister Shinzo Abe's government is keen to push for a "robotics revolution". His government launched a five-year push to deepen the use of intelligent machines in manufacturing, supply chains, construction and healthcare, while expanding the robotics markets from 660 billion yen (US$7.7 billion) in 2015 to 2.4 trillion yen (US$28 billion) by 2020.

CHALLENGES
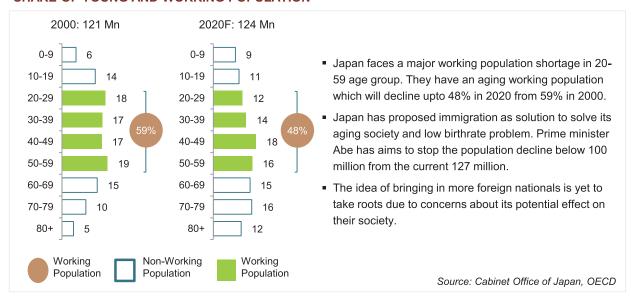
- Japan is at the forefront of the 'Super Aged Society' and has classified aging as the high-priority issue. The root causes behind the super aged society is decreasing birthrate and high life expectancy. All these factors are resulting into shrinking of working population.

- Japan also faces resource problems for which they have formed a strategy with regards to minerals, water, food and infrastructure through ICT solutions including sensors, communications technologies, big data, etc.

JAPAN: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate

2012-2017: 1.2%   2017-2022: 0.7%

■ GDP Value (JPY tn)   ▬ GDP Growth Rate %

1.5%   2.0%   0.3%   1.2%   1.0%   1.2%   0.6%   0.8%   0.2%   0.7%   0.6%

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
499	509	510	517	522	528	531	536	537	541	544

CAGR : -0.88%

Source: Cabinet Office of Japan via Haver database

SHARE OF YOUNG AND WORKING POPULATION

2000: 121 Mn   2020F: 124 Mn

Age	2000	2020F
0-9	6	9
10-19	14	11
20-29	18	12
30-39	17	14
40-49	17	18
50-59	19	16
60-69	15	15
70-79	10	16
80+	5	12

59%   48%

● Working Population   ☐ Non-Working Population   ■ Working Population

- Japan faces a major working population shortage in 20-59 age group. They have an aging working population which will decline upto 48% in 2020 from 59% in 2000.
- Japan has proposed immigration as solution to solve its aging society and low birthrate problem. Prime minister Abe has aims to stop the population decline below 100 million from the current 127 million.
- The idea of bringing in more foreign nationals is yet to take roots due to concerns about its potential effect on their society.

Source: Cabinet Office of Japan, OECD

GDP SEGMENTATION – SERVICE SECTOR GROWING AT 0.25% CAGR (2004-15)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Manufacturing	34%	35%	36%	37%	38%	32%	35%	34%	34%	34%	34%	33%
Service	52%	52%	51%	51%	51%	55%	54%	54%	54%	53%	53%	54%
Others	13%	13%	13%	12%	12%	12%	12%	12%	12%	13%	13%	13%

■ Others (Mining, Electricity, Construction, Wholesale, etc.)   ■ Service   ■ Manufacturing

Others CAGR 2004-15: -0.16%   Service CAGR 2004-15: 0.25%   Manufacturing CAGR 2004-15: -0.33%

Source: METI
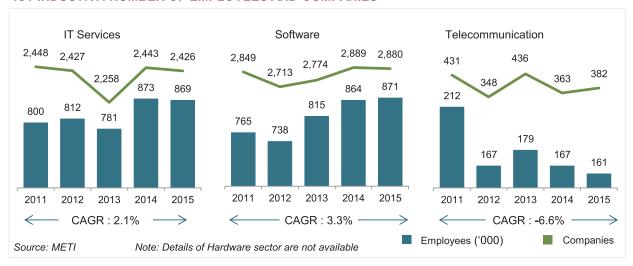
ICT INDUSTRY SEGMENTS

ICT Market Segmentation (JPY tn)

- ICT Industry has been growing at a steady pace. Software sector is a major contributor growing at 10% CAGR in 2011-15.
- Decline in hardware manufacturing share due to foreign competition is a major concern for Japanese ICT industry.

CAGR 2011-15

Hardware : -1.2%	Software : 10.0%
Telecom : 0.9%	IT Services : 2.8%
	Others : 0.8%

ICT Industry CAGR : 2.6%

Source: MIC White Paper 2016

ICT INDUSTRY: NUMBER OF EMPLOYEES AND COMPANIES

IT Services — CAGR : 2.1%

Software — CAGR : 3.3%

Telecommunication — CAGR : -6.6%

Employees ('000)   Companies

Source: METI   *Note: Details of Hardware sector are not available*

INVESTMENT IN ICT SECTORS (JPY TN)

Total Investment in ICT industry grew from JPY 7.2 tn in 1980 to JPY 166 tn as of 2014 growing at 9.4% CAGR. IT software investments grew fastest to reach JPY 81.3 tn as of 2014 while telecom sector showed slowest growth.

Parameters	1980	2014	CAGR 1980-14
Overall IT investment	7.2	166.13	9.7%
Telecom. equipment	2.6	31.9	7.7%
Computer acc. devices	3.0	53.0	8.8%
IT software	1.6	81.2	12.2%

Source: MIC White Paper 2016

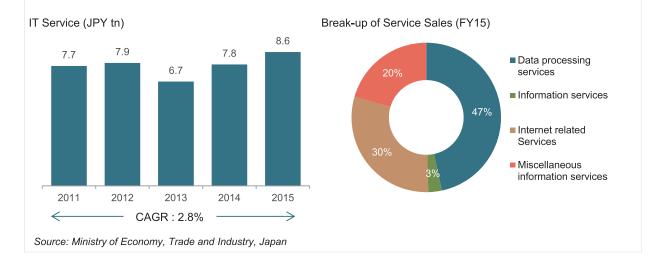IT investment   Telecom equipment   Computer device   Software

JAPAN: IT SERVICES

IT SERVICE INDUSTRY GROWING AT A SLOW PACE

- Despite IT Hardware's historical significance, IT Services also play a vital role in Japan's economy. Data processing services hold a major share in Japanese market.
- Major domestic Japanese companies (sales in 2015) – Fujitsu (JPY 275.1 mn), NEC (JPY 245.1 mn), Hitachi (JPY 169.2 mn), NTT Data (JPY 125.9 mn), IBM Japan (JPY 73.4 mn), Otsuka (JPY 50.9 mn).

IT Service (JPY tn)

Break-up of Service Sales (FY15)

Year	2011	2012	2013	2014	2015
Value	7.7	7.9	6.7	7.8	8.6

CAGR : 2.8%

Pie chart: Data processing services 47%, Information services 3%, Internet related Services 30%, Miscellaneous information services 20%

Source: Ministry of Economy, Trade and Industry, Japan

LOW EXPORTS AND IMPORTS OF IT SERVICES

- Japanese market is dominated by domestic companies. Cultural and language barriers makes it difficult to penetrate the market and comprehend user requirement.
- Japanese customers consider user requirement over time consumed to complete the task during billing process affecting profitability of outsourcing vendors. Chinese and Taiwanese vendors are able to manage repeat or re-coding work within budget making them the largest outsourcing partner for Japanese companies.
- IT services exports from Japan are weak due to product customization and system integration done in local languages and management's weak English language capabilities.

LOW PRODUCTIVITY ISSUES FACED BY IT SERVICE SECTOR

- As per IPA (2012), 75% of Japan's IT technical employees were located in IT service sector. Still, Japan's overall IT productivity is low due to following reasons –
    - High share of aged population in overall workforce who have low competency with latest skills
    - Overall IT talent shortage faced by the Japanese industry
    - IT professionals have low English language competencies.
- Hence, improving the overall productivity is more critical to the industry along with increasing number of IT professionals to improve their overall service competency.

JAPAN: SOFTWARE
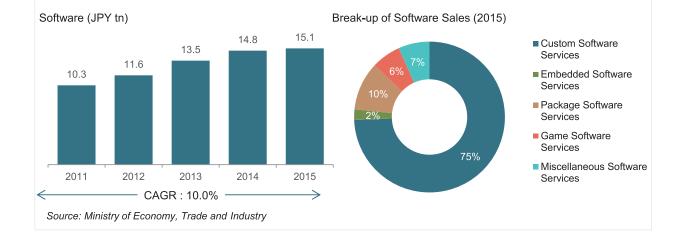
HUGE SOFTWARE SALES BUT MOSTLY LIMITED TO ASIA

Japan is second to the US in software sales and has strong process capabilities in software development but they lack in global presence.

- Major export destinations - China, Korea, Hong-Kong
- Major IT Software companies - Canon, Mitsubishi, Matsushita, Fujitsu, Toshiba, Ricoh ,Oki

Japanese companies focus more on operational effectiveness (cost, productivity and quality) instead of product innovation resulting in loss of global market share. Major Japanese players lagging in global market are now shifting focus from IT sectors to non-IT sectors to sustain themselves.

- Hitachi, Toshiba, and Mitsubishi Electric have shifted their primary business focus to large social infrastructure projects in energy, transportation, and utilities.

The scarcity of ICT software professionals and underdeveloped market for ICT processes outsourcing result in higher costs for small firms.

Software (JPY tn)

Break-up of Software Sales (2015)

CAGR : 10.0%

Source: Ministry of Economy, Trade and Industry

JAPANESE FIRMS STRENGTHENING INNOVATION IN SOFTWARE

Large Japanese IT software firms are investing in, partnering with foreign companies along with acquiring domestic start-ups especially in the field of Big data, Analytics, IoT etc. to get innovative edge in competition while developing software solutions.
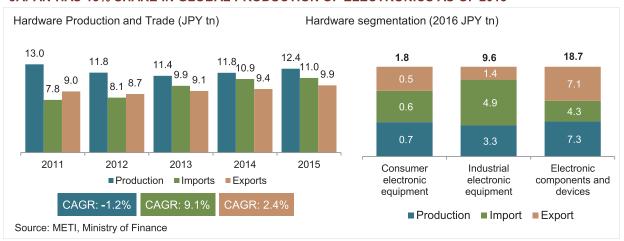
- Overall Japan VC funding - JPY 73.8 bn of which more than 50% goes towards IT firms.

JAPANESE FIRMS STRENGTHENING INNOVATION IN SOFTWARE

- Embedded software was traditionally developed in Japan as an ancillary part of hardware. But as the systems got sophisticated, Japanese software engineers with hardware knowledge found it difficult to handle software aspect.
- Typically, Japanese firms expenditure on developing and maintaining existing embedded software is much higher than innovation.
- Also, a huge shortfall of Japanese embedded software engineers is observed resulting in low domestic competency of software development. Subsequently companies widely outsource software development to overseas centers in China and India driven by the strong requirements for cost reduction.

JAPAN: ICT HARDWARE

JAPAN HAS 13% SHARE IN GLOBAL PRODUCTION OF ELECTRONICS AS OF 2015

Hardware Production and Trade (JPY tn)

Hardware segmentation (2016 JPY tn)

CAGR: -1.2%   CAGR: 9.1%   CAGR: 2.4%
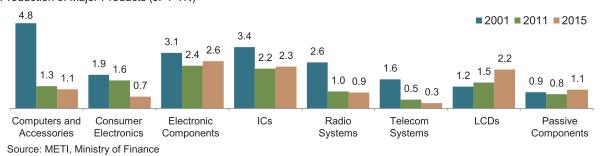
Source: METI, Ministry of Finance

JAPAN LOSING SHARE IN HARDWARE MANUFACTURING FOR COMPUTERS, SMARTPHONES, ETC.

- Japan was the global leader in hardware sector and known for its quality and efficiency. But gradually, it lost dominance in many segments such as Computers, Consumer electronics and Smartphones owing to international competition.
- Japan has shown a good growth in Liquid Crystal Display (LCDs) and Passive components. 92% of all the display devices manufactured domestically are consumed in Japan.

Production of Major Products (JPY TN)

Source: METI, Ministry of Finance
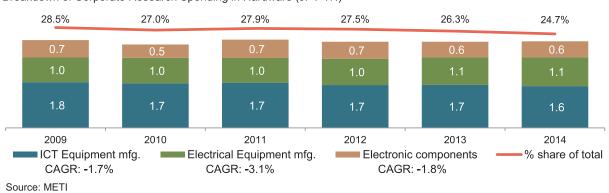
ICT HARDWARE HAS THE HIGHEST SHARE OF JAPAN'S R&D SPEND BUT DECLINING

The IT Hardware segment spent JPY 3.3 tn in FY-14 to retain their competitive edge and keep developing hi-tech manufacturing lines. This share has declined gradually from 28.5% of total R&D spend in FY-09 to 24.7% in FY14.

Breakdown of Corporate Research Spending in Hardware (JPY TN)

ICT Equipment mfg. CAGR: -1.7%   Electrical Equipment mfg. CAGR: -3.1%   Electronic components CAGR: -1.8%   % share of total

Source: METI

JAPAN: TELECOMMUNICATIONS

JAPAN SHOWING GROWTH IN HIGH END TELECOM SERVICES

Telecom Market (JPY TN)

2011	2012	2013	2014	2015
13.3	13.0	17.0	16.3	16.6

CAGR: 0.9%

- Japan, one of the largest and most developed markets in the world has begun 5G trials in a bid to launch 5G by 2020.
- Japan has 12 mn M2M connections which is 2nd highest in the world. Telecom service providers are strategically offering M2M services on their communications network in anticipation of IoT's emergence.
- Customers are shifting to Mobile virtual network operators (MVNOs) due to relaxation in SIM regulations and attractive plans offered. Mobile Network operators (MNOs) are also entering this business.

ONE OF THE HIGHEST FIBRE-OPTIC BROADBAND PENETRATION IN THE WORLD
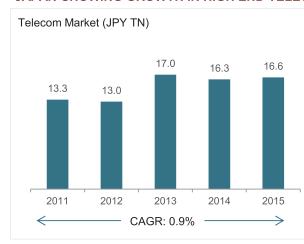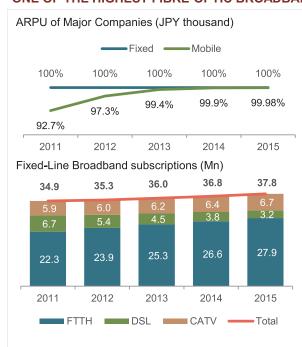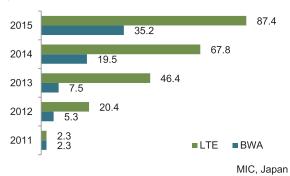
ARPU of Major Companies (JPY thousand)

Fixed — Mobile

	2011	2012	2013	2014	2015
Fixed	100%	100%	100%	100%	100%
Mobile	92.7%	97.3%	99.4%	99.9%	99.98%

Fixed-Line Broadband subscriptions (Mn)

	2011	2012	2013	2014	2015
Total	34.9	35.3	36.0	36.8	37.8
CATV	5.9	6.0	6.2	6.4	6.7
DSL	6.7	5.4	4.5	3.8	3.2
FTTH	22.3	23.9	25.3	26.6	27.9
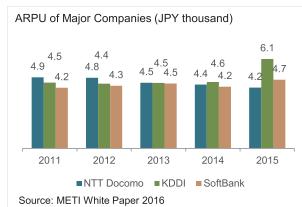
- Japan has achieved one of the highest high-speed fibre-optic broadband penetration in the world with 2/3rd households subscribed in 2015.
- Eg. NTT in Japan matched the price of DSL to ensure migration to FTTH.

Mobile Ultra-High-Speed Broadband Subscriptions (Mn)

	LTE	BWA
2015	87.4	35.2
2014	67.8	19.5
2013	46.4	7.5
2012	20.4	5.3
2011	2.3	2.3

MIC, Japan
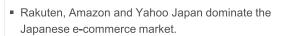
JAPAN HAS 2ND HIGHEST ARPU IN THE WORLD

ARPU of Major Companies (JPY thousand)

	2011	2012	2013	2014	2015
NTT Docomo	4.9	4.8	4.5	4.4	4.2
KDDI	4.5	4.4	4.5	4.6	6.1
SoftBank	4.2	4.3	4.5	4.2	4.7

- NTT DoCoMo and KDDI account for 72.9% share of overall telecom service revenue in 2016.
- The telecom industry has been experiencing disruption with the advent of OTT communication applications in Japan. This has resulted in decline of voice ARPU among Japanese carriers with 2014 ARPU being almost a third of 2009 levels and data ARPU growth remaining flat.

Source: METI White Paper 2016

JAPAN: E-COMMERCE

4TH LARGEST E-TAIL MARKET IN THE WORLD

E-Commerce Market Size

- Rakuten, Amazon and Yahoo Japan dominate the Japanese e-commerce market.
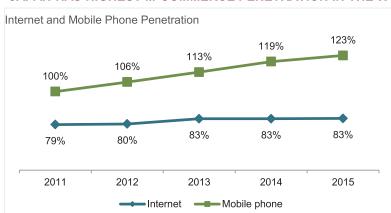- Japan's e-Commerce market takes advantage of the advanced logistical systems and infrastructure as well as the large number of convenience stores (konbini).
- 76% of the people with internet access shop online.
- By 2021 ~18% of all retail sales will take place through e-commerce channels.

Source: Ministry of Economy, Trade and Industry

2012	2013	2014	2015	2016	2021
78	92	106	112	124	224

CAGR: 23.5%

JAPAN HAS HIGHEST M-COMMERCE PENETRATION IN THE WORLD

Internet and Mobile Phone Penetration

Mobile phone: 100%, 106%, 113%, 119%, 123%
Internet: 79%, 80%, 83%, 83%, 83%

| 2011 | 2012 | 2013 | 2014 | 2015 |

Internet   Mobile phone

- In 2016, 54% of the purchases were made through smartphones.
- The increase in smartphone penetration will drive the growth of e-commerce in Japan.
- Younger generations had the highest preference towards mobile with 20-29 age group highest in smartphone access.

Parameters	FY11	FY12	FY13	FY14	FY15
Internet subscribers (bn)	9.61	9.65	10.04	10.02	10.05
Mobile subscribers (bn)	128.2	136.0	144.0	152.7	156.5

Source: METI

E-TAIL PENETRATION TO GROW FURTHER

Venture capital firms are investing in companies which have a synergic fit with the ecosystem of the e-commerce firms.
- Rakuten Ventures, established a USD 84 million fund in 2016 to fund such tech startups.
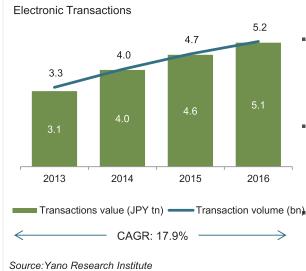
The government plans to open special economic zones which will offer reduced taxes and provide subsidies to new companies establishing e-commerce operations.
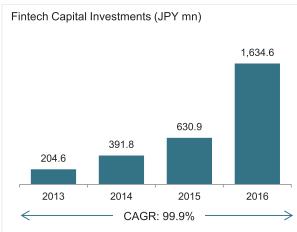
JAPAN: FINTECH

HIGH SHARE OF CASH TRANSACTIONS INHIBITING DISRUPTIVE FINTECH GROWTH

Electronic Transactions

Transactions value (JPY tn) — Transaction volume (bn)

CAGR: 17.9%

Source:Yano Research Institute

- Japanese people prefer paying in cash over any other medium due to their risk averse nature and transaction security concerns. This had inhibited the disruptive fintech growth in Japan. Also, net banking penetration in Japan stands at 16% in 2015.
- However, fintech penetration will grow as acceptance levels of people increase progressively. Fintech in Japan will grow due to expansion of block chain technology, growing users of virtual currencies, and sufficient support from government and private entities.
- Penetration of fintech in e-commerce payments is high with 60% of the payments being made through credit cards.

FINTECH INVESTMENT GROWTH DRIVEN BY FAVOURABLE POLICIES

Fintech Capital Investments (JPY mn)

CAGR: 99.9%

Source: Swedish Agency For Growth Policy Analysis

- Japan has 2nd lowest level of early entrepreneurship activity in world which may act as a barrier to growth of fintech startups. Japan had 130 fintech startups as of 2016 which the government plans to increase further.
- Fintech investment will grow very fast in coming years due to various government initiatives and growing interest of private investors. The investments saw a jump when government amended Banking Act in 2016 allowing banks upto 100% ownership in fintech startups from earlier 5% to reduce entry barriers.

JAPANESE BANKS FIRST TO REGULATE VIRTUAL CURRENCY EXCHANGE

- Japanese banks are among the first in the world to experiment with digital currency payment and domestic money transfers over a blockchain. This move is expected to boost private investment further after the collapse of Mt. Gox bitcoin exchange in 2014.
- Japan's three largest banks are investors in "Bitflyer", a bitcoin exchange with a USD 34.15 mn capitalization.
- Bitcoin exchanges bitFlyer and Quoine ranked 2nd and 3rd respectively in Japanese fintech ventures investment size in 2015.

Bitcoin users	50,000
Stores accepting Bitcoin	2500
Bitcoin exchanges	7

JAPAN: DIGITAL TRANSFORMATION INITIATIVES

Japan progresses in ICT is based on various strategies, the recent strategies are given below-

ICT Growth Strategy (2013)	ICT Growth Strategy-II (2014)	Japan Revitalization Strategy- (2013)
ICTs for Inclusive Social and Economic Development in Japan (2013)	MIC White Paper on ICT (2014)	Declaration to be the World's Most Advanced IT Nation (2013)

ICT GROWTH STRATEGY (2013)
Vision

Create new value - added industries   Solving social problems   Improving and strengthening ICT infrastructure

Mission – To be the most active country in the world

Industry Academia Government Collaboration

Super Aging Society x ICT
- Promote nationwide expansion of e-health record.
- *Creation of a new industry of a scale of USD 202 bn by 2020*

Broadcasting Contents
- Promote efficiency and speed improvements in the processing of broadcast content rights
- *Triple the overseas business from 2013 to 2018*

Resource problems x ICT
- Research and development in medium to long term projects in various fields to bring about consistency in the value chain.
- Improve sensor technology for efficient maintenance of roads and bridges by 2020.
- *A value addition of USD 176 bn by 2025.*

Broadcasting Services
- Support for early realization of next generation broadcasting systems(4K, 8K, Smart TV)
- *Achieving the world's first next generation broadcasting services and creating a new market.*

Development of Environment by the Government

ICT smart town development
- *Promote global expansion of ICT Smart Towns by around 2018.*

Creation of Innovation
- *Establish a framework to give challenging opportunities to people interested in carrying out research.*

Cybersecurity / Open Data / Big Data
- Improve cybersecurity in collaboration with ASEAN countries
- Eliminate unreasonable regulations through inter-ministerial cooperation.
- *Carry out R&D to improve information security and protect privacy.*

Geospatial Information
- Introduce advanced disaster prevention systems, such as disaster response robots
- Introduce model disaster management systems in japan and overseas
- *Expanding the relevant markets to a scale of USD 547 bn from the current USD 176 bn.*

Source: Ministry of Internal Affairs and Communication, Government of Japan

JAPAN: DIGITAL TRANSFORMATION INITIATIVES

Key programmes which are mainly focused in Japan's ICT Strategies are shown below-

Programme	Information
Industry Academia Government Collaboration	
ICT for the super aging society	Construction of a **Smart Platinum Society** by taking the following steps: **Establishment of an ICT disease prevention model** • Implement a large scale demonstration to establish a disease prevention model using health – care points and other incentives. **Nationwide expansion of EHR(Electronic Health record)** • Reduce system related costs by standardizing the data and system specifications. • Promote the spread and deployment of EHR throughout Japan. **Improvement in ICT literacy** • Improve ICT literacy by utilization of cloud services and giving demonstrations in community centers and schools.
Addressing resource problems through ICT	**Minerals** • Develop a high speed water – related communication system suitable to the offshore environment. **Water** • Use big data to advance water related systems. **Food** • Network production areas in remote locations to share the knowhow of skilled farmers and market information. **Infrastructure** • Promote research and development of sensor technologies and to understand the state of infrastructure from wired and wireless sensors for efficient maintenance and management of roads and bridges.
Development of Environment by the Government	
ICT smart town development	• Construct a common platform based on the demonstrative project of ICT Smart Town in key areas throughout Japan to allow the cross-linkage of services and data.
Cybersecurity	• Establish the Cybersecurity Research Center (CYREC) in the National Institute of Information and Communications Technology and improving the analytical capability of Japan to cope with sophisticated cyber-attacks. • Collaborate with ASEAN countries to improve cyber security worldwide.
Geospatial Information	• Developing a system that will make a big data analysis of G-spatial information in real time • Introducing advanced disaster management systems, such as disaster-response robots • Develop a disaster prevention system that will apply advanced information to large-scale disasters and special disasters that people cannot approach, with the help of unmanned remote controlled robots

Source: Digital Japan, Ministry of Electronics and Information Technology, Government of Japan

JAPAN: DIGITAL TRANSFORMATION INITIATIVES

ICT GROWTH STRATEGY II

Vision

Creating new innovation through connecting various things and services by ICT

Approach

Priority Projects

Local Revitalization	**Solving social problems**	**Tokyo 2020 Olympic & Paralympic Games**
• ICT smart town • G-spatial city • Smart agriculture	• Medical care • Education • Disaster prevention • Transportation • Support for women's activities • Measures for aging infrastructure • E-Government, e-Local government • ICT new business creation	• Promotion of free public Wireless LAN access • Promotion of "Global communication project" (sophistication of multi-language voice translation system) • Promotion of 4K/8K (Super Hi-Vision) utilization • Promotion of overseas expansion of broadcasting contents

ICT common basis

Platform
- G-spatial platform
- Platform of ICT smart towns
- Utilization of big data and open data

Infrastructure
- Promotion of free public Wireless LAN access at sightseeing spots, disaster-prevention facilities and others
- Promotion of 4K/8K utilization
- Development of ubiquitous network
- Review of competition policy for development of the world's most advanced ICT infrastructure

Environmental improvement
- Development and utilization of human resources
- Promotion of Research and Development
- Promotion of measures for information security, environmental improvement for utilizing personal data

Source: Digital Japan, Ministry of Electronics & Information Technology, Government of Japan

JAPAN: DIGITAL TRANSFORMATION INITIATIVES

Japan Revitalization Strategy (Growth Strategy) 2015

BASIC CONCEPT

Priority of Abenomics: First stage
▪ Overcome the deflation
▪ Tackle the lack of demand, with 'three arrows'

Current situation
▪ A virtuous economic cycle in motion
• Corporate profits at its highest level
• Wage hikes for the two consecutive years
• A sign of recovering consumption
• Labor market (supply and demand) tightened
• Rapid decrease in GDP gaps
▪ Economy expected to overcome the deflation
▪ Investment on upward trend but not sufficient

Abenomics: Second stage
▪ Realize a productivity revolution by investment in the future
▪ Promote "Local Abenomics"

Challenges
▪ Mid-long term constraint of workforce Necessary to overcome the supply constraints in order to realize a sustainable growth
▪ Key to overcome this challenge : improvement of productivity
▪ Now is the time for action : investment of the private sector for the future

PRINCIPAL MEASURES

Revolution in productivity by investment in the future

Encouraging corporate behavior to improve "earning power"	Accelerating proactive actions to challenge a new era	Developing personal capabilities and knowledge
▪ **Enhancement of growth-oriented corporate governance** • Healthy interaction between companies and investors • Growth-oriented reform of corporate tax • Expand investment in public/private sectors ▪ **Promotion of innovation and venture business** • Bridging projects between Silicon Valley and Japan • Fundamental reforms of universities ▪ **International expansion to growing markets including Asia** • Promote high quality infrastructure partnership	▪ **"4th Industrial Revolution" caused by the development of IoT, A.I. and Big data.** • Examine its impacts on industrial structure and labor market structure and formulate a vision ▪ **Full utilization of ITC, with reinforcement of cyber security measures** • Fundamentally reinforce cyber security measures • Expand utilization of " Social security and tax Number system"	▪ **Improvement of labor quality through addressing long-working hours practices, further promotion of women, elderly persons etc.** ▪ **Development of capabilities of human resources in the era of great transformation of the society** • Knowledge development of individuals, higher vocational education systems

Promotion of Local Abenomics

• Enhance "earning power" of mid-ranking companies, SMEs and micro enterprises
• Vitalize services industry and enhance its productivity
• Transform primary industry/ health care industry/ tourism into key industries

Source: Digital Japan, Ministry of Electronics & Information Technology, Government of Japan

JAPAN: DIGITAL TRANSFORMATION INITIATIVES

Progress of the "Growth Strategy" to date and measures for accelerating reforms

Principal measures of growth strategy	Government Initiatives
Strengthen of earning power of mid-ranking companies, SMEs	**Added design technologies to the support target by the Small and Medium Sized Enterprise Manufacturing Enhancement Act (in Feb.2015)** **Support "Hometown Specialties"** ▪ encourage vitalization of regions by developing hometown specialties and to its market development
Revitalization and productivity improvement of service industry	**Implementation of measures listed in "Service Industry Challenge Program" (Apr. 2015)** ▪ Promote IT utilization, overseas expansion, improvement of activities ("kaizen"), etc in various industries
Establishment of "Proactive Management" in primary industry	**Integrated reform of the Agricultural Cooperative System, Agricultural Committees and Agricultural Production Corporations (Act passed in Aug. 2015)** ▪ Members of committees will be selected by the mayor ▪ Relax the requirements for Agricultural Production Corporations **Decided to review rice production adjustment, which has lasted for more than 40 years** **Promotion of export** ▪ Establish category-specific export organizations for 7 items such as rice and beef to promote exports
Revitalization of medical care/ nursing care/ healthcare industry	**Accelerate commercialization of regenerative medicine** ▪ Allow outsourcing of culturing and processing of cells ▪ Enact an adaptive licensing approval system **Create a new system for combining insured and uninsured medical services** ▪ Allow patients, upon request, to receive prompt advanced medical care at medical institutions of their preference **Promote business alliances through a new healthcare corporation system** ▪ Allow for consolidated and integrated management of multiple medical corporations
Key-industrialization of tourism industry	**Strategic relaxation of visa requirements (14 countries from Jul. 2013 to Aug. 2015)** ▪ Exemption of visas as well as Issuance of multiple-entry visas for visitors **Creation of a new program for longer stay of foreign visitors in Japan (Jun. 2015)** ▪ permitting wealthy foreign visitors to stay for a maximum of one year for sightseeing purposes **Expansion of the tax-free program** ▪ Expansion of range of tax-free items for foreign visitors to all since Oct. 2014. ▪ Enabling shopping malls and shopping districts to establish Tax-free Counters, where tax-free procedure is completed at once since Apr. 2015.
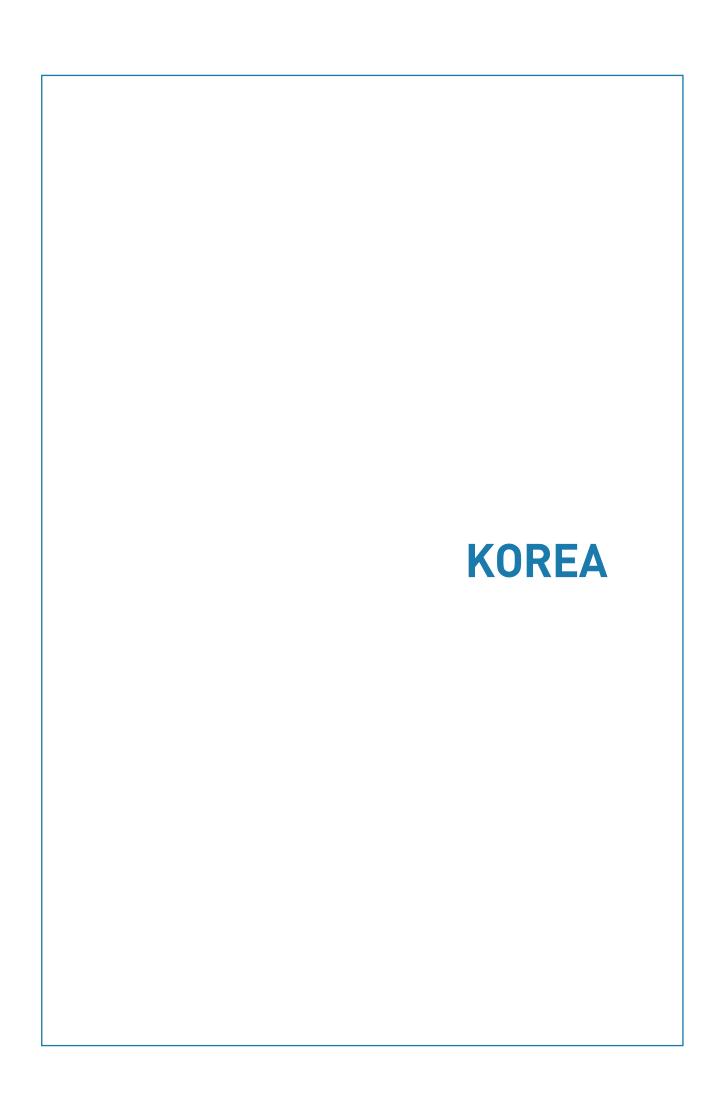
Source: Digital Japan, Ministry of Electronics & Information Technology, Government of Japan

KOREA

KOREA: EXECUTIVE SUMMARY

ICT OVERVIEW

- Korean ICT industry is worth KRW 456 tn as of 2017, having grown at a 4.7% CAGR during 2007-17. The ICT equipment manufacturing segment accounts for almost 70% of overall ICT industry. The country is recognized as a leader in many segments such as DRAMs, semiconductors, etc. However, the ICT equipment manufacturing segment in Korea has its own set of challenges owing to a saturated domestic market and increasing global competition.

- Korea's software and IT services companies are expanding into foreign markets. Applied software products have the highest demand from foreign countries amongst the offerings. Korea is witnessing heavy investments in the virtual reality segment (including augmented reality). The market for virtual reality in Korea is projected to reach KRW 5.7 tn by 2020.

- The telecommunication and broadcasting services market in Korea is one of the most active and mature in the world. The industry is focusing on advancing in new technologies; they have started building the infrastructure for 5G services and aim to launch it by 2020.

- Korea has the sixth largest e-commerce market in the world and second highest digital buyer percentage in the Asia-Pacific region. Because of the small size of the country and high population density, Korea has exceptionally fast fulfillment rates.

- FinTech startups like Kakao Pay and Viva Republica are receiving good funding support. However, stringent regulations remain a barrier to the success of the fintech industry. In a recent policy relaxation, a non-financial firm can hold up to 50% stake in internet-only banks. Korea also aims to introduce bitcoin regulation in 2017 owing to positive and steady adoption being witnessed.

DIGITAL AGENDA

- Intelligent IT, engine of Fourth Industrial Revolution, refers to the technology that is capable of performing the highly complex functions of human intelligence by combining the "intelligence" of artificial intelligence (AI) with the "information" provided by data-processing and network technologies, such as the Internet of Things (IoT), cloud computing, big data analysis, and mobile technologies (referred to collectively as "ICBM technologies").

- Policy objective is to develop and foster data and network infrastructure with which Korean businesses can develop their own innovative technologies to enable them to secure leading positions in the global market.

DIGITAL INITIATIVES

Korea's national vision is to devise and implement a balanced policy regime that encompasses technologies, industries, and society and shapes the development of a more humane society. Following are the main objectives of the Intelligent IT initiatives :

- Apply Intelligent IT services of the basis of AI technology to distinct sectors of the society to improve their efficiency and competency:
  - Defense - To develop an "AI-based assistant chief of staff" in the national defense network by 2030.
  - Crime - Increase the arrest rate from 78% in 2014 to 88% in 2030 by developing AI systems for crime information analysis.
  - Government - Complete MeGov, a custom service which automatically recognizes the needs and circumstances of individual citizens, by 2020.
  - Transportation - Develop an intelligent transportation system that incorporates data from vehicle's sensors by 2019.

KOREA: EXECUTIVE SUMMARY

DIGITAL INITIATIVES
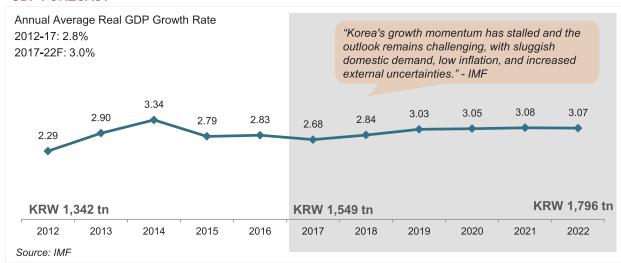
- Develop a super-connected network environment supporting a wide range of convergence services
  - Launch 5G and Giga Internet services (as of 2020) to accelerate Fourth Industrial Revolution.
  - Launch interdepartmental test projects in 2018 to link intelligent networks with other industries (self-driving cars, intelligent robots, drones, smart homes, etc.).
- Generate innovative and customized services in different sections of the society.
  - Healthcare - Develop intelligent public healthcare applications which tracks and exchanges health information by 2020. Develop innovative healthcare devices by 2022.
  - Education - Increase the number of schools participating in the Creative Convergence Leadership Program from 52 in 2016 to 100 by 2018 and produce 50,000 Intelligent IT graduates by 2030.
  - Manufacturing - Introduce manufacturing robots to smart factories capable of decision-making in 20 industries by 2018 and provide financial incentives to businesses to adopt smart service technologies and systems by 2020.
- Encourage businesses to develop roadmaps and promote R&D to use blockchain technology to enhance data management security.
  - Reform regulations with a view to fostering blockchain technology to apply in overseas remittance, trading stocks, and payments to form the basis of a cash-free society.
- Develop an open system, connect private and public data platforms with the government, for the systematic storage and utilization of sensor data generated by various IoT devices for smart cities.
  - Bring together both public- and private-sector urban data and Intelligent IT to establish a smart city platform by 2022.
  - 5G network will enhance real-time response and actions on ICBM (IoT, cloud computing, big data, and mobile).

CHALLENGES
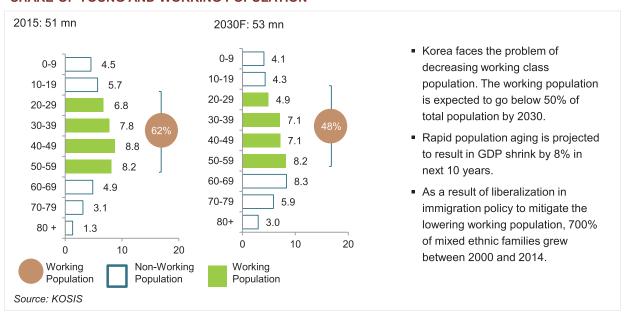
Korea faces threat from cyber-attacks due to the country's high network connectedness, advanced use of mobile devices, and high internet penetration. The country has heightened its security protocols over recent years due to frequent cyber-attacks and has chartered a cyber-warfare specialized school which intends to increase no of cyber security experts from 400 in June 2017 to 5,000 by the end of 2017.

KOREA: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate
2012-17: 2.8%
2017-22F: 3.0%

"Korea's growth momentum has stalled and the outlook remains challenging, with sluggish domestic demand, low inflation, and increased external uncertainties." - IMF

2.29	2.90	3.34	2.79	2.83	2.68	2.84	3.03	3.05	3.08	3.07
2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022

KRW 1,342 tn   **KRW 1,549 tn**   **KRW 1,796 tn**

Source: IMF

SHARE OF YOUNG AND WORKING POPULATION

2015: 51 mn

Age	Value
0-9	4.5
10-19	5.7
20-29	6.8
30-39	7.8
40-49	8.8
50-59	8.2
60-69	4.9
70-79	3.1
80 +	1.3

62%

Working Population   Non-Working Population

2030F: 53 mn

Age	Value
0-9	4.1
10-19	4.3
20-29	4.9
30-39	7.1
40-49	7.1
50-59	8.2
60-69	8.3
70-79	5.9
80+	3.0

48%

Working Population

Source: KOSIS

- Korea faces the problem of decreasing working class population. The working population is expected to go below 50% of total population by 2030.

- Rapid population aging is projected to result in GDP shrink by 8% in next 10 years.

- As a result of liberalization in immigration policy to mitigate the lowering working population, 700% of mixed ethnic families grew between 2000 and 2014.

SERVICE SECTOR IS THE LARGEST CONTRIBUTOR TO KOREA'S GDP

GDP Segmentation

	2012	2013	2014	2015	2016
Manufacturing	31.6%	31.8%	31.9%	31.6%	31.5%
Other (Agriculture, Mining, Electricity, etc.)	4.6%	4.6%	4.6%	4.6%	4.5%
Services (Wholesale, Real Estate, etc.)	59.2%	59.1%	59.2%	59.3%	59.2%
Construction	4.5%	4.5%	4.4%	4.5%	4.9%

- Services has the major share in total GDP driven mostly by wholesale, retail trade, restaurants and hotels services, capturing the major share of 19.4% in total services.

- Manufacturing is the second largest contributor to GDP, majorly dependent on exports.

Source: The Bank of Korea

KOREA: ICT INDUSTRY OVERVIEW

EQUIPMENTS DOMINATE ICT PRODUCTION

ICT Production Segmentation (KRW tn)

Year	Services and Software	Equipment	Telecommunications	Total
2007	22.1	211.8	55.2	289.0
2009	26.0	252.0	60.5	338.6
2011	29.5	314.3	65.9	409.7
2013	35.5	325.7	69.9	430.9
2015	51.3	324.2	72.5	447.9
2017	56.2	322.4	77.4	456.0

CAGR: 4.7%

#Korea defines ICT Hardware as ICT Equipment

ICT production is dominated by ICT equipment manufacturing, a global leader in many ICT related products such as DRAMs, semiconductors etc.

CAGR: 2007-17

Telecommunications: 3.4%

ICT Equipment: 4.3%

IT Services and Software: 9.8%

Source: ITSAT

ICT EQUIPMENT HAS THE LARGEST SHARE; SOFTWARE AND SERVICES GROWING FASTEST

ICT Sector Segmentation

Year	Services and Software	Equipment	Telecommunications
2007	7.7%	73.3%	19.1%
2009	7.7%	74.4%	17.9%
2011	7.2%	76.7%	16.1%
2013	8.2%	75.6%	16.2%
2015	11.5%	72.4%	16.2%
2017	12.3%	70.7%	17.0%

■ Services and Software   ■ Equipment   ■ Telecommunications

- ICT equipment manufacturing has the highest share. The sector has a significant share in global market but has shown a downward trend due to saturated domestic market and global competition.
- ICT services and software are expanding in foreign markets to grow the overall market.

Source: ITSAT

HIGH R&D EXPENDITURE ON ICT FOR PRODUCT AND SERVICE INNOVATION

Gross Domestic Expenditure on Research and Development on ICT (KRW tn)

Year	Value
2011	16.8
2012	18.9
2013	20.3
2014	21.9
2015	21.3

CAGR: 6.1%

- Korean ICT industry has high reliance on R&D to keep innovating new products and services.
- Korea invests almost 1.5% of GDP in ICT industry. ICT hardware is the main focus of R&D investment to stay at a leading position in the global market.

Source: KISDI

KOREA: IT SERVICES AND SOFTWARE

HIGH GLOBAL EXPORTS DUE TO ENTRY IN FOREIGN MARKET BY MAJOR IT PLAYERS

Production and Export of Software and IT Services (KRW tn)

	2013	2014	2015	2016	2017
Production	361.9	363.6	394.5	410.9	427.0
Export	4.5	5.7	6.7	7.3	7.7

CAGR: 2013-17

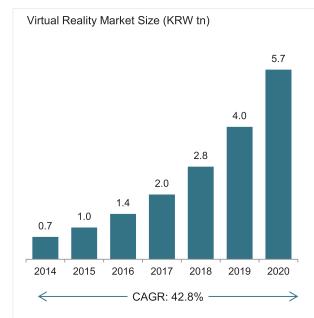| Production: 4.2% | Export: 14.7% |

Source: KISDI, MSIP

- Major IT service providers had inclining growth rates due to entries into foreign markets and business diversification drives. The service providers are facing limitations in domestic market.
- IT consulting/system integration and IT system management/support reduced overall IT service exports. Applied software products are driving the software exports due to high foreign demand.

Note: The production figures for 2015 and 2016 were estimated from provisional data. KISDI projections for 2017

HEAVY GROWTH IN AUGMENTED REALITY AND VIRTUAL REALITY DRIVEN BY INVESTMENTS

Virtual Reality Market Size (KRW tn)

2014	2015	2016	2017	2018	2019	2020
0.7	1.0	1.4	2.0	2.8	4.0	5.7

CAGR: 42.8%

Source: Ministry of Science, ICT and Future Planning and Korea Virtual Reality Industry Association (2015)

- The Korea Virtual Reality Industry Association projects the Korean Virtual Reality (VR) market to reach KRW 5,700 billion in 2020.
- Recent large scale investments went in virtual reality (VR) whereas most of the funding went to augmented reality (AR) in 2014. Companies including Magic Leap, Jaunt and Blippa account for major portion of funding for the industry.
- Major Korean telecommunications carriers are offering or planning to offer VR platform services:
    - KT plans to offer 360-degree VR video services mainly on its Mobile TV service.
    - LG Uplus is offering 360-degree VR video content in its LTE Video Portal through partnerships with Mooovr and Verest.
    - SK Telecom plans to provide 360-degree VR content through their mobile video platform content.

INCREASING DEMAND FOR SOFTWARE FROM NEW SECTORS

- Major software package providers reported a good revenue performance on the strength of continuous demand for software including business software as well as increasing software developments in new business areas such as FinTech and Cloud Computing.
- Software packages are expected to record a growth rate of 6.9% in 2017 thanks to rising demand for security, electronic payment and corporate solution packages as well as increasing demand in the public sector.
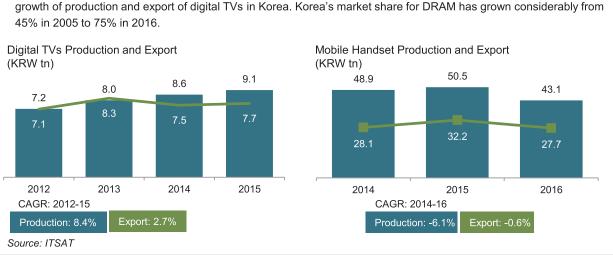
Source: MSIP

KOREA: ICT EQUIPMENT

ICT EQUIPMENT EXPORTS CONTINUOUSLY DOMINATING KOREAN EXPORTS

Production and Exports of ICT Equipment (KRW bn)

CAGR: 2007-17

Production: 3.6%   Export: 4.3%

- Korea is one of the leading manufacturing economy with highly developed manufacturing infrastructure.
- Korea's dependence on ICT goods exports is 19.8% out of total goods exports turns out to be the highest amongst the OECD countries.

Source: MSIP

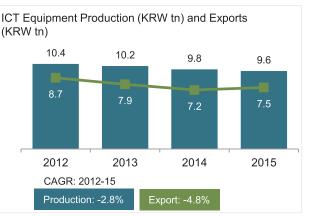## ICT EQUIPMENT SECTOR GROWTH BOOSTED BY DRAM, SMARTPHONES AND DIGITAL TV

- Korea's global market share in TV manufacturing reached 50% mark in 2016 and will continue to grow further driven by export of ultra-high definition TVs.
- Increasing global demand for NAND flash products, mobile DRAMs, large OLED and UHD TV panels will drive the growth of production and export of digital TVs in Korea. Korea's market share for DRAM has grown considerably from 45% in 2005 to 75% in 2016.

Digital TVs Production and Export (KRW tn)

CAGR: 2012-15

Production: 8.4%   Export: 2.7%

Source: ITSAT

Mobile Handset Production and Export (KRW tn)

CAGR: 2014-16

Production: -6.1%   Export: -0.6%

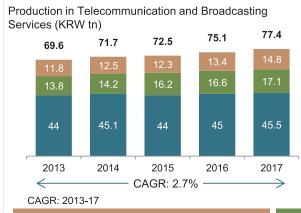## FOREIGN COMPANIES TAKING GLOBAL MARKET SHARE OF DOMESTIC COMPANIES

- Declining global demand of PC and rising Chinese PCs and white box products have caused decline in share of Korean PC manufacturers.
- Korea's market share for smartphones and small and mid-sized panels is decreasing due to increasing Chinese competition.
- Korea is focusing on launching new tablet PC products and auxiliary memory units since the global trend is moving from PCs to tablet PCs.

Source: ITSAT

ICT Equipment Production (KRW tn) and Exports (KRW tn)

CAGR: 2012-15

Production: -2.8%   Export: -4.8%

KOREA: ICT TELECOMMUNICATIONS

HIGHLY MATURE TELECOM MARKET LEADS TO STAGNANT GROWTH

Production in Telecommunication and Broadcasting Services (KRW tn)

	2013	2014	2015	2016	2017
Total	69.6	71.7	72.5	75.1	77.4
Fixed-mobile content and convergence services	11.8	12.5	12.3	13.4	14.8
Broadcasting Services	13.8	14.2	16.2	16.6	17.1
Communication Services	44	45.1	44	45	45.5

CAGR: 2.7%

CAGR: 2013-17

Fixed-mobile content and convergence services: 5.8% Broadcasting Services: 5.5% Communication Services : 0.8%
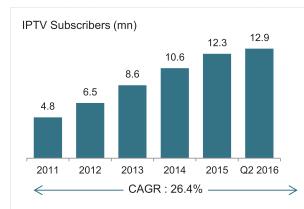
Source: MISP

- Korea has one of the world's most active telecommunications markets backed by strong support from the government.
- The telecommunication and broadcasting industry is experiencing slow growth due to highly saturated market.
- The telecommunication and broadcasting companies have major focus on building the infrastructure to expand LTE services and deploy 5G technology.
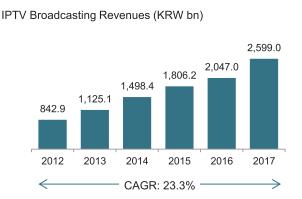
INCREASING REVENUES DRIVEN BY DIGITAL IPTVs

IPTV Subscribers (mn)

2011	2012	2013	2014	2015	Q2 2016
4.8	6.5	8.6	10.6	12.3	12.9

CAGR : 26.4%

IPTV Broadcasting Revenues (KRW bn)

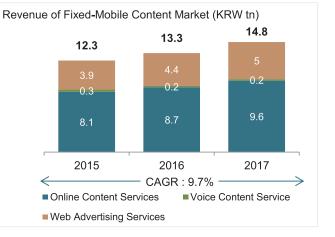| 2012	2013	2014	2015	2016	2017
842.9	1,125.1	1,498.4	1,806.2	2,047.0	2,599.0

CAGR: 23.3%

- The IPTV segment has been on a growing trend backed by a marked increase in subscribers opting for fixed-mobile bundled products and smart set-top box. The market is dominated only by KT, SK Broadband and LGU+.
- The growth in the number of subscribers is expected to increase license fee income, while increasing ad revenues and expanding Video On Demand (VOD) services are likely to push up related revenues.

Source: MISP

FIXED-MOBILE CONENT MARKET HAS HIGH GROWTH DRIVEN BY INTERNET GAMES

- The industry has continued an upward swing, backed by growth in the Internet game and web advertising service segments.
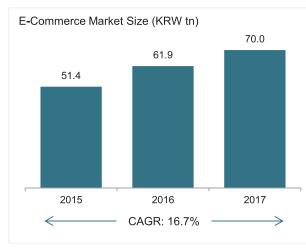- Internet gaming accounts for the largest share of around 40% of fixed-mobile content service revenues.
- Web advertising services, recorded a two-digit growth rate, driven by the increasing penetration of smartphones and the expansion of mobile business areas such as O2O commerce

Source: MISP

Revenue of Fixed-Mobile Content Market (KRW tn)

	2015	2016	2017
Total	12.3	13.3	14.8
Web Advertising Services	3.9	4.4	5
Voice Content Service	0.3	0.2	0.2
Online Content Services	8.1	8.7	9.6

CAGR : 9.7%

■Online Content Services ■Voice Content Service
■Web Advertising Services

KOREA: E-COMMERCE
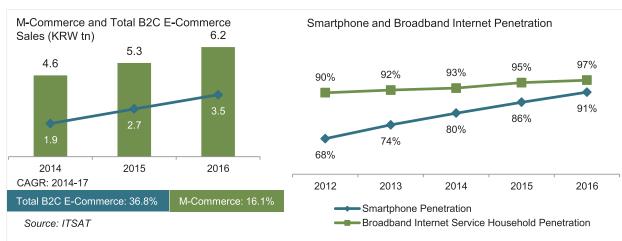
KOREA IS THE 6TH LARGEST E-COMMERCE MARKET IN THE WORLD

E-Commerce Market Size (KRW tn)

51.4 — 2015
61.9 — 2016
70.0 — 2017

CAGR: 16.7%

- The country has the second highest digital buyer percentage in the Asia-Pacific region due to high-penetration of smartphones. Domestic e-commerce comprises almost 20% of Korea's total retail industry.
- Because of the small country size and high population density, Korea has exceptionally fast fulfillment rates.

Source: ITSAT

M-COMMERCE GROWING AT AN IMPRESSIVE CAGR OF OVER 35%

M-Commerce and Total B2C E-Commerce Sales (KRW tn)

4.6 — 2014
5.3 — 2015
6.2 — 2016

1.9 — 2014
2.7 — 2015
3.5 — 2016

CAGR: 2014-17

| Total B2C E-Commerce: 36.8% | M-Commerce: 16.1% |

Source: ITSAT

Smartphone and Broadband Internet Penetration

90% — 2012
92% — 2013
93% — 2014
95% — 2015
97% — 2016

68% — 2012
74% — 2013
80% — 2014
86% — 2015
91% — 2016

◆ Smartphone Penetration
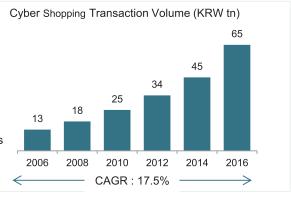■ Broadband Internet Service Household Penetration

- Korea has second highest percentage of retail m-commerce sales in the total retail e-commerce sales in the world, transactions through mobile accounts for around 60% of total online purchases.
- Mature smartphone and internet penetration with one the fastest average internet speed in the world explains high contribution of m-commerce. Coupang was the most preferred website for mobile users followed by 11st Street and TMON.

GROWING DOMESTIC MARKET USED HEAVILY FOR TRAVEL RESERVATION

- Korea has saturated smartphone and internet penetration, special promotional offers for mobile shoppers is provided by online shopping companies to lure customers as it is convenient and fast for both the parties.
- E-commerce companies are building logistic infrastructure for quick delivery service termed as "rocket delivery".
- Clothing, Footwear and accessories contributed 77% to the overall online shopping sales followed by tickets and bookings for entertainment at 45.6%.
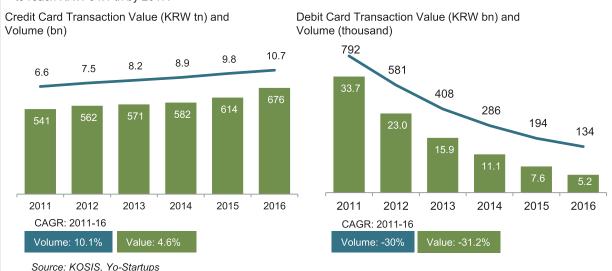
Source: MSIP

Cyber Shopping Transaction Volume (KRW tn)

13 — 2006
18 — 2008
25 — 2010
34 — 2012
45 — 2014
65 — 2016

CAGR : 17.5%

KOREA: FINTECH

CREDIT CARD PAYMENTS WITNESSING STEADY GROWTH

- FinTech transaction value was estimated at KRW 51.7 tn in 2016. At 19.9% CAGR it is expected to reach KRW 104.5 tn in 2020.
- According to the Korea Institute of Finance, the mobile payment market is growing 18% year on year and is expected to reach KRW 34.1 tn by 2017.

Credit Card Transaction Value (KRW tn) and Volume (bn)

Debit Card Transaction Value (KRW bn) and Volume (thousand)

CAGR: 2011-16
Volume: 10.1%   Value: 4.6%

CAGR: 2011-16
Volume: -30%   Value: -31.2%

Source: KOSIS, Yo-Startups

INVESTMENTS IN FINTECH STARTUPS ON A RISE

Fintech investments (KRW bn)

CAGR: 330.5%

- Fintech startups continue to be a popular investment option since 2015.
    - Payments company Viva Republica raised KRW 53.6 bn in 2017.
    - Ant Financial also announced a KRW 223.5 bn investment in Kakao Pay in Q2 2017.
- The government has a technology-forward initiative to establish the country as a Fintech hub in Asia. It has offered a pledge of KRW 3 tn over next three years (2019) to financially support fintech startups and companies.
- However, stringent regulations remain a barrier to fintech success. In a recent policy relaxation, a non-financial firm can hold up to 50% stake in internet-only banks. This move is expected to encourage the internet-only banking and innovations in digital finance.

Source: Korea Herald

KOREA STEADILTY BECOMING A CRYPTOCURRENCY HUB

- Korea aims to introduce bitcoin regulation in 2017 since the bitcoin adoption is increasing steadily.
- Korea's blockchain consortium currently consists of 21 financial institutions and 5 blockchain technology firms.
- A major financial institution such as Shinhan Bank has already initiated a remittance service in the Korea-China corridor through mobile app backed by bitcoin.
- Similarly, the Korea Exchange (KRX), Korea's securities exchange operator has also launched a blockchain-powered trading platform that allows startups to trade equity shares on the open market.

The government launched Mid- to Long-Term Master Plan in Preparation for the Intelligent Information Society in December 2016 with an aim to achieve as a knowledge based society. Following are the key points of the master plan-

NATIONAL VISION

Realizing a Human-Centered Intelligent Information Society

ROLES AND RESPONSIBILITIES

Business
- Foster a healthy ecosystem of competition over innovative intelligent IT and Services.
- Secure the rights and access to intellectual properties available worldwide through R&D, M&A and strategic alliances
- Recognize the value of data and technologies and invest in and develop new services that make use of intelligent IT.
- Fulfill social responsibilities, such as ensuring the timeliness and transparency of decision-making processes, meritocracy in hiring and, reinforced re-training for employees.

Citizens
- Enhance creativity, understanding of intelligent IT, and other core capabilities necessary to lead society into the future.
- Participate actively in new intelligent IT industries based on entrepreneurial spirit and the boldness to take risks.
- Participate actively in the policymaking process (e.g. suggest ways of using intelligent IT to solve social problems).
- Participate in social discourses concerning legal and regulatory reforms, transition to a more flexible regulatory regime, etc.

Government
- Foster the market environment so as to boost and maximize the effectiveness of the private sector.
- Implement a balanced system of market-promoting policies (supporting entrepreneurship, providing test beds, etc.).
- Provide fertile ground for increasing private-sector investment by first applying intelligent IT to public services.
- Develop and foster social and cultural infrastructure to support entrepreneurial endeavors, human resources development, and a new intelligent IT culture.

Research Community
- Support the development of technologies and human resources.
- Carry out basic R&D related to intelligent IT that corporations tend to avoid.
- Support systemic human resources. development through convergence- and creativity-oriented education.
- Enhance expertise in the intelligent information society and articulate future visions.
- Lead research on the social and economic effects of intelligent IT.

SOCIAL NEEDS

PUBLIC CONCERNS

Loss of jobs

Unsafe and inappropriate use of technologies

BUSINESS' CONCERNS

| Shortage of experts | Excessive regulation | Lack of industrial ecosystem | Lack of infrastructure |

Source: MSIP

KOREA: DIGITAL TRANSFORMATION INITIATIVES

The strategy aims in fostering an intelligent information society on the basis of public-private partnership, with businesses and citizens playing leading roles and the government and research community providing support. Following are the strategic policy tasks for the realization of a humane intelligent information society-

	TECHNOLOGY	**INDUSTRIES**	**SOCIETY**
Objectives	**Establish world-class infrastructure for Intelligent IT**	**Promote the application of Intelligent IT to all industries**	**Take proactive steps to reform and strengthen the social support system**
Policy focus	• Strengthen technologies and data as sources of competitiveness. • Develop networks that ensure secure access to data.	• Catalyze private-sector innovation based on public sector examples. • Concentrate support on industries with the potential for significant ripple effects. E.g. Medicine, manufacturing	• Reform the education, employment, and welfare policies that form the social basis for Intelligent IT. • Reinforce countermeasures against pending issues (e.g., cyber threats and ethical concerns).
Tasks	1. Generate value from data, the source of future competitiveness. 2. Develop infrastructure for Intelligent IT . 3. Establish a super-connected networking environment centered on data and services.	4. Proactively apply Intelligent IT to public services. 5. Support private-sector innovation by forming ecosystems for Intelligent IT industries. 6. Generate new value through intelligent healthcare services. 7. Ensure the digital innovation of manufacturing.	8. Achieve innovation in education for the future. 9. Proactively manage automation and the diversification of employment types. 10. Strengthen the social security net in response to the rise of the intelligent information society. 11. Reform laws and ethics to ensure harmonious human machine coexistence. 12. Counter downsides (e.g., cyber threats and AI failures).

Following is the analysis of strength government's role in strategic policy tasks and their urgency

Source: MSIP

KOREA: DIGITAL TRANSFORMATION INITIATIVES

Details	Targets
1. Identification and generation of value from data as a source of future competitiveness	
■ To create a data-based society and decision making system. ■ Establish a national data management system ■ Encourage blockchain technology usage to enhance data management security.	■ Public organizations to identify and disclose their data amenable to machine learning (20 organizations by 2018, all by 2025). ■ Foster businesses with data transactions specialization from 50 in 2016 to 100 in 2020. ■ Provide practical education to foster skilled professionals to solve real problems from 500 per year in 2017 to 1,000 in 2030.
2. Establishment of the basis for AI technology	
■ Encourage universities and research centers to develop infrastructure for Korean AI-based industries.	■ Be globally competent in cognitive technologies by 2023. ■ Increase independent and government ICT R&D research projects at universities from 43.5% (2016) to above 70% (2017).
3. Creation of a super-connected, data- and service-centered network environment	
■ Develop flexible, high-performance networks capable of supporting convergence services ■ Focus policy resources on enhancing the quality and reliability of networks ■ Introduce quantum. cryptography technology in phases to eliminate the risk of cyber attacks.	■ Launch 5G and Giga Internet services (as of 2020). ■ Launch interdepartmental test projects in 2018 for services linking intelligent networks with other industries (self-driving cars, intelligent robots, drones, smart homes, etc). ■ Provide an additional 28 MHz of IoT-exclusive channels and an additional 12 GHz for control and communication of portable wireless devices by 2026.
4. Proactive application of Intelligent IT to national services	
■ Apply Intelligent IT to public services to improve public services to generate early market demand for Intelligent IT among businesses. ■ Improve military efficiency and competency using Intelligent IT.	■ To develop an "AI-based assistant chief of staff" in the national defense network by 2030 ■ Increase the arrest rate from 78% in 2014 to 88% in 2030 by developing AI systems for crime information analysis. ■ Complete MeGov, a system that customizes government services by automatically recognizing the needs of individual citizens, by 2020.

Source: MSIP

KOREA: DIGITAL TRANSFORMATION INITIATIVES

Details	Targets
5. Creation of Intelligent IT industry ecosystems and facilitation of private-sector innovation	
▪ Encourage entrepreneurism in the intelligent IT industry and reform business regulations ▪ Personalize a wide range of services (finance, distribution, broadcasting, etc.)	▪ Establish smart cities (Seoul/Gyeonggi-do) by 2019, intelligent robotics (Gyeongsang-do/Jeolla-do) by 2021 and smart tourism (Gangwon-do) by 2023. ▪ To raise a fund of KRW 30 billion by 2017 for the growth of tech startups and SMEs specializing in Intelligent IT and data.
6. Generation of innovation and new value through intelligent healthcare services	
▪ To establish customized and intelligent healthcare services to cope with population aging and prevent diseases. ▪ Establish a data environment for the provision of effective and quality healthcare services.	▪ Develop EMR-sharing network by 2025. ▪ Develop intelligent public healthcare applications by 2020 ▪ Use ICT to eliminate blind spots in the healthcare system and develop and distribute innovative healthcare devices, such as caretaker, nursing robots and muscle-enhancing suits by 2022.
7. Digital innovation of manufacturing	
▪ Establish platform-based production systems with Intelligent IT to collect and analyze market data. ▪ Develop a cyber-physical system (CPS) for mass customization and create an ecosystem for the servitization of manufacturing.	▪ Introduce manufacturing robots to smart factories capable of decision-making in 20 industries by 2018. ▪ Introduce financial incentives to encourage businesses to adopt smart service technologies by 2020.
8. Innovation of education for the intelligent information society	
▪ Develop an adaptive learning system capable of maximizing the learning effect for students by analyzing their learning histories and progress using Intelligent IT.	▪ Increase the number of schools in the Creative Convergence Leadership Program from 52 in 2016 to 100 by 2018. ▪ Expand specialized education to produce 50,000 Intelligent IT graduates by 2030.

Source: MSIP

KOREA: DIGITAL TRANSFORMATION INITIATIVES

Details	Targets
9. Active response to automation and employment diversification	

- Increase labor market flexibility, with a focus on shifting from input to output.
- Expand the employment security net in anticipation of employment diversification
- Improve employment support services to support inter-sector job transitions.

- Expand the scope of the Earned Income Tax Credits (EITCs), and the tax benefit for working individuals and households by 2018.
- Increase the number of the Entrepreneurial graduates for Intelligent IT to 1,000 by 2030.

10. Reinforcement of the social security net for the intelligent information society

- Apply Intelligent IT to people's daily lives to achieve an open, discrimination-free society and maintain stable livelihoods.
- Development of Intelligent IT for the elderly, the underprivileged, and people with disabilities.

- Apply Intelligent IT to the social security net information system by 2020 to minimize budget waste.
- Introduce a post-retirement five-year plan for citizens by 2021 to support the aging population.

11. Legal and ethical reforms for the intelligent information society

- To reform existing laws and institutions in order to enable individuals and businesses to use Intelligent IT freely and safely.
- Establish human-centered ethics to govern data-collection processes and AI Algorithms.

- Expand flexible working hours programs and introduce a working-hour account system
- Reform and improve the entire legal system to grant rights and responsibilities to "electronic persons" in preparation for the dissemination of AI and self-learning machines.

12. Prevention and management of negative impacts

- Effectively predict, prevent, and manage all possible negative impacts of Intelligent IT (such as cyber threats and AI errors) to mitigate peoples' fears
- Establish an intelligent, automatic national defense system with capability to counter cyber threats.
- Develop an Intelligent IT software security assessment system.

- Real-time threat transmission and blocking system for international networks by 2020, connected networks by 2025, and corporate networks by 2030.
- Develop the Personal AI Shield, which automatically identifies and troubleshoots security threats to personal AI devices and services connected via networks by 2025.

Source: MSIP

MALAYSIA

MALAYSIA: EXECUTIVE SUMMARY

ICT OVERVIEW

- The Malaysian ICT industry is valued at RM 81 bn as of 2016.

- Availability of cheap labor in other countries and a drop in demand for key microelectronic components due to digitization has led to the decline of the ICT hardware market from RM 38.6 bn in 2010 to RM 36.8 bn in 2016.

- The telecom sector has grown from RM 27.1 bn in 2010 to RM 45.6 bn in 2016. Malaysia has one of the highest mobile phone penetration rates in the world. The government is improving broadband connectivity and speeds through initiatives like High Speed Broadband (HSBB) and Sub Urban Broadband (SUBB).

- IT services has grown from RM 11.4 bn in 2010 to RM 25 bn in 2016 at 14% CAGR which has made Malaysia a favored IT outsourcing destination in the world. Malaysia plans to become a hub for business development analytics (BDA) in the ASEAN region and has launched the ASEAN Data Analytics Exchange in 2017 to achieve this goal.

DIGITAL AGENDA

- All the four pillars under Malaysia's Digital Economy Agenda — driving investments, building local tech champions, catalyzing digital innovation ecosystems and digital inclusivity — achieved solid performance.
  - On driving investments, Malaysia Digital Economy Corporation (MDEC) recorded new investments totaling RM16.3 bn in 2016, up from RM4.57 bn in 2015.
  - On the building local tech companies, MDEC incepted the Global Acceleration and Innovation Network (GAIN) in 2016 to assist high-potential Malaysian technology companies to grow and expand their reach, regionally and globally via the four pillars – market access, risk capital, tech refresh and visibility. The programme is targeted to boost annual revenue of GAIN companies to exceed RM100 mn.
  - Malaysia Digital Hub was set up for developing an innovation ecosystem which offers opportunity for global expansion for startups, access to high-speed broadband and fibre-optic internet connectivity, funding opportunities and a workforce-ready ecosystem.
  - The final pillar, digital inclusivity, is MDEC's initiative to boost people's income in rural areas through eRezeki and eUsahawan. Under eRezeki, 50,618 people have been trained to date, earning a total income of RM16.4 mn. Under eUsahawan, 51,203 entrepreneurs were trained, with RM42.8 mn in total income earned.

DIGITAL INITIATIVES

- The Digital Free Trade Zone (DFTZ) jointly created by China's Alibaba Group and the MDEC will be a future one-stop digital hub of logistics, payment gateway, clearance and data standardization.
  - DFTZ will help SMEs facilitate cross-border transactions as well as ensure seamless logistics. DFTZ will be a boost to Malaysia's e-commerce strategic roadmap, which aims to double the nation's e-Commerce growth and SME exports.

- MDEC collaborated with Human Resources Development Fund (HRDF) Malaysia to up skill the talent development for the Digital Economy. Under this collaboration, funds are allocated from HRDF's Pool Fund, for the development of programmes on critical ICT skills.

- Malaysia is also one of the few countries which have developed a comprehensive roadmap to make the Internet of Things, a key contributor to the country.
  - The country is in a good position for strong IoT with high mobile penetration of 143.7%, internet usage of 65.8% and social media penetration of 45%.
  - Malaysia's National IoT Roadmap has outlined long term initiatives to develop Malaysia into a premier regional IoT hub and contribute RM9.5 bn to the country's Gross National Income (GNI) by the year 2020 creating 14,270 high-skilled employment opportunities.

MALAYSIA: EXECUTIVE SUMMARY
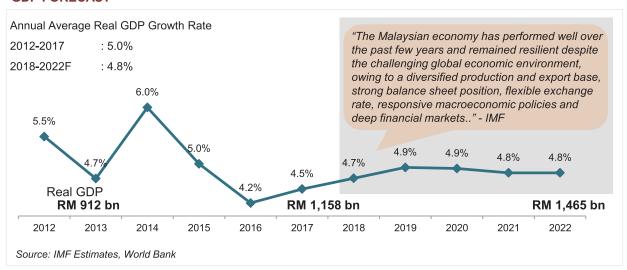
KEY CHALLENGES

- Awareness and adoption of SMEs towards ICT is still quite low in Malaysia, where nearly 97% of the enterprises are either SMEs or micro-enterprises. According to a study by Federation of Malaysian Manufacturers (FMM) in 2016, only 2% of SMEs use ICT applications actively. Only 16% of SMEs embarked on e-commerce activities. Nearly 55% of SMEs do not know how to use the internet.

- According to PIKOM, only 10% of new human resource in ICT sector is employable. The curriculum in educational institutions is not evolving according to the changing situation of ICT sector which is further intensifying this problem.

- Internet of Things presents many security-related challenges for enterprises. With cyber security at the focus, Malaysia has to address the global trend of cyber security skilled professional shortage.

MALAYSIA: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate

2012-2017   : 5.0%
2018-2022F   : 4.8%

"The Malaysian economy has performed well over the past few years and remained resilient despite the challenging global economic environment, owing to a diversified production and export base, strong balance sheet position, flexible exchange rate, responsive macroeconomic policies and deep financial markets.." - IMF

5.5%   4.7%   6.0%   5.0%   4.2%   4.5%   4.7%   4.9%   4.9%   4.8%   4.8%

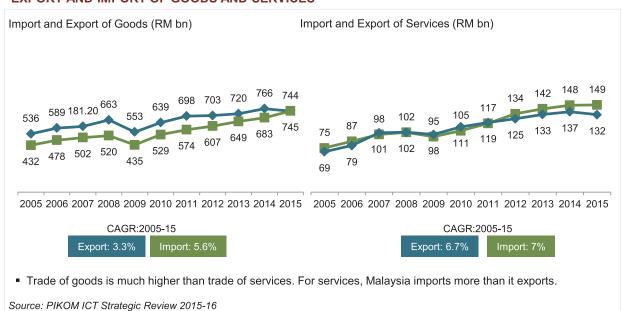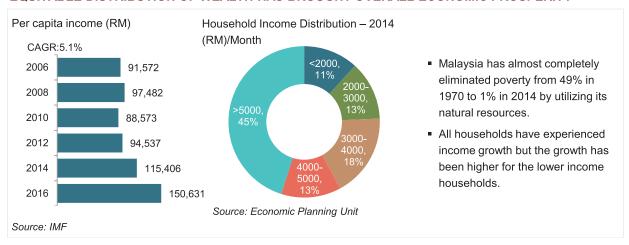Real GDP
RM 912 bn   **RM 1,158 bn**   **RM 1,465 bn**

2012   2013   2014   2015   2016   2017   2018   2019   2020   2021   2022

Source: IMF Estimates, World Bank

EXPORT AND IMPORT OF GOODS AND SERVICES

Import and Export of Goods (RM bn)

536 589 181.20 663 553 639 698 703 720 766 744
432 478 502 520 435 529 574 607 649 683 745

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

CAGR:2005-15

Export: 3.3%   Import: 5.6%

Import and Export of Services (RM bn)

75 87 98 102 95 105 117 134 142 148 149
69 79 101 102 98 111 119 125 133 137 132

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

CAGR:2005-15

Export: 6.7%   Import: 7%

- Trade of goods is much higher than trade of services. For services, Malaysia imports more than it exports.

Source: PIKOM ICT Strategic Review 2015-16

EQUITABLE DISTRIBUTION OF WEALTH HAS BROUGHT OVERALL ECONOMIC PROSPERITY

Per capita income (RM)

CAGR:5.1%

Year	Value
2006	91,572
2008	97,482
2010	88,573
2012	94,537
2014	115,406
2016	150,631

Source: IMF

Household Income Distribution – 2014 (RM)/Month

<2000, 11%
2000-3000, 13%
3000-4000, 18%
4000-5000, 13%
>5000, 45%

Source: Economic Planning Unit

- Malaysia has almost completely eliminated poverty from 49% in 1970 to 1% in 2014 by utilizing its natural resources.
- All households have experienced income growth but the growth has been higher for the lower income households.

MALAYSIA: ICT INDUSTRY OVERVIEW

ICT MARKET SIZE OVERVIEW

Overall ICT Industry Market Size (RM bn)

CAGR:0.3 %

	2010	2011	2012	2013	2014	2015	2016
Contribution to GDP	80.2	81.3	88.2	89.1	89.5	76.9	81.9
Others	3.1	3.3	4.1	4.3	4.6	4.2	4.7
Computer Services	11.4	11.8	13.4	15.3	16.7	15.6	17.9
Telecommunication	27.1	29.0	32.4	34.0	35.2	30.4	32.8
Hardware	38.6	37.3	38.3	35.5	33.0	26.6	26.4

■ Hardware ■ Telecommunication ■ Computer Services ■ Others
■ Contribution to GDP

 # Other consists of Broadcasting, Publishing, Motion picture, video and television programme
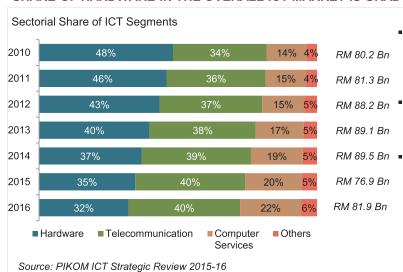*Source: PIKOM ICT Strategic Review 2015-16*

- The government sees ICT as a very important means to achieve its goal of making Malaysia a developed economy by 2020.
- The government also plans to make Malaysia a regional ICT service hub by 2020.
- The growth in the ICT industry has been slow primarily due to a steady decline in hardware manufacturing.

CAGR:2010-16

Hardware: -6.2%

Telecommunications: 3.2%

Computer Services: 7.9%

Others#: 7.1%

SHARE OF HARDWARE IN THE OVERALL ICT MARKET IS GRADUALLY DECLINING

Sectorial Share of ICT Segments

Year	Hardware	Telecommunication	Computer Services	Others	
2010	48%	34%	14%	4%	RM 80.2 Bn
2011	46%	36%	15%	4%	RM 81.3 Bn
2012	43%	37%	15%	5%	RM 88.2 Bn
2013	40%	38%	17%	5%	RM 89.1 Bn
2014	37%	39%	19%	5%	RM 89.5 Bn
2015	35%	40%	20%	5%	RM 76.9 Bn
2016	32%	40%	22%	6%	RM 81.9 Bn

■ Hardware ■ Telecommunication ■ Computer Services ■ Others

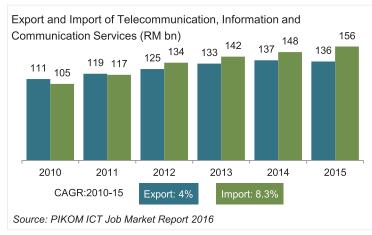*Source: PIKOM ICT Strategic Review 2015-16*

- ICT spending shifted from hardware manufacturing in the 1990s and 2000s to higher-value added segments such as software and services starting from 2010.
- The service sector is the largest contributor and the fastest growing segment of the ICT industry.
- The hardware production is declining because of increased price competition from other countries and a reduction in demand for certain microelectronic components with the emergence of digital technologies.

EXPORT VOLUMES ARE GRADUALLY DECLINING WHILE IMPORT VOLUMES ARE RISING

Export and Import of Telecommunication, Information and Communication Services (RM bn)

	2010	2011	2012	2013	2014	2015
Export	111	119	125	133	137	136
Import	105	117	134	142	148	156

CAGR:2010-15   Export: 4%   Import: 8.3%
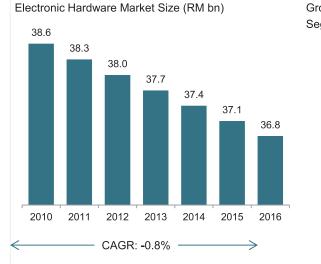
Source: PIKOM ICT Job Market Report 2016

- Imports have been increasing at a gradual pace but exports have stagnated since 2013.
- Imports continue to be higher than the exports and hence, Malaysia is taking steps become a net exporter of products.
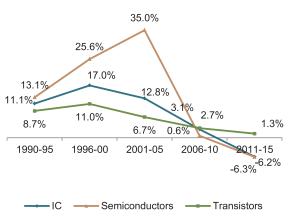
MALAYSIA: HARDWARE

IT HARDWARE HAS ONE OF THE LARGEST SHARES OF THE ICT MARKET DESPITE THE DECLINE

- Rapid industrialization took place in the Malaysian electronics hardware sector from the 1960s to the late1980s due to Japanese and American firms setting up low wage labor–intensive assembly plants.
- Growth in manufacturing continued during the 1990s, mainly driven by product exports. However, since the mid 2000s, the hardware sector has been on a decline since Malaysia has lost its competitive edge to other emerging economies with cheap labor availability.
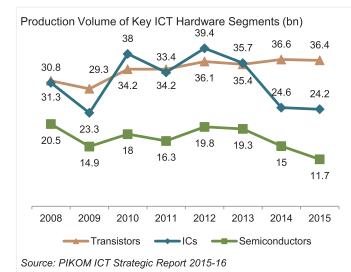
Electronic Hardware Market Size (RM bn)

Growth Rate by Volume of Key ICT Hardware Segments

Source: PIKOM ICT Strategic Report 2015-16

IC AND SEMICONDUCTOR PRODUCTION IS STEADILY DECLINING

Production Volume of Key ICT Hardware Segments (bn)

- Emergence of digital technologies has resulted in a decline in the production volume of microelectronic components such as integrated circuits(ICs) and semi-conductors.
- Electronic transistors have recorded a positive growth of 2.2% CAGR from 2008-15. This growth is however very low compared to 1990s growth when export of microelectronic components brought significant earnings to the country.
- Some production facilities have even closed down since the demand for microelectronic components is gradually shrinking.

Source: PIKOM ICT Strategic Report 2015-16

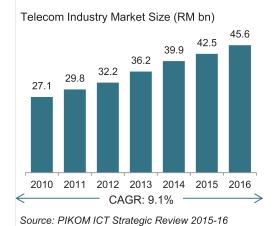## MALAYSIA LAGS BEHIND IN ICT HARDWARE INNOVATION

- The Malaysian ICT hardware industry has mainly been active in the lower value added electronics segments.
- Malaysia lacks strong R&D capabilities necessary for sustained growth. The ICT hardware industry has been dominated by MNCs having limited R&D presence in Malaysia. Even local firm operations are limited to less sophisticated products due to low R&D capabilities.
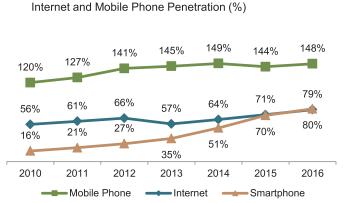
MALAYSIA: TELECOMMUNICATION
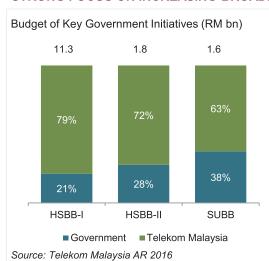
STEADY INCREASE IN OVERALL TELECOM REVENUES

- Mobile phone penetration in Malaysia is one of the highest in the world.
- The 3G and 4G coverage is also relatively high at 97% and 75% as of 2016. A full rollout of 5G services is expected by 2020-2025 with the trails by Celcom already underway in 2017.

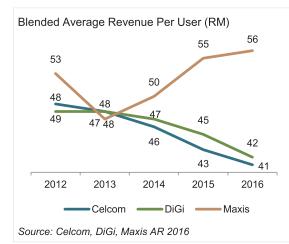Telecom Industry Market Size (RM bn)

Internet and Mobile Phone Penetration (%)

Source: PIKOM ICT Strategic Review 2015-16

Source: BNM

STRONG FOCUS ON INCREASING BROADBAND CONNECTIVITY

Budget of Key Government Initiatives (RM bn)

Source: Telekom Malaysia AR 2016

- The government plans to upgrade broadband infrastructure further through High Speed Broadband Initiative (launched in 2 phases HSBB-I and HSBB-II) and Sub-Urban Broadband (SUBB).
- HSBB is targeted to develop Malaysia's broadband infrastructure and increase broadband penetration. This initiative is undertaken in partnership with Telekom Malaysia.

Initiative	Target speed (Mbps)	Premises to be covered	Project timelines
HSBB-I	10 to 100	1.3 mn	2008-12
HSBB-II	20 to 100	390,000	2015-17
SUBB	20 to 100	420,000	2015-19

PRICE MARGINS OF MALAYSIAN TELECOM OPERATORS ARE THIN

Blended Average Revenue Per User (RM)

Source: Celcom, DiGi, Maxis AR 2016

- Though telecom revenues are increasing with the growth in data consumption, revenue per incremental Mb has been coming down steadily. This decline is majorly due to:
  - Increasing CAPEX of operators due to the accelerating data volumes.
  - Free unlimited data offered by telecom operators for accessing social media resulting in low profits due to lack of net neutrality in Malaysia.
- Hence, telecom operators are now moving towards non traditional sources of income to supplement their revenues.
- E.g. Maxis has been offering IoT solutions to Malaysian enterprises in partnership with Vodafone since 2016.

MALAYSIA: IT SERVICES AND SOFTWARE

IT SERVICES RECORDING A DOUBLE DIGIT GROWTH RATE
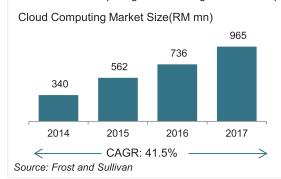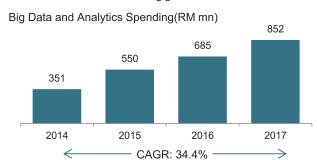
IT Services Market Size (RM bn)

- Malaysia is rapidly emerging as one of the most favored outsourcing destinations for global companies.
- Global business services(GBS) is a core focus in economic development, with 499 GBS companies having their outsourcing center and back offices in Malaysia.
- Despite a slowdown in the economy, the ICT services industry showed double digit growth in 2016. This growth trend is expected to continue in the coming years.

CAGR: 14%
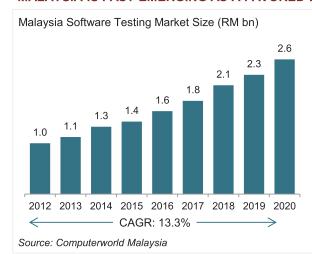
Source: PIKOM ICT Strategic Review 2015-16

DATA ANALYTICS AND CLOUD COMPUTING ARE FOCUS AREAS FOR MALAYSIA

- Malaysia is increasing spending on Big Data and Analytics(BDA) as it aims to establish itself as ASEAN's leading BDA solution hub. It launched the ASEAN Data Analytics Exchange(ADAX) in 2017 with the goal of making it the definitive resource hub for BDA in the ASEAN region by 2020.
- Even cloud computing market has grown at an impressive 2.8x from 2014-17 indicating growth in demand.

Cloud Computing Market Size(RM mn)

CAGR: 41.5%

Source: Frost and Sullivan

Big Data and Analytics Spending(RM mn)

CAGR: 34.4%

MALAYSIA IS FAST EMERGING AS A FAVORED DESTINATION FOR SOFTWARE TESTING

Malaysia Software Testing Market Size (RM bn)

CAGR: 13.3%

Source: Computerworld Malaysia
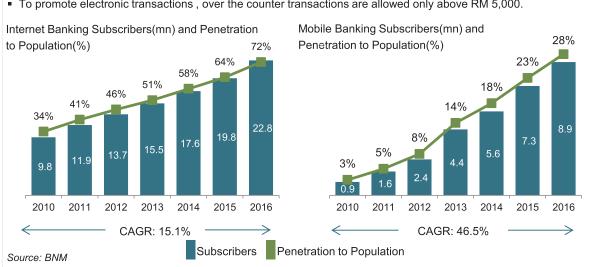
- Malaysia aims to reach 5% of the global software testing market by 2020, which was worth RM 217 billion in 2016 as per Malaysian Software Testing Board (MSTB).
- MSTB has also launched a Quality-Test Assist Programme (Q-Tap) to help establish Malaysia as a regional software testing hub.
- MSTB introduced the MSTH Cluster programme to enhance the overall competitiveness of products and services within the clusters, and optimize the cost of operations. The programme is expected to be a useful platform for discussions on software testing industry-related issues.

MALAYSIA: FINTECH

HIGH ADOPTION OF CURRENTLY PRESENT CASHLESS PAYMENT METHODS

- Adoption of cashless payment methods has always been high in Malaysia. The number of electronic payment transactions has grown steadily over the years with increasing PC and broadband penetration.
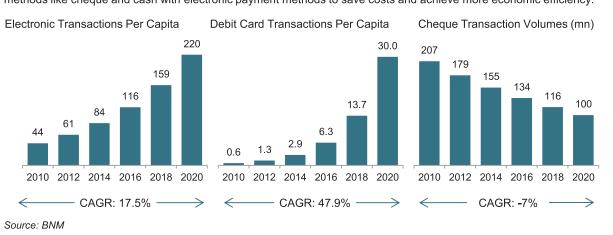- To promote electronic transactions , over the counter transactions are allowed only above RM 5,000.

Internet Banking Subscribers(mn) and Penetration to Population(%)

Mobile Banking Subscribers(mn) and Penetration to Population(%)

CAGR: 15.1%

CAGR: 46.5%

Subscribers   Penetration to Population

Source: BNM

GOAL TO INCREASE ELECTRONIC PAYMENT TRANSACTIONAL VOLUME

Bank Negara Malaysia's Financial Sector Blueprint 2011-2020, gives a strong thrust to replace paper based payment methods like cheque and cash with electronic payment methods to save costs and achieve more economic efficiency.

Electronic Transactions Per Capita

Debit Card Transactions Per Capita

Cheque Transaction Volumes (mn)

CAGR: 17.5%

CAGR: 47.9%

CAGR: -7%

Source: BNM

FAVOURABLE ENVIRONMENT FOR FINTECH STARTUPS

- The Malaysian fintech industry currently has around 80 startups as of 2016 with digital payment, finance, insurance and investment being the main segments. The government plans to increase this number further and is implementing various initiatives to attract investors such as –
    - A regulatory sandbox has been established by BNM to promote fintech without damaging the existing system.
    - Islamic Finance Platform is a fast growing segment in the Malaysian fintech landscape. Six Islamic banks launched an investment account platform (IAP) to direct funds from investors to entrepreneurs.
    - Under the Malaysia Tech Entrepreneur Program (2017) fintech startup founders are eligible for funding and corporate tax exemption for up to 5 years.
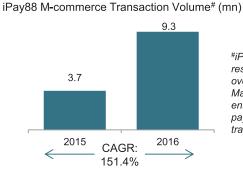
MALAYSIA: E-COMMERCE

THE MALAYSIAN E-COMMERCE INDUSTRY IS ON A STEADY GROWTH TRAJECTORY

- M-commerce is growing 3 times faster than e-commerce. A high penetration of smartphone and rise in internet businesses like Uber and GrabCar which transact via mobile phones is driving the rapid growth of m-commerce.
- 40% of e-Commerce spending in Malaysia is cross border. The government has lifted non-tariff barriers and reduced border clearance lead time for inbound and outbound parcel to catalyze growth.
- Malaysia is expected to become a net exporter from a net importer in 2018.

E-commerce Market Size (RM bn)

2012	2013	2014	2015	2016
49	53	61	68	75

CAGR: 11.2%

iPay88 M-commerce Transaction Volume# (mn)

2015	2016
3.7	9.3

CAGR: 151.4%

#iPay88 is responsible for over 70% % of Malaysia's entire online payment system transactions

Source: Malaysia National e-commerce Strategic Roadmap, iPay88 Statistics

THE GOVERNMENT IS COMMITTED TO INCREASING E-COMMERCE ADOPTION

Malaysia government has planned some major initiatives to increase e-commerce adoption since they believe it to be vital to Malaysia's economic future.

National e-Commerce Strategic Roadmap

The national e-commerce strategic roadmap has been developed with the goal of doubling the e-commerce growth rate to 20.8% by 2020.

- Accelerate seller adoption of e-Commerce.
- Increase adoption of e-procurement by businesses
- Lift non-tariff barriers and reduce border clearance lead time for inbound and outbound parcel.
- Make strategic investments in select e-commerce companies
- Promote national brands to boost cross border e-commerce.

Digital Free Trade Zone

Malaysia established the world's first Digital Free Trade Zone (DFTZ) in 2017 to increase cross border goods trading and drive e-commerce growth. DFTZ is expected to achieve below objectives by 2025:

- Double the growth rate of Malaysia's SME goods' exports.
- Facilitate movement of RM 280 bn worth of goods.
- Creation of 60,000 direct and indirect jobs.

ACTUAL GROWTH WILL OUTPERFORM NORMAL GROWTH DRIVEN BY MAJOR INITIATIVES

E-commerce market projections (RM bn)

2016	2017	2018	2019	2020
75	92	113	139	170
75	83	93	103	114

— With Additional Initiatives - - - Business as Usual

Source: Malaysia National e-commerce strategic roadmap
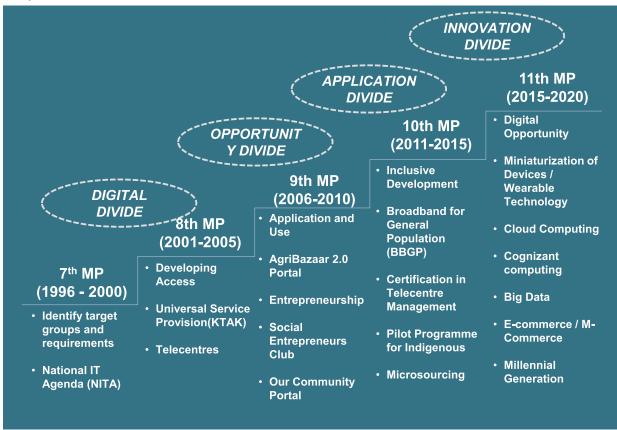
Parameter	2016	2020 (Business As Usual)	2020 (With Intervention)
Size (RM bn)	75	114	170
Growth	11.2% (2012-16)	11% (2016-20)	22.7% (2016-20)
% Share of GDP	6.8%	8.5%	12.7%

MALAYSIA: DIGITAL TRANSFORMATION INITIATIVES

ICT-LED INNOVATION THRUST

11th Malaysia Plan (MP) gives special focus on ICT sector and has accordingly decided key aspects to be covered under the plan.

SUMMARY OF STRATEGIC THRUSTS, STRATEGIES AND PROGRAMS UNDER THE 11TH MP

5 Strategic Thrusts	12 Strategies	30 Programs

Thrust	Strategy	# Programs
T1: Integrated digital services	S1 – Enhance Government Digital Services S2 – Leapfrog the Usage of Digital Services	6
T2: Data driven government	S1 – Leverage on Government Data S2 – Manage and Coordinate Public Sector Data	5
T3: Optimise shared services and strengthen cyber security	S1 – Strengthen Public Sector ICT Infrastructure S2 – Strengthen Digital Communication Capability S3 – Strengthen Public Sector Cyber Security	8
T4: Collaborative and dynamic ICT governance	S1 – Strengthen Digital Government Strategic Leadership S2 – Strengthen Digital Government ICT Organisation S3 – Strengthen Public Sector ICT Governance	6
T5: Professional and capable work force	S1 - Strengthen Management of Public Sector ICT Personnel S2 - Develop and Retain ICT Talent in Public Sector	5

In addition to the 11th Malaysia Plan, Malaysia has a long term digital transformation program known as Digital Malaysia which will which started in 2012 and will continue till 2040.

Source: MAMPU

MALAYSIA: DIGITAL TRANSFORMATION INITIATIVES

Digital Malaysia is the nation's program based on three strategic thrusts to advance the country towards a developed digital economy by 2020.

Creating an ecosystem that promotes the pervasive use of digital technology in all aspects of the economy to connect globally and interact in real time resulting in increased GNI, enhanced productivity and improved standards of living

Digital Malaysia Phase 1	Digital Malaysia Phase 2	Digital Malaysia Phase 3
2012-2020	*2021-2030*	*2031-2040*

STRATEGIC THRUSTS

Move from supply to demand focused

Enable new class of digital entrepreneurs through demand focused initiatives

Shift from consumption to production

Nurture a new generation of IT savvy youths

Evolve from low to high knowledge add

Drive automation and technology adoption among SMEs to boost productivity

GOALS

Increased contribution of Digital Economy to Malaysia's GNI

Using RM 31.1 bn in investments to create 160,000 jobs and boost overall Digital Economy GNI to RM 294 bn by 2020.

Enhance productivity of Malaysian economic sectors

Contribute 1% of the projected absolute growth of SME contribution to GDP by 2020

Improve standard of living for Malaysians

Additional RM 7,000 income per annum for 350,000 citizens from digital economy by 2020.

TARGETS BY 2020

ICT contribution to GDP from 9.8% in 2010 to 17%

#16 in IMD 2011 World Competitiveness Scoreboard to Top 10

#36 in 2010 to Top 20 in digital economy rankings

Source: MDEC

MALAYSIA: DIGITAL TRANSFORMATION INITIATIVES

DIGITAL MALAYSIA INITIATIVES

1 Tap Demand for Digital Products and Services

3 Increase citizen income and unlock entrepreneurship potential for the B40 Group

2 Nurture a new generation of digital-savvy youth

4 Enhance SME productivity

KEY PROJECTS STARTED IN 2012 UNDER DIGITAL MALAYSIA INITIATIVE

Projects	GNI (RM mn)	Jobs	Investment (RM mn)
Asian eFulfillment Hub Digital Malaysia will build eFulfilment capabilities and infrastructure targeting global online retailers. The hub will offer integrated logistics solutions and warehousing, packaging and kitting services.	294	1,622	620
Enabling ePayment Services for SMEs and Micro Enterprises Digital Malaysia and SME Corp Malaysia (project's Public Sector Lead) encourage and enable easier adoption of ePayment methods to SMEs by providing easy access to affordable terminals and readers.	5,000	2,000	600
Shared Cloud Enterprise Services The key objective is to make Malaysia's economic organisation and human capital competent amongst regional players through the development of enterprise shared services. The project also targets the SMEs' adoption of cloud solutions to increase their business volumes.	300.5	1,572	45.5
Develop On-Demand, Customised Online Education Digital Malaysia is developing a centralized customized education and learning exchange portal (CELEX) to serve as online classrooms for courses, education and career counseling service providers as well as meeting points for employers and students.	265	1,025	39.8
Microsourcing to Generate Income for the B40 This project, with the Ministry of Women, Family and Community Development (KPWKM) as the Public Sector Lead, focuses on helping B40 (those with household income of RM1,440 per month or below) generate some income by offering them digital access.	2,200	340,000	413
Facilitating Social Uplift The Ministry of Women, Family and Community Development (KPWKM), as the Public Sector Lead shall focus on socially uplifting the B40 by collaborating with MDeC to plan, match and distribute vertical programmes and funding to the target communities and need areas.	70	1,400	72
Grow the Embedded Systems Industry Digital Malaysia's Project aims to develop the embedded systems industry as a new source of growth to capture the growing global embedded systems market. This is achieved by capitalising on Malaysia's established electronics ecosystems and skilled local enterprises.	7,300	22,500	10,200
Develop a Trusted Mobile Digital Wallet System With MDeC (the Public Sector Lead), the project aims to establish a trusted nationwide system that allows consumers to transact securely and confidently by embedding virtual cards and vouchers in mobile digital wallet applications in their smartphones or other devices.	783	122	112

Source: MDEC

NEW ZEALAND

NEW ZEALAND: EXECUTIVE SUMMARY

ICT OVERVIEW

- New Zealand's ICT industry has been growing steadily at a CAGR of 3.4% since 2009 and stands at NZ$ 8.9 bn as of 2015. Telecommunication and software sectors contribute almost 40% of the overall industry's revenues. Sustainable growth in the ICT industry has led to significant employment opportunities. Since 2004, more than 12,000 new jobs have been created, predominantly driven by the software services segment.

- The share of software services segment grew from 28% of the total ICT industry's revenues in 2007 to 41% by 2015. Software services particularly computer system design is expanding rapidly.

- Telecommunications has shown a stable growth in both mobile and fixed line broadband connections both having grown at a 4% CAGR from 2012-16. Mobile phone penetration is now well over 100%. The penetration of fixed broadband is rather low and stands at 30%. This is changing with the number of subscriptions for fibre optic broadband increasing

- E-commerce is in its growth phase with smartphone penetration at around 70% as of 2015. M-commerce is gaining significant popularity with nearly 45% of the consumers aged between 15 and 65 made at least one purchase via m-commerce in 2014. During 2014-2019, m-commerce is projected to grow at a 25% CAGR to reach ~NZ$ 14 bn.

- Fintech has also shown positive acceptance and recorded a strong 23% 5-year CAGR growth until 2016. To promote and encourage Fintech startups, the New Zealand Tech Industry Association announced the launch of a new working group, FinTech NZ that will focus on fintech and innovation.

DIGITAL AGENDA

- The ICT Strategy and Action Plan (2017) was launched the New Zealand government in June 2013.
- The ICT Strategy and Action Plan aims to focus on following areas:
  - **Digital Services:** Focus on seamlessly providing public services to citizens through programs such as Better Public Services (BPS) Result 9 and 10 and Realme identity.
  - **Information:** Improve the data and analytics infrastructure by establishing a 'Social Sector Data Exchange' which would help in shaping public policies by providing information driven insights.
  - **Technology:** Accelerating adoption of ICT marketplaces where suppliers can provide ICT catalogue and adopt cloud services. After successful prototyping of 'Public Cloud Market', a contract negotiation with a platform supplier will enable agencies to purchase public cloud services to save time and money.
  - **Investment:** Investment in innovative digital services are being prioritised and benefits are being realised. 'Strategic Investment Support and Advice' is working with Chief Executives to establish governance and funding frameworks to support innovation.
  - **Leadership :** A 'Graduate Recruitment Programme' was initiated to enhance government's ability to attract and retain ICT graduates and future leaders.

DIGITAL INITIATIVES

- Deliver the Better Public Services Result 10 programme so New Zealanders can make their government transactions digitally.
    - The government is on track on its target of making for 70% of the common government transactions happen digitally by 2017. By 2021 – to meet Result 10, it aims to increase it to 80%.
    - The government is planning to launch an ICT marketplace by the second half of 2017 that would provide public cloud access to agencies under a common commercial contract. This would bring down the procurement costs and improve the process.
    - Digital Health 2020: The government launched the New Zealand Health Strategy which has measures to improve the use and access of electronic health records. It also has measures to support data to improve care delivery and the use of 'smart systems'. This is being done with the goal to improve sharing of data and strengthen the national analytical capability.
    - Open Government Information and Data Programme (Open Data NZ) - Open Data NZ makes data held by the government available for communities, agencies and businesses to be re-used.
    - Ultra-fast Broadband and Rural Broadband Initiative investment to build NZ's fibre-optic cable network Phase 1 already launched and executed. NZ$360 mn. allocated for phase 2 implementation.
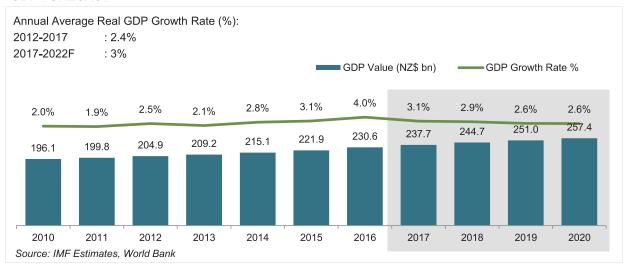
CHALLENGES

- Funding access for cross-agency work and system-wide interventions to implement cross-agency initiatives is difficult. The Partnership Framework Strategic Investment Group is at work to discuss funding options.
- Cross-agency initiatives aren't well governed and there are issues with the authorizing environment and accountability.
- The long established agency-centric systems and processes make it difficult to share information and manage horizontal and cross agency citizen focused working.
- An aversion to taking risks has restricted progress and prevented from exploiting opportunities such as enhanced information sharing and an adoption of public cloud services.

NEW ZEALAND: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate (%):
2012-2017   : 2.4%
2017-2022F   : 3%

GDP Value (NZ$ bn)   GDP Growth Rate %

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GDP Growth Rate %	2.0%	1.9%	2.5%	2.1%	2.8%	3.1%	4.0%	3.1%	2.9%	2.6%	2.6%
GDP Value	196.1	199.8	204.9	209.2	215.1	221.9	230.6	237.7	244.7	251.0	257.4

Source: IMF Estimates, World Bank

GROWTH IN WORKING POPULATION DUE TO IMMIGRATION

Share of Young and Working Population

2000: 38 mn   2020F: 47 mn

Age	2000		2020F
0-9	5.8		6.0
10-19	3.0		6.2
20-29	3.0		6.4
30-39	3.0		5.7
40-49	3.3		5.8
50-59	2.8		6.3
60-69	2.1		5.2
70-79	1.3		3.6
80+	0.9		1.9

48%   51%

Working Population   Non-Working Population   Working Population

- New Zealand is witnessing population growth largely due to migration, as more workable populace is needed in the country.
- New Zealand has an ageing population. One of the major factor is that there is high increase of average life expectancy.
- With declining birthrates, ageing is expected to have serious implications in New Zealand's agriculture sector as there is some amount of confusion of who will buy the farms and farm animals.

Source: National Population Estimates, stats.gov

SERVICE SECTOR GROWING WHILE MANUFACTURING DECLINES

GDP Segmentation

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Manufacturing	15.7	15.7	14.4	13.3	13.4	11.6	11.8	11.9	11.6	11.2	11.9
Service	68.8	69.3	69.7	68.6	69.5	70.7	70.0	70.2	71.0	70.1	71.4
Others	3.9	3.7	3.8	3.7	3.7	3.7	3.5	3.5	3.6	3.4	3.5

■ Others (Mining, Electricity, Construction, Wholesale, etc.)   ■ Service   ■ Manufacturing

Others CAGR 2004-14: -0.90%   Service CAGR 2004-14: 0.43%   Manufacturing CAGR 2004-14: -2.44%

Source: OECD

NEW ZEALAND: ICT INDUSTRY OVERVIEW
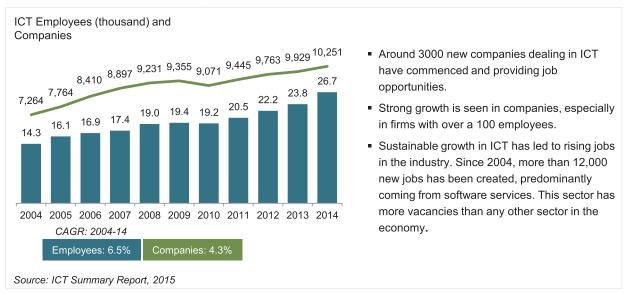
ICT INDUSTRY GROWING DUE TO HIGH SINGLE DIGIT SOFTWARE SERVICES GROWTH

ICT Market Segmentation (NZ$ mn)

7,793	**7,645**	**8,123**	**8,216**	**8,356**	**8,650**	**8,899**
405	373	444	424	386	416	426
3,408	3,318	3,480	3,608	3,491	3,581	3,664
2,648	2,632	2,919	3,084	3,364	3,514	3,608
964	993	807	761	733	758	841
368	329	473	339/383	383	381	360
2009	2010	2011	2012	2013	2014	2015

CAGR : 2.2%

- ICT Industry has shown a gradual increase from 2009-2015.
- The top two sectors i.e. Telecom and the software (computer system design) sector, each has almost 40% share in the contribution to ICT.
- The software services (computer design) has witnessed the highest growth of 8% CAGR.

CAGR 2009-15

Hardware : 1.3%	Software : 8.0%
Telecom : 1.8%	IT Services : -3.4%
	Others : -0.5%

Source: ICT Summary Report, 2017

ICT INDUSTRY: MORE THAN 12,000 JOBS CREATED IN A DECADE

ICT Employees (thousand) and Companies

7,264	7,764	8,410	8,897	9,231	9,355	9,071	9,445	9,763	9,929	10,251
14.3	16.1	16.9	17.4	19.0	19.4	19.2	20.5	22.2	23.8	26.7
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014

CAGR: 2004-14

Employees: 6.5% | Companies: 4.3%

- Around 3000 new companies dealing in ICT have commenced and providing job opportunities.
- Strong growth is seen in companies, especially in firms with over a 100 employees.
- Sustainable growth in ICT has led to rising jobs in the industry. Since 2004, more than 12,000 new jobs has been created, predominantly coming from software services. This sector has more vacancies than any other sector in the economy.

Source: ICT Summary Report, 2015

FOCUS ON ICT INDUSTRY DRIVING DOUBLE DIGIT GROWTH IN R&D EXPENSE

Business Expenditure on R&D ICT (NZ$ mn)

18%	20%	19%	25%	27%
163	200	221	311	436
2008	2010	2012	2014	2016

CAGR : 13.1%

Innovations in ICT sector driving growth of R&D expenditure in New Zealand. R&D expenditure in ICT grew by 14% CAGR from 2008-16.

- Business expenditure on R&D ICT
- Business expenditure on R&D ICT (%)

Source: ICT Summary Report, 2017

NEW ZEALAND: IT SERVICES

IT DESIGN AND DEVELOPMENT LEADING IT SERVICES EXPORT GROWTH

IT Services Exports (NZ$ mn)
CAGR : 11.6%

2013: 684
- 16
- 255
- 159
- 150
- 104

2014: 752
- 28
- 330
- 155
- 162
- 77

2015: 841
- 39
- 370
- 211
- 184
- 37

2016: 950
- 49
- 370
- 215
- 167
- 149

- IT Services exports grew by 12% CAGR from 2013-16, owing to the growth of IT Design and Development exports.
- IT Design and Development which contributes to around 40% of IT Service exports grew by 13% over the last three years.
- Information technology services (includes IT support, design, hosting and infrastructure services). It is mostly carried out by computer service and software businesses. The industry has rapidly grown over the past eight years. It was worth NZ$ 6.1 bn in 2014 which more than 25% of what it was in 2012.

CAGR 2013-16

Data information Services/Others: 12.7%	IT Technical consulting and support services: 3.6%
Licenses to reproduce and/ or distribute computer software: 10.6%	IT Design and Development: 13.2%
Non Customized Software Online: 45.2%	

Source: ICT Summary Report, 2017

IT SERVICES EXPORTS DOMINATED BY GROWTH IN EXPORTS TO THE US AND EUROPE

IT Services Exports by Country(NZ$ mn)

2008: 559
- 41.9%
- 25.9%
- 1.1%
- 9.8%
- 8.2%
- 13.1%

2016: 870
- 27.4%
- 35.4%
- 1.0%
- 8.7%
- 9.3%
- 18.2%

- The IT Services exports was led by exports to newer geographies of the US and Europe in the last 8 years.
- Exports to Australia were fairly stagnant during the same period.

■ Australia ■ US ■ Canada ■ UK ■ Asia ■ Europe   Total

CAGR : 5.7%

Source: ICT Summary Report, 2017

NEW ZEALAND: SOFTWARE

COMPUTER SYSTEM DESIGN LEADING GROWTH IN ICT INDUSTRY

Total Revenue (NZ$ mn)

5,548	5,854	6,187	6,682	6,982
2011	2012	2013	2014	2015

CAGR : 5.9%

Source: ICT Summary Report, 2017

- Software Services (Computer system design) made up 41% of ICT industry in 2015, up from 28% in 2007.
- The combined revenue of the computer system design sector is growing at 5% per annum.
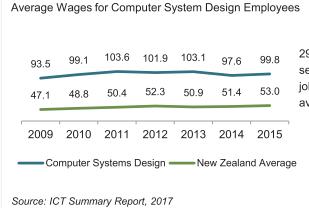
HIGH ROE DRIVING FIRMS TO INVEST IN COMPUTER SYSTEM DESIGN SERVICES

Investment in Expansion vs. NZ Average (% firms)

	2012	2013	2014	2015	2016
Computer systems design	47%	38%	41%	41%	43%
New Zealand average	27%	28%	30%	30%	31%

■ Computer systems design ■ New Zealand average

- Around 40% of the firms have invested in expansion of Software services (Computer System design) in the last 5 years as against the average of 30% of New Zealand firms.
- The key factor i.e. the Return on Equity has always ranged above 30% as compared to New Zealand average of ~10%.

Source: ICT Summary Report, 2017

RISING EMPLOYMENT IN THE COMPUTER SYSTEM DESIGN SECTOR DUE TO BETTER WAGES

Average Wages for Computer System Design Employees

	2009	2010	2011	2012	2013	2014	2015
Computer Systems Design	93.5	99.1	103.6	101.9	103.1	97.6	99.8
New Zealand Average	47.1	48.8	50.4	52.3	50.9	51.4	53.0

──Computer Systems Design ──New Zealand Average

29,700 people are employed in the computer system design sector in 2016. Computer system design has added 10,700 jobs since 2010 as the wages is almost twice the national average.
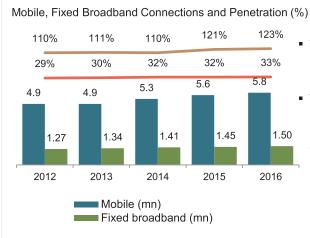
CAGR: 2009-15

Computer Systems Design: 1.1%

New Zealand Average: 2%

Source: ICT Summary Report, 2017

NEW ZEALAND: TELECOMMUNICATION

MOBILE PENETRATION ALREADY AT 123% AND 3 / 4 NEW ZEALANDERS USE SMARTPHONES

Mobile, Fixed Broadband Connections and Penetration (%)

	2012	2013	2014	2015	2016
Penetration (top line)	110%	111%	110%	121%	123%
	29%	30%	32%	32%	33%
Mobile (mn)	4.9	4.9	5.3	5.6	5.8
Fixed broadband (mn)	1.27	1.34	1.41	1.45	1.50

- Mobile (mn)
- Fixed broadband (mn)

- There has been a stable growth in both mobile and fixed line broadband connections. Since last 5 years, they both have witnessed 4% CAGR.
- While mobile penetration is over a 100%, fixed broadband penetration is just around 30%. However broadband usage is increasing and there are more subscriptions for fibre optics (for both government and private operator lines)

CAGR: 2012-16
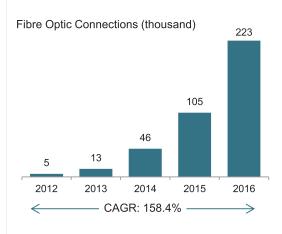
Fixed Broadband: 4.2%   Mobile: 4.3%
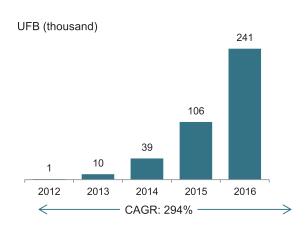
Source: Annual Telecommunications Monitoring Report,2016

FIBRE BROADBAND CONNECTIONS GALLOPING DUE TO GOVERNMENT SPONSORED LINES
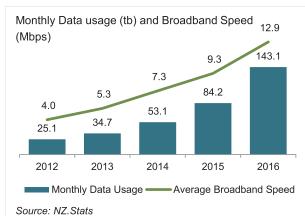
There has been galloping growth in the fibre optic connections. It has grown by 45 times in the last 5 years primarily on the back of demand for higher speeds at reasonable pricing and government sponsored UFB lines.

Fibre Optic Connections (thousand)

2012	2013	2014	2015	2016
5	13	46	105	223

CAGR: 158.4%

UFB (thousand)

2012	2013	2014	2015	2016
1	10	39	106	241

CAGR: 294%

Source: ICT Summary Report, 2017

BETTER SPEEDS DRIVING MORE BROADBAND USAGE

Monthly Data usage (tb) and Broadband Speed (Mbps)

	2012	2013	2014	2015	2016
Average Broadband Speed	4.0	5.3	7.3	9.3	12.9
Monthly Data Usage	25.1	34.7	53.1	84.2	143.1

- Monthly Data Usage
- Average Broadband Speed

With 34% CAGR in broadband speeds owing to the usage of fibre optic networks, the broadband usage has multiplied by 6 times in the last 5 years.

CAGR: 2012-16

Speed: 54.5%   Usage: 34%

Source: NZ.Stats
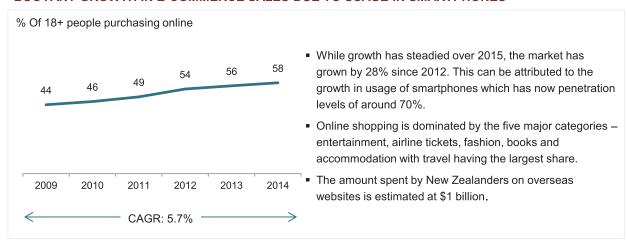
NEW ZEALAND: E-COMMERCE

BUOYANT GROWTH IN E-COMMERCE SALES DUE TO USAGE IN SMARTPHONES

% Of 18+ people purchasing online

44   46   49   54   56   58

2009   2010   2011   2012   2013   2014

CAGR: 5.7%

- While growth has steadied over 2015, the market has grown by 28% since 2012. This can be attributed to the growth in usage of smartphones which has now penetration levels of around 70%.
- Online shopping is dominated by the five major categories – entertainment, airline tickets, fashion, books and accommodation with travel having the largest share.
- The amount spent by New Zealanders on overseas websites is estimated at $1 billion.

M-COMMERCE TO GROW AT AROUND 25% CAGR FROM 2014-19

M-commerce Market Size (NZ$ bn)

13.7

4.5

2014   2019

CAGR: 24.9%

Source: Frost & Sullivan
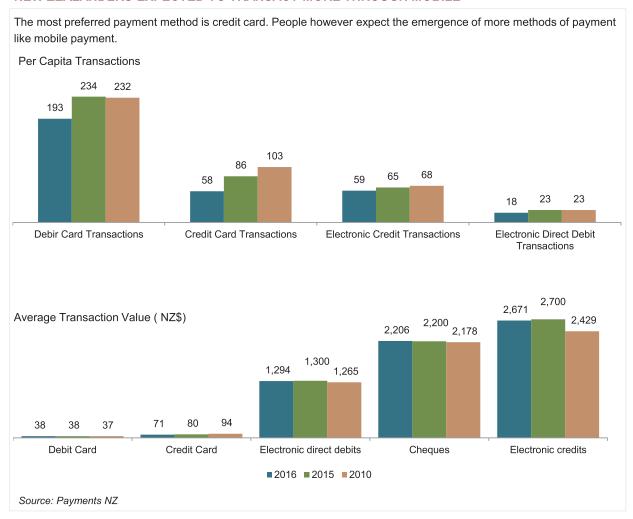
- Almost 45% of all New Zealand consumers aged between 15 and 65 made at least one mobile commerce purchase in 2014.
- In 2014, services, such as travel and financial services, account for the largest category of expenditure at NZ$ 2.5 bn, followed by purchase of physical goods at around NZ$1.4 bn.
- 21% of consumers frequently conduct research on products and services before coming to a retail store.

NEW ZEALAND: FINTECH

FINTECH GROWTH IS THE FASTEST AMONG ALL TECH RELATED INDUSTRIES

5 Year CAGR Sector Growth of top 200 NZ tech firms (2016)

23%	Fintech
18%	Software Solutions
16%	Digital Media
9%	IT services and support
9%	Healthcare

- There is huge expectation in Fintech sector as it has posted a growth of 23% in FY16 and on growth path with the MBIE receiving expressions of interest from over fifty organizations including banks, insurers etc.

- To push Fintech Start ups, the New Zealand Tech Industry Association announced the launch of a new working group, FinTechNZ that will focus on fintech and innovation.

Source: Ministry of Business, Innovation and Employment

NEW ZEALANDERS EXPECTED TO TRANSACT MORE THROUGH MOBILE

The most preferred payment method is credit card. People however expect the emergence of more methods of payment like mobile payment.

Per Capita Transactions

	2016	2015	2010
Debir Card Transactions	193	234	232
Credit Card Transactions	58	86	103
Electronic Credit Transactions	59	65	68
Electronic Direct Debit Transactions	18	23	23

Average Transaction Value (NZ$)

	2016	2015	2010
Debit Card	38	38	37
Credit Card	71	80	94
Electronic direct debits	1,294	1,300	1,265
Cheques	2,206	2,200	2,178
Electronic credits	2,671	2,700	2,429

■2016 ■2015 ■2010

Source: Payments NZ

NEW ZEALAND: DIGITAL TRANSFORMATION INITIATIVES

The Government ICT Strategy was revised in 2015 to ensure that, in a dynamic technology environment, it can achieve the government's aim of an ICT-enabled transformation of public services to New Zealanders. Following are the key points-

OPPORTUNITIES

| Exploiting emerging technologies | Unlocking the value of information | Leveraging agency transformations | Partnering with the private sector |

FOCUS AREAS

DIGITAL SERVICES

| Agencies and third parties agree how to deliver federated services | Service delivery channels are rationalised | Common service components are re-used by agencies | Federated services are piloted using 'life events |

INFORMATION

| Information skills drive new insights and better decisions | Open data and sharing by default supported by privacy and security settings | Public trust and confidence permits sharing and re-use of information | Frameworks and infrastructure facilitate flows of information and re-use |

TECHNOLOGY

| Common capabilities and shared services are adopted where possible | Agencies have easy access to innovations from the ICT industry | IT units partner with their business units to drive innovation | Policies, standards, business models shared across the system |

INVESTMENT

| I&T investments are targeted at fewer initiatives with more impact | Maximise value from technology investments | Cost and benefits from investment in digital services are realised | Agency transformation initiatives deliver system benefits |

LEADERSHIP

| Public sector leaders re-balance agency & system priorities | Public sector leaders lead change to overcome system barriers | Build workforce capability that encourages innovation | Agencies look to industry and third-parties for sources of innovation |

OUTCOMES

| Customers experience seamless, integrated and trusted public services | Information-driven insights are reshaping services and policies, and adding public and private value | Adoption of information and technology innovations is accelerated and value is being created | Investment in innovative digital services is being prioritised and benefits are being realised | Complex problems are being solved and innovative solutions are being adopted |

Source: Department of Internal Affairs

NEW ZEALAND: DIGITAL TRANSFORMATION INITIATIVES

INTEGRATED PROGRAMME OF WORK TO DELIVER THE GOVERNMENT ICT STRATEGY

Digital services
- Easier Access to Digital Services for Individuals
- Technology-Enabled Services for Businesses
- Digital-Enabled Identity

Information
- Building an enabling data environment and policy settings
- Standards to enable sharing of data
- Data analysis to inform decision-making
- Releasing information into the public arena

Technology / commercial
- Establishing an ICT Marketplace
- Accelerating adoption of cloud computing
- Common Capability Acceleration

Investment
- ICT Investment Strategy

Leadership / people
- Information, Technology and Digital Leadership, Capability and Workforce
- Leveraging Agency Transformation Programmes

Government ICT Strategy
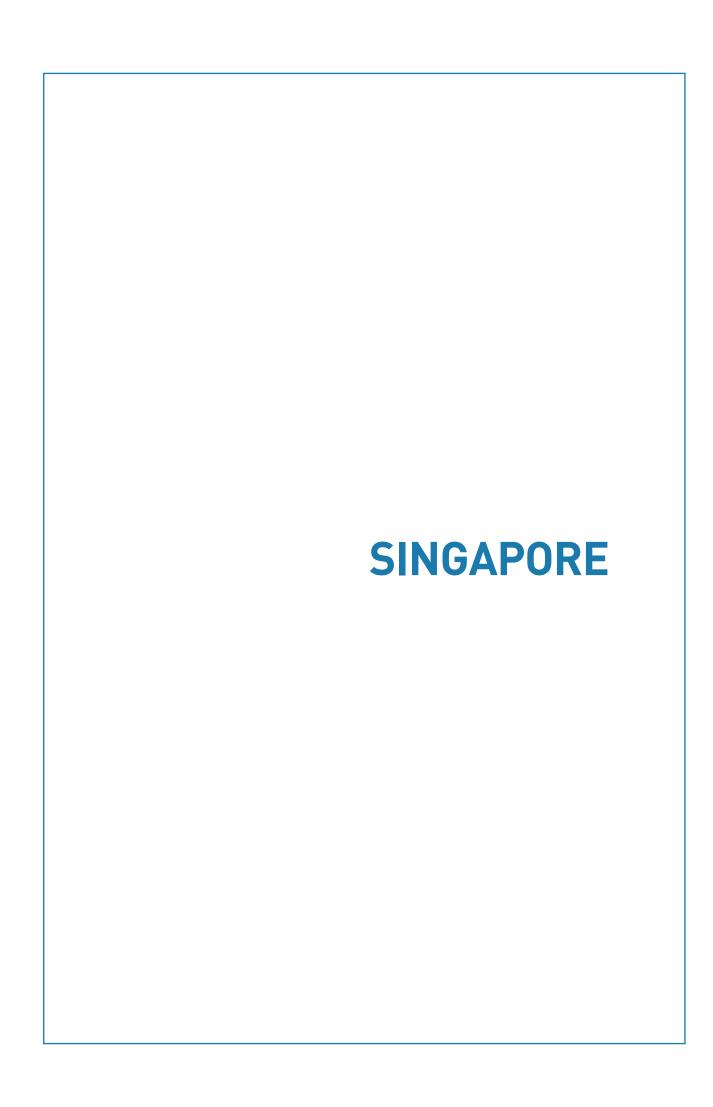
Outcomes   *Benefits*

Customers experience seamless, integrated and trusted public services

Customers can easily access the right services

Information driven insights are reshaping services and policies, and adding public and private value

Government-held information is widely available and used to inform analysis and decision-making

Adoption of information and technology innovations is accelerated and value is being created

Capability is responsive and able to meet changing needs

Investment in innovative digital services is being prioritized and benefits are being realized

Use of the investment management system is optimized to achieve value for money

Complex problems are being solved and innovative solutions are being adopted

Effective services are delivered in partnership with third parties

Source: Department of Internal Affairs

NEW ZEALAND: DIGITAL TRANSFORMATION INITIATIVES

A summary of the status of initiatives within the dynamic Integrated Programme of Work is presented below -

TITLE	STAGE	DESCRIPTION	TARGETS
DIGITAL SERVICES			
Smart Start (DIA)	Do	Making it easier for expectant and new parents to access birth-related products and services across government agencies.	On track to deliver enhancements to existing service by Jun 2017, which are expected to deliver further time and cost savings to customers and agencies and drive further uptake of the service.
Being a Victim of Crime (Police)	Do	Making it easier for victims of crime to access personalised services, when and how they choose.	Discovery and design work underway. Business case to be developed by Jul 2017. This service has the potential to significantly improve victims' experience for a proportion of the over 200,000 people who are victims of crime annually.
Managing Bereavement (DIA)	Do	Making it easier for customers to prepare for their own death and ease burden for next of kin and executors.	Initial release on track to go live by Jun 2017. There are currently around 600,000 people over the age of 65 who could potentially benefit from these services.
Enrolling for Tertiary Education (TEC)	Plan	Making it easier for students to enrol at tertiary institutions.	Initial prototype on track to be developed by Jun 2017. 420,000 students were enrolled in formal tertiary study programmes in 2015.
Turning 65 – Becoming a Senior (MSD)	Plan	Making it easier for seniors to access information and receive entitlements.	Documented service design on track to be completed by Jun 2017. The population aged 65 years and over is expected to grow by about100,000 during the current decade.
Information Sharing for Business (DIA)	Do	Making it easier for businesses by reducing duplication of effort when interacting with government.	Prototypes on track to go live by Jun 2017. Potential savings of $300m per annum, primarily in reduced costs to businesses – subject to further verification during business case development.
Integrated Service Ref. Architecture (DIA)	Do	Developing a common technical framework and approach to delivery of integrated services.	Testing ICT architectural foundations for future integrated services by 30 Jun 2017 – this work will provide the architectural foundations for all future integrated services.
Channel and Service Strategy (DIA)	Think	Supporting all agencies to develop a system-wide approach to customer-centric digital services.	Currently in discovery phase, developing recommendations for next steps. Supporting agencies to develop a system approach to digital service delivery.
Common Delegations and Authorisation (DIA)	Do	Making it easier for businesses and individuals to delegate authority to others when dealing with government.	Difficulty finding agencies willing/able to participate in user pilots within timeframe – steering group to consider next steps. Potential savings of NZ$ 40m per annum primarily in reduced cost to businesses – subject to further verification.
Digital Services Design (DIA)	Think	Strengthening governance and delivery of customer-centric digital services.	Completion of discovery phase and developing options for future work by 30 Jun 2017. This work will ensure the development of consistent, high quality customer-centric digital services.
Digital-Enabled Identity (DIA)	Think	Making it easier for customers to identify themselves when interacting digitally with government.	Future direction agreed with Ministers. Next phase of development subject to approval of budget bid in May 2017.

Source: Department of Internal Affairs

NEW ZEALAND: DIGITAL TRANSFORMATION INITIATIVES

TITLE	STAGE	DESCRIPTION	TARGETS
INFORMATION			
Data Futures Partnership (Stats)	Do	Championing data use innovation by accelerating data use/sharing initiatives and building a trusted innovation culture.	Publishing guidelines for trusted data use by 30 Jun 2017. 18 data innovation catalyst projects have been funded to date.
Social Sector Data Exchange (SIU)	Do	Developing analytics infrastructure to inform better investment decisions and improve social sector results.	Strong engagement with agencies and NGOs, but some challenges in on boarding them within desired SIU timeframes.
Integrated Data Infrastructure Enhancements (Stats)	Think	Enable development of enhanced Integrated Data Services for government, Iwi, NGOs, and businesses.	Delayed due to Kaikoura earthquake. Replanning subject to funding bid through Data Investment Framework.
Open Govt. Information and Data Programme (Stats)	Do	Drive proactive release of high value public data and info, promote open data and info across NZ.	Completion of new programme action plan and monitoring dashboards by Jun 2017. This programme will provide a suite of tools and more direct support to agencies to increase the pace and quality of data release and re-use over next 3 years.
LEADERSHIP AND PEOPLE			
Graduate Recruitment Programme (DIA)	Do	Growing a leadership talent pipeline to support the digital transformation of government service.	15 Graduates already placed in agencies. Considering potential extension of the programme. Decision by 30 Jun 2017. This programme enhances the ability of government to attract and retain ICT graduates and future leaders.
Digital Skills Survey (DIA)	Do	Baseline survey of public service digital leadership and capability to identify and address skills gaps.	Digital leadership and capability report to be completed by 30 Jun 2017. This report will give us an understanding of the all-of-government information, technology and digital skills that will be needed to deliver digital services to NZ.
INVESTMENT			
Strategic Investment Support and Advice	Do	Defining the governance and investment decision role of a powered-up Partnership Framework.	Working with Chief Executives to establish governance and funding frameworks to support Innovation.
TECHNOLOGY			
Public Cloud Marketplace (DIA)	Do	Enabling agencies to purchase public cloud services through a common platform.	Following successful prototyping, contract negotiation with a platform supplier will be concluded by mid 2017. When implemented, will enable agencies to purchase public cloud services through a common platform, saving them time and money.
Accelerating Adoption of Public Cloud (DIA)	Do	Reducing cost and increasing resilience of ICT across government.	On track to deliver most work packages by 30 Jun 2017, remainder to be delivered under BAU. More than half of agencies plan to move to cloud office productivity services in next 12 month, with potential cost avoidance of $4060m over next six years.

Source: Department of Internal Affairs

SINGAPORE

SINGAPORE: EXECUTIVE SUMMARY

ICT OVERVIEW

- Singapore's ICT industry is the largest contributor to their economy, contributing S$ 189.5 bn in 2015 (or 48% of Singapore's GDP).
- IT hardware is the largest segment of the ICT industry which was valued at S$ 138.6 bn in 2015. The share of hardware in the overall ICT industry has increased from 54% in 2010 to 73% in 2015 with growth being driven by re-export of mobile and smart phones, telecommunication equipment and storage devices.
- A slowdown is anticipated in the telecommunication industry with both internet and mobile phone penetration attaining saturation.
- Singapore houses more than 80% of the world's largest software and service companies due to availability of talent and a supportive environment by the government.
- Singapore is a dream market for e-commerce companies due to a low current penetration and a high per user spending.

DIGITAL AGENDA

- 'Smart Nation' was officially launched by Prime Minister Mr. Lee Hsien Loong on 24 November 2014. It is the government's effort to help provide better living for everyone in the future through technology-enabled solutions.
- Smart Nation initiative strives to develop people-centric solutions to address global urban challenges. Taking advantage of the compact size and single layer government, Singapore can take a holistic national view and scale up successful innovations efficiently.

DIGITAL INITIATIVES

- **Services**
  - In order to improve governance and public services the government launched MyInfo application in May-2016 as a platform to manage personal data for government transactions
  - PayNow has been introduced by the Association of Banks in Singapore (ABS). It is a mobile application for consumers to carry out retail transactions. There are plans are to add government-related transactions to the application next year.
  - Singapore is also an important financial service hub in South Asia. This highlights the importance of cyber security for digital networks.
  - The Government recognizes the possible risks and has prioritized safeguarding relevant systems and networks that relates to security of citizens and privacy of data by establishing a new government outfit - the Cyber Security Agency of Singapore.
- **Mobility**
  - It objective is to improve the entire transport infrastructure specially focusing on public transport system by using technology based solutions.
  - Data-driven shuttle bus services and seat booking is provided through the smartphone app Beeline SG. It is an open cloud-based smart mobility platform.
  - Open data and analytics for urban transportation focuses on real time analysis of data from commuters' fare cards and hotspots to manage buses and help facilitate transport planning. This has resulted in 92% reduction in the number of bus services with crowding issues and reduction of average waiting time on popular services by 3 to 7 minutes.

DIGITAL INITIATIVES

- **Health**

    - Health-Hu, A digital healthcare solution launched in Jan 2016 under Health IT Master plan (HITMAP), is Singapore's first one-stop online health information and services portal. It connects patients and healthcare institutions. It has 56,000 download s till now.
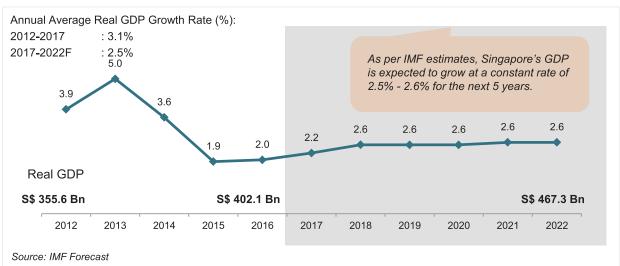
- **Living**

    - Focuses on leveraging technology to improve our urban environment. Launch of One Service mobile application to enhance interaction between public and government agencies.

CHALLENGES
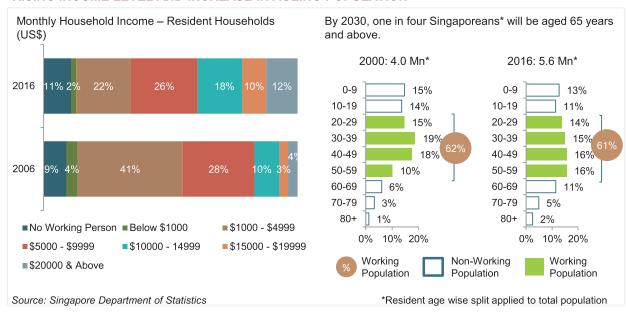
- Singapore's massive Smart Nation drive has run into speed bumps. As Prime Minister Lee Hsien Loong acknowledged at the annual tech summit in 2017. "We really are not going as fast we ought to".

    - Such initiatives require a highly sophisticated digital data processing infrastructure. Singapore is facing a major skill shortage in ICT sector and is hiring foreign manpower to fill the gap. Government has tied up with Coursera for training of data analyst professionals.

    - Accurate implementation of smart nation initiatives is a major challenge and which requires focus and co-ordination among different government departments and private companies involved in the project.

    - Data integration is a main challenge in creating smarter cities. Large amount of data generated through multiple sources need to be analyzed to deliver the objectives of smart city.

    - Government has - on several occasions - stressed the need for private sector and the general public to play a bigger role in the Smart Nation initiative. But Singapore companies seem to be waiting for the Government to take the lead in rolling out smart solutions.

    - Size of the Singapore market could also be a limitation. It renders the country to be less attractive for foreign companies compared to other cities with a larger population and hence bigger market size.

    - Ageing population - By 2030, the number of Singaporeans aged 65 and above is expected to double to 900,000. It means 1 in 4 Singaporeans will be aged 65 years and above, up from 1 in 8 today.

SINGAPORE: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate (%):
2012-2017   : 3.1%
2017-2022F   : 2.5%

As per IMF estimates, Singapore's GDP is expected to grow at a constant rate of 2.5% - 2.6% for the next 5 years.

Real GDP

| 3.9 | 5.0 | 3.6 | 1.9 | 2.0 | 2.2 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 |

S$ 355.6 Bn   **S$ 402.1 Bn**   **S$ 467.3 Bn**

2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

Source: IMF Forecast

RISING INCOME LEVEL AND INCREASE IN AGEING POPULATION

Monthly Household Income – Resident Households (US$)

| 2016 | 11% | 2% | 22% | 26% | 18% | 10% | 12% |
| 2006 | 9% | 4% | 41% | 28% | 10% | 3% | 4% |

- No Working Person
- Below $1000
- $1000 - $4999
- $5000 - $9999
- $10000 - 14999
- $15000 - $19999
- $20000 & Above

By 2030, one in four Singaporeans* will be aged 65 years and above.

2000: 4.0 Mn*

Age	%
0-9	15%
10-19	14%
20-29	15%
30-39	19%
40-49	18%
50-59	10%
60-69	6%
70-79	3%
80+	1%

62%

2016: 5.6 Mn*

Age	%
0-9	13%
10-19	11%
20-29	14%
30-39	15%
40-49	16%
50-59	16%
60-69	11%
70-79	5%
80+	2%

61%

% Working Population   Non-Working Population   Working Population

Source: Singapore Department of Statistics   **Resident age wise split applied to total population*

SHARE OF SERVICE SECTOR IS HIGHEST IN GDP AND EXPECTED TO INCREASE IN FUTURE

Sectorial Share of GDP (%)

	2006	2008	2010	2012	2014	2016
Ownership of Dwellings	3.1	3.9	3.8	4.4	4.6	4.4
Services Producing Industries	65.1	68.7	68.5	69.2	69.8	69.4
Goods Producing Industries	31.8	27.4	27.7	26.4	25.6	26.2

- Services are the major contributor and its share is expected to increase in the future.
- The government is increasingly focusing on growing share of the services segment and is taking adequate measures to establish Singapore as the financial and data analysis hub in South Asia.
- Government plans to build an integrated and world class e governance structure by utilizing the existing advanced ICT infrastructure.

Source: Singapore Department of Statistics

SINGAPORE: ICT INDUSTRY OVERVIEW

SINGAPORE'S ICT INDUSTRY IS GROWING AT AN IMPRESSIVE RATE OVER LAST 5 YEARS

ICT Revenue Share (S$ Bn)

Total Revenue CAGR 2010-15: 18%

		189.5
		3.7
	167.0	12.4
156.3	3.3	19.7
3.4	13.9	
12.3	19.7	15.1
19.4		

2010: 82.8 — 2.0 / 14.0 / 12.2 / 9.6 / 45.0
2011: 94.6 — 2.8 / 10.2 / 12.7 / 9.4 / 59.5
2012: 113.2 — 2.1 / 10.8 / 12.9 / 12.5 / 74.9
2013: 156.3 — 3.4 / 12.3 / 19.4 / 14.6 / 106.6
2014: 167.0 — 3.3 / 13.9 / 19.7 / 15.1 / 115.0
2015: 189.5 — 3.7 / 12.4 / 19.7 / 15.1 / 138.6

Source: IMDA

	CAGR (10-15)
Hardware	25%
IT Services	9%
Software	10%
Telecommunication Services	-2%
Content Services	13%

- ICT industry's revenue accounts for nearly 48% of Singapore's GDP.
- Hardware manufacturing constitutes major share of Singapore's ICT sector.

HARDWARE IS THE HIGHEST REVENUE GENERATOR AND FASTEST GROWING SUB SEGMENT

ICT Sector Revenue Split

Year	Hardware				
2015	73%	8%	10%	7%	2%
2014	69%	9%	12%	8%	2%
2013	68%	9%	12%	8%	2%
2012	66%	11%	11%	10%	2%
2011	63%	10%	13%	11%	3%
2010	54%	12%	15%	17%	2%

Source: IMDA

- Increase in demand for semiconductors is the major driver for increasing share of hardware.
- In 2015, East Asia was the top export destination region accounting for 38.6% of exports followed by South East Asia at 30.8%.
- Exports are major growth driver for hardware and contribute 85% of total hardware revenue (2015).
- Hardware exports are growing at a CAGR (10-15) of 30.4% compared to domestic market CAGR (10-15) of 8.4%.

SHARE OF RE-EXPORTS IS DRASTICALLY INCREASING

ICT Sector: Domestic and Export Revenue Share

Year	Processed Exports	Re-Exports	Domestic
2010	15%	41%	44%
2011	12%	50%	38%
2012	13%	55%	31%
2013	10%	59%	31%
2014	9%	61%	30%
2015	8%	63%	28%

Processed Exports CAGR 2010-15: 4.7%
Re-Exports CAGR 2010-15: 28.8%
Domestic CAGR 2010-15: 8.1%

Source: IMDA

% Share	2010	2011	2012	2013	2014	2015
Domestic	36.2	35.8	35.5	48.5	50.7	53.4
Re-Exports	33.9	47	62.5	92.9	101.6	120.1
Processed Exports	12.7	11.8	15.2	15	14.8	16

- Exports contribute approximately 70% of total ICT revenue. This trend is expected to increase in the future.
- Hardware segment contributed the bulk of re-exports (96%) while software segment dominated processed exports (53.6%) .
- Re-exports have increased 3.5x over the last 6 years.
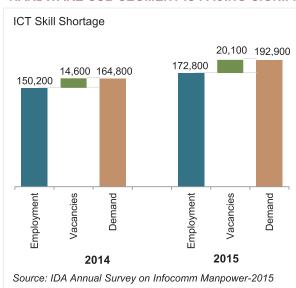
SINGAPORE: HARDWARE

HARDWARE REVENUE IS EXPECTED TO CONTINUE ON GROWTH TRAJECTORY

ICT Market Segmentation and Total Revenue Split (S$ Bn)

CAGR (2010-15): 25.2%

CAGR:2010-15

Domestic: 8.4%   Exports:30.4%

Source: IMDA
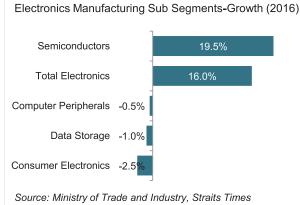
- Major growth driver for hardware sub segment is re-exports of mobile and smart phones, telecommunication equipment and storage devices.
- Singapore is a major hardware production center owing to its high-quality manufacturing systems backed by a well established ecosystem consisting of component manufacturers, Electronics manufacturing services companies, Availability of global talent and support infrastructure.

HARDWARE SUB SEGMENT IS FACING SIGNIFICANT SKILL SHORTAGE

ICT Skill Shortage

Source: IDA Annual Survey on Infocomm Manpower-2015

- Singapore has addressed skill shortage so far by importing foreign workers. This has led to lower wages, which has resulted in local graduates shunning this segment.This has further driven the demand for foreign workers.
- Singapore Ministry of Communications and Information (MCI) announced in April 2016 an investment of S$120 mn to meet the needs of ICT labour. The fund will help support the training for both current and future ICT professionals. It will focus its efforts in high demand areas such as data analytics, cyber security, software development, and network and infrastructure.

ELECTRONICS PRODUCTION RISING DUE TO INCREASE IN GLOBAL SEMICONDUCTOR DEMAND

Electronics Manufacturing Sub Segments-Growth (2016)

Source: Ministry of Trade and Industry, Straits Times
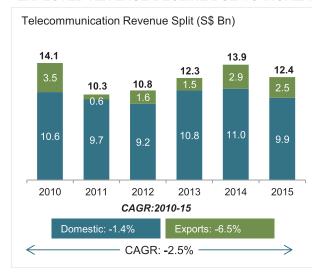
- Semiconductors contributed 70% of the total electronics manufacturing output of Singapore in 2016.
- Smart cars and Internet of Things (IoT) are few trends expected to drive semiconductor demand in the long term.
- Increased price competition from Chinese companies and rising operating costs are major challenges faced by Singapore semiconductor manufacturers.
- Segments such as industrial IoT, portable handheld gadgets, IoT in healthcare, robotics, AR and VR, drones and autonomous vehicles will drive growth.

SINGAPORE: TELECOMMUNICATION
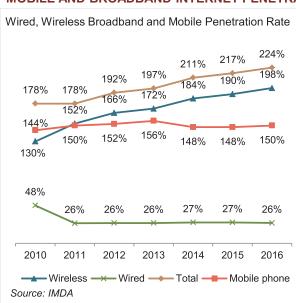
EXPECTED REVENUE DECLINE DUE TO INCREASED COMPETITION AND MARKET SATURATION

Telecommunication Revenue Split (S$ Bn)

CAGR:2010-15

Domestic: -1.4%   Exports: -6.5%

CAGR: -2.5%

- Singapore is one of the most developed telecom market in the Asia-Pacific region.
- Decreasing contribution of legacy services (Voice and Messaging) could lead to further declines in growth of mobile revenues.
- Roaming Revenue (Component of legacy services) which contributes 10% of mobile revenue is declining due to usage of OTT services.
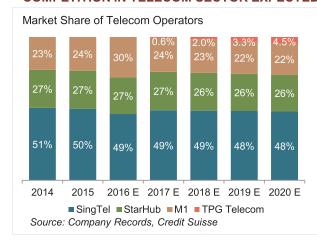
Source: IMDA

MOBILE AND BROADBAND INTERNET PENETRATION HAS REACHED A SATURATION LEVEL

Wired, Wireless Broadband and Mobile Penetration Rate

Source: IMDA

- The mobile phone penetration in Singapore has been above 100% for past many years and has now reached a saturation with 150% penetration in 2016.
- However, wireless broadband subscribers are increasing at an impressive rate due to increase in demand for digital services such as targeted advertising, office communication suite and Software-as-a-Service (SaaS), location-based services and cashless payments.
- Singapore is a good test bed for new telecom products due to high internet penetration and strong infrastructure.
  - Singtel successfully tested 5G mobile technology (2016), as part of Singapore's push to become a 'connected society'.

COMPETITION IN TELECOM SECTOR EXPECTED TO INTENSIFY WITH ENTRY OF TPG TELECOM

Market Share of Telecom Operators

Source: Company Records, Credit Suisse

- Market growth is also expected to be slower over next few years as market penetration in mobile and internet service has reached a saturation level.
- The entry of TPG Telecom in 2017 is expected to intensify competition resulting in reduced revenues and service prices. TPG has substantial experience in managing broadband networks and plans to build on this expertise to establish data centric business model.
- Retention of existing subscribers will play a major role for telecom service providers to sustain and grow in the future. This may result in reduction in tariffs which will impact the sector revenue.

SINGAPORE: IT SERVICES AND SOFTWARE
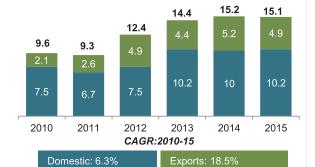
SOFTWARE IS THE 2ND LARGEST ICT SEGMENT FOLLOWED BY IT SERVICES

- Singapore has more than 80 of the top 100 software and services companies. Many of them, have regional or APAC headquarters in Singapore. Software and IT services together contributed 18.4% of the total ICT revenues in 2015.
- Availability of global talent, excellent ICT infrastructure and supportive government policies are the major drivers attracting major international IT companies to set us base in Singapore.

Software Revenue: Domestic and Export (S$ Bn)   IT Services Revenue: Domestic and Export (S$ Bn)
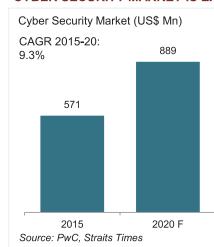
CAGR:2010-15

| Domestic: 27.7% | Exports: 0.6% |

CAGR:2010-15

| Domestic: 6.3% | Exports: 18.5% |

Source: IMDA

CYBER SECURITY MARKET IS EXPECTED TO GROW AS FINANCIAL SERVICES GO DIGITAL

Cyber Security Market (US$ Mn)

CAGR 2015-20: 9.3%

889

571

2015   2020 F

Source: PwC, Straits Times

- Singapore is a leading financial and investment hub in South Asia with financial services as its strategic sector. Cyber security is expected to play a crucial role as more business and individuals are shifting to digital financial transactions.
- MNC's are the largest customer segment for cyber security solutions with more than 65% share in 2015 followed by government .
- SME segment is under penetrated and is expected to be the fastest growing segment (12.8%). Hence, many companies are focusing on developing cost-effective solutions for SMEs.
- Cyber security also faces shortage of skilled workers, especially at the middle and senior levels. Subsequently, TechSkills Accelerator (TeSA) has been to train new and existing manpower in ICT sector.

BUILDING ECOSYSTEM TO ESTABLISH SINGAPORE AS INTERNATIONAL DATA ANALYTICS HUB

- Singapore has established itself as a regional data management hub in Southeast Asia. According to the Economic Development Board (EDB), the data analytics will add S$.35 bn in value to the economy by 2017.
- Singapore plans to develop a Data Centre Park to attract MNCs and enterprises to set up their headquarters and premium data center operations in the country.
- Singapore working aggressively towards becoming the world's first Smart Nation capable of using technology to enhance transport, healthcare and other public services. Data sciences and analytics are playing a very important role in this.

Source: IMDA, Straits Times

SINGAPORE: E-COMMERCE

SHARE OF E -COMMERCE IN TOTAL RETAIL SALES IS EXPECTED TO INCREASE

E-Commerce Market Size (S$ Bn)
CAGR: 18.3%

6.7%

2.1%

7.5

1.4

2015   2025

■ Revenue (S$ Bn) ━━ % of total retail
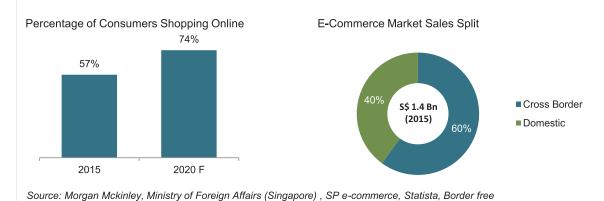
- Low e-commerce penetration combined with high internet penetration provides a major growth opportunity for e-commerce sector.
- Singapore at the moment is the dream market for e-commerce businesses as the average annual e-commerce spending per user in 2016 was S$1,375.
- Store-based retailers to venture into online commerce can be expected to increase and the competition will inevitably become more intense.
- Singapore plans to drive e-commerce and other wings of the digital economy within the region when it assumes chairmanship of ASEAN in 2018.

Source: Morgan Mckinley, SP e-commerce, Statista, Channel New Asia, Singapore Business Review, Google and Temasek

E-COMMERCE PENETRATION IS EXPECTED TO INCREASE RAPIDLY

- Singapore has one of the highest e-commerce penetration in Southeast Asia due to high mobile phone penetration.
- Supportive trade policies and superior connectivity have ensured cross border sales have a large in the overall e-commerce revenues. Manufacturers and retailers have now overcome the limitations of the small domestic market, higher property rent and human resource deficit which has resulted in a high share of cross border transactions.

Percentage of Consumers Shopping Online

74%

57%

2015   2020 F

E-Commerce Market Sales Split

40%

S$ 1.4 Bn
(2015)

60%

■ Cross Border
■ Domestic

Source: Morgan Mckinley, Ministry of Foreign Affairs (Singapore) , SP e-commerce, Statista, Border free
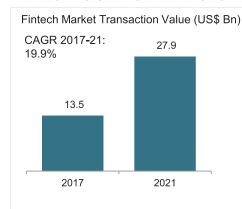
SINGAPORE TO ALLOW BANKS TO ENTER E-COMMERCE BUSINESS

- Banks in Singapore face tough competition from online non-financial companies that are leveraging their large user base to services such as digital wallets, payments and remittance.
- Hence, Singapore is changing its regulations to make it easier for banks to move into non-financial complementary business areas such as e-commerce.
- The Monetary Authority of Singapore will streamline the regulations relieving banks from seeking prior permission while investing in e-commerce. The investment have been capped to 10% of the bank's capital funds.

Source: SP e-commerce

SINGAPORE: FINTECH

FINTECH POISED FOR RAPID GROWTH DUE MATURE DIGITAL AND FINACIAL INFRASTRUCTURE

Fintech Market Transaction Value (US$ Bn)

CAGR 2017-21: 19.9%

13.5 (2017)

27.9 (2021)
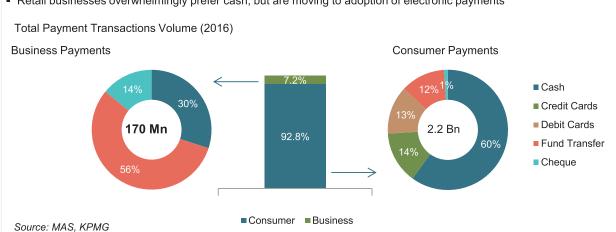
- Singapore has one of the best global financial services industry ecosystem with around 200 banks with total assets of S$2.7 trillion having operational headquarters in Singapore.
- The current use of mobile devices for payments remains relatively small but it is expected to grow as more businesses adopt digital mobile payments. High penetration of smartphones, wireless broadband and banked population will support the growth.
- In 2017, Association of Banks in Singapore launched PayNow, a service allowing customers of seven participating banks to transact just by using their mobile number or identity card number.

Source: Morgan Mckinley, Ministry of Foreign Affairs, SP e-commerce, Statista, Pay Vision

CASH AND CORE BANKING SOLUTIONS ARE STILL MOST PREFFERED MODES OF PAYMENTS

- Singapore's well-established financial infrastructure and payment mechanisms are acting as hindrance for fintech payments growth since consumers do not feel urgent need to switch to other payment modes.
- Retail businesses overwhelmingly prefer cash, but are moving to adoption of electronic payments

Total Payment Transactions Volume (2016)

Business Payments

170 Mn
- 30%
- 56%
- 14%

7.2%

92.8%

■ Consumer ■ Business

Consumer Payments

2.2 Bn
- 60%
- 14%
- 13%
- 12%
- 1%

■ Cash
■ Credit Cards
■ Debit Cards
■ Fund Transfer
■ Cheque

Source: MAS, KPMG

GOVERNMENT IS ACTIVELY FOCUSING ON DEVELOPING FINTECH SECTOR

- Singapore has one of the most progressive governing authorities in the financial services industry worldwide. The MAS has plans to relax certain regulatory requirements for development of fintech. Some of their major initiatives are:
  - MAS, under financial sector technology and innovation (FSTI) scheme has committed S$225 million SGD to be distributed over five years into development of fintech projects.
  - Launch of the Fintech and Innovation Group (FTIG) and the Fintech office.
  - Fintech regulatory sandbox creation, a move towards an open-API architecture.
  - Opening of the MAS's Fintech Innovation Lab – the "looking glass @ MAS" to promote fintech startups.

Source: NASDAQ, MAS, Lets Talk Payments

SINGAPORE: DIGITAL TRANSFORMATION INITIATIVES

35 YEARS OF DIGITAL JOURNEY

Singapore started its digital transformation in 1980. This transformation can be divided into four phases which are explained below.

CSCP *(1980-1999)*	e-Government Action plan I and II *(2000-2005)*	iGov2010 *(2006-2010)*	eGOV 2015 *(2011-2015)*

35 YEARS OF DIGITAL JOURNEY

Automation of public service Basic IT infrastructure and data hubs	Online service delivery (1,600 e-services deployed) Integrated services	Integration of data, process and systems for Government agencies 300 mobile government services deployed	Focus on collaboration within and outside Government
ICT drove Public Sector efficiency	*ICT drove Public Service excellence*	*ICT drove Whole-of-government integration*	*ICT drives Government-private value innovation and economic competitiveness*

Source: IDA

The government of Singapore has the Smart Nation program to digitally transform the nation.

SMART NATION FOCUSES ON 5 KEY DOMAIN AREAS TO PROVIDE SMART SOLUTIONS

"Singapore strives to become a Smart Nation to support better living, stronger communities, and create more opportunities, for all.

Smart Nation
S I N G A P O R E
Many Smart Ideas • One Smart Nation

And "smartness" is not a measure of how advanced or complex the technology being adopted is, but how well a society uses technology to solve its problems and address existential challenges. Citizens are ultimately at the heart of our Smart Nation vision, not technology." – Smart Nation Singapore website.

The key initiatives under Singapore – Smart Nation program are classified under 4 broad categories below -

MOBILITY	SERVICES	HEALTH	LIVING

Source: Smart Nation Singapore

SINGAPORE: DIGITAL TRANSFORMATION INITIATIVES

The government of Singapore has three focus areas namely- healthcare, transportation and payments wherein it is aggressively pushing the adoption of digital services and has taken a number of initiatives in this regard.

ASSISTIVE TECHNOLOGY, ANALYTICS AND ROBOTICS FOR AGING AND HEALTHCARE

Focuses on developing assistive technology and robotics for growing ageing and disabilities population. Initiatives such as delivery drones for medicines and equipment dispatch, Industrial robotic arm, Automated guided vehicles (AGV), Augmented reality for doctors and data analytics to improve productivity are being developed.

HEALTHHUB PORTAL: A DIGITAL HEALTHCARE SOLUTION

HealthHub, launched in January 2016 under Health IT Masterplan (HITMAP), is Singapore's first one-stop online health information and services portal. It connects patients and healthcare institutions. It has 56,000 downloads till now.

TELEHEALTH: INTEGRATED AND SEAMLESS HEALTHCARE SERVICES AT HOME

- The Smart Health Video Consultation (VC) for Healthcare was launched in Apr 2017, the first of three tele-health solutions that will be rolled out to shift care beyond hospitals.
- Smart Health Tele-Rehab, a national pilot by Integrated health Information Systems (IHiS) and T-Rehab, has been implemented from May 2017.

NATIONAL STEPS CHALLENGE

- National Steps Challenge empowers Singaporeans to take responsibility for their health and well being by tracking their stems, diet and total calories consumed and exhausted.
- Since its launch in Nov 2015, 70% of previously inactive participants now average more than 7,000 steps per day, with 30% of participants clocking about 10,000 steps a day on average.
- Over 156,000 people, both young and old, participated. 63% of challenge participants continued to use it well beyond the formal programme.
- National Steps Challenge Season 2: more than 330,000 participants have signed.

Source: Smart Nation Singapore

SINGAPORE: DIGITAL TRANSFORMATION INITIATIVES

SPEARHEADING RESEARCH IN STANDARDS FOR SELF-DRIVING VEHICLES (SDVS)

- The Land Transport Authority (LTA) and JTC, in partnership with the Nanyang Technological University (NTU), launched CETRAN on 1 August 2016.
- It will be operational in the second half of 2017 and will facilitate companies to test, certify, trial and deploy SDVs here.

MOBILITY-ON-DEMAND: REAL-TIME DEMAND-DRIVEN TRANSPORT THROUGH APPS

- Partnership agreements between Land Transport Authority (LTA), Delphi Automotive Systems and nuTonomy for the trials of shared autonomous mobility-on-demand concepts in the one-north test-bed.
- **Beeline SG –** Open cloud-based smart mobility platform to provide data-driven shuttle bus services and seat booking through smartphone app.
- Since launch in Aug 2015, Beeline has received more than 30,000 suggested routes, runs 23 Beeline routes, and has 3,800 active monthly bookings.

OPEN DATA AND ANALYTICS FOR URBAN TRANSPORTATION

- It focuses on real time analysis of data from commuters' fare cards and hotspots to manage buses and help facilitate transport planning. Insights gained from data will help LTA to better anticipate and address the needs of commuters.
- 92% reduction in the number of bus services with crowding issues and reduction of average waiting time on popular services by 3 to 7 minutes.
- The Fusion Analytics for public Transport Emergency Response (FASTER) system analyze data collected from various sources to improve planning.
- A next-generation Electronic Road Pricing System that will collect comprehensive, real-time, aggregated traffic data and in turn help develop a more accurate picture of real-time traffic situation.

SELF-DRIVING VEHICLES (SDVS): FUTURE OF MOBILITY IN SINGAPORE

- Launched trials for autonomous mobility-on-demand services to comprise a fleet of shared self-driving shuttles or pods that can be booked through smartphones.
- National University of Singapore (NUS) and the Singapore-MIT Alliance for Research and Technology (SMART) have collaborated to test a fleet of self-driving golf-buggies and working research prototypes have been demonstrated.
- Gardens by the Bay, in collaboration with ST Engineering introduced the Auto Rider, the first fully-operational SDV in Asia aimed at enhancing connectivity within the garden.

CONTACTLESS FARE PAYMENT FOR PUBLIC TRANSPORT IN SINGAPORE

- **Contactless Fare Payment for Public Transport in Singapore:** Near Field Communication (NFC) for the phone payment in MRT, LRT and public buses and taxis.
- **Account-Based Ticketing (ABT) System:** for direct payment of public transport fare using contactless credit or debit cards. LTA and MasterCard will jointly launch a pilot in Mar 2017.

Source: Smart Nation Singapore

SINGAPORE: DIGITAL TRANSFORMATION INITIATIVES

DIGITAL GOVERNMENT: PUBLIC SERVICES MADE MORE SEAMLESS WITH TECHNOLOGY

- **MyInfo:** Launched in May 2016, as a platform to manage personal data for Government e-transactions, currently available across 18 government e-services. 150+ similar government digital services expected by 2018.
- **CorpPass:** An authentication, authorization system for entities to access government e-services. It will allow access to 200 government digital services by Dec'17.
- **eCitizen portal**: A citizen-centric online portal which provides one-stop access to a host of government e-services and government-related information and services.

REGULATORY SANDBOX FOR INNOVATIVE FINTECH EXPERIMENTATION

- The Monetary Authority of Singapore (MAS) intends to create a Smart Financial Centre to increase efficiency, create opportunities, and allow better risk management.
- **FinTech Innovation Lab:** A platform for FinTech community to connect, collaborate, and co-create with one another.
- **LATTICE80:** Singapore's first FinTech Innovation Village, offers dedicated physical space for FinTech start-ups
- **One-stop virtual entity for FinTech matters:** Plans to set up one-stop virtual entity for all FinTech related matters and to promote Singapore as a FinTech hub.

TOWARDS A SMART CASHLESS SOCIETY WITH CONTACTLESS PAYMENT

- Unified contactless payment looks set for widespread adoption. With reward and loyalty programmes, contactless e-payment will gain traction and reception.
- PayNow, launched by Association of Banks in Singapore (ABS) offers consumers retail transactions and may include government-related transactions next year.
- Two upcoming initiatives will put Singapore on the map for being the first to offer innovative fare payment solutions in South-east Asia.

LEVERAGING TECHNOLOGY TO IMPROVE OUR URBAN ENVIRONMENT

- The Municipal Services Office (MSO) and the National Environment Agency (NEA) have each developed 2 mobile apps.
- **One Service:** Mobile app to enhance interaction between residents and government agencies. In one year from launch in 2015, the app had 55,000 registrations and 32,000 cases reported through the app.
- **myENV app:** To help users better plan their activities and take pre-emptive measures in safeguarding the environment. The app has 138,000 average monthly active users (Dec'15 – May'16).

SMART HOMES: TECH-ENABLED SOLUTIONS FOR HOMES IN SINGAPORE

- The "Smart HDB Town Framework" for Smart Planning, Smart Environment, Smart Estate, and Smart Living.
- Smart planning tools and data analytics to analyze the wind flow, solar irradiance and shaded areas to design new flats.
- A number of private sector-driven smart home trials have been launched, such as The Luxurie by M1 and Keppel Land in December 2015.

Source: Smart Nation Singapore

SRI LANKA

SRI LANKA: EXECUTIVE SUMMARY

ICT OVERVIEW

- Sri Lanka ICT industry revenues are estimated at LKR 93 bn in 2014 and expected to grow at 15.2% CAGR till 2019. IT Hardware has the largest share while IT Services is the fastest growing segment.

- There are over 300 IT and BPM companies that operate in Sri Lanka, mostly small and medium companies and few large global players. Their major advantage is the low cost English speaking workforce and stable business environment.

- 3G and 4G technologies cover 75% of the population and the revenues through data services are increasing. Sri Lanka is the first country in the world where Google has launched it's Project Loon to further improve internet connectivity.

- Sri Lanka currently faces a shortage of IT service labour and is taking steps to increase its workforce in the sector to achieve SLASSCOM's 'Vision 2022' of seeing the Sri Lankan IT service sector become a $ 5 billion industry from the current LKR 41bn.

DIGITAL AGENDA

- Information and Communication Technology Agency (ICTA) is implementing e-Sri Lanka initiative which involves building IT infrastructure and supporting environment, developing ICT human resources, delivering citizen services and modernizing government, leveraging ICT for socio-economic development and promoting Sri Lanka as an attractive ICT destination.

- The Government's vision is to build Sri Lanka to be a competitive global ICT centre through fostering innovation and inclusive digital empowerment, and has launched a medium term strategy for a Digital Sri Lanka (2017-2020) based on five priority areas
  - Developing Information infrastructure
  - Developing the human resources
  - Enhancing digital inclusion
  - E-Government
  - Safe and secure cyber environment

- Sri Lanka plans to deliver universal internet access, increase digital literacy to 90% by 2020, build a national fibre-optic backbone connecting government buildings and residences to high-speed internet, and a national cloud storage project to boost network capabilities and capacity.

DIGITAL INITIATIVES

- Smart Sri Lanka and OneGov 2020 initiatives were introduced to accomplish universal internet access, increase digital literacy to 90% by 2020, a national cloud storage project to enhance network performance and capacity, building a national fibre-optic network connecting government buildings and residences to high-speed internet and.

- Smart Sri Lanka, developed as a follow-up programme to the eSLDP, focuses on e-government services, improving the local business environment, job creation, and improving e-literacy, connectivity and affordability, particularly in rural areas.
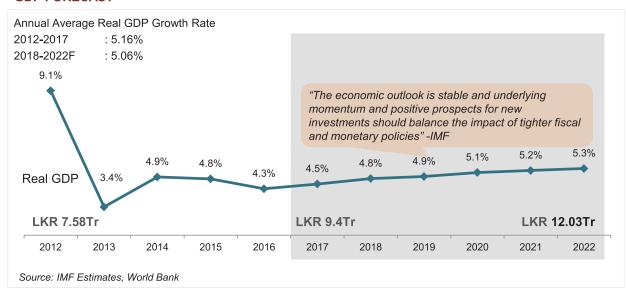
CHALLENGES

- ICT industry in Sri Lanka is growing at a faster pace compared to growth in skilled ICT manpower resulting in shortage of employees. Under Digitally Inclusive Sri Lanka programme, government has introduced an initiative to train 3,60,000 ICT professionals over the next 5 years.

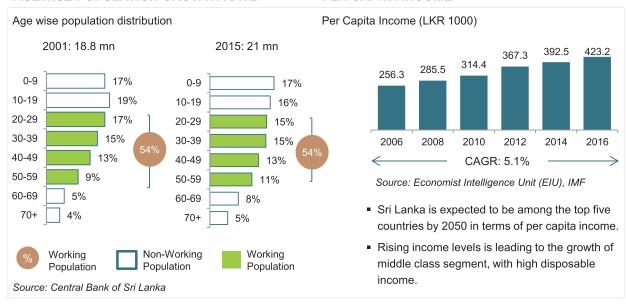- Government legislations and regulations are acting as a hindrance for the growth of fintech sector.

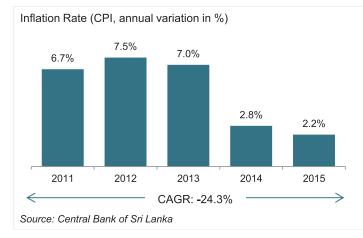# SRI LANKA: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate
2012-2017   : 5.16%
2018-2022F   : 5.06%

9.1%

"The economic outlook is stable and underlying momentum and positive prospects for new investments should balance the impact of tighter fiscal and monetary policies" -IMF

Real GDP

3.4%   4.9%   4.8%   4.3%   4.5%   4.8%   4.9%   5.1%   5.2%   5.3%

LKR 7.58Tr   **LKR 9.4Tr**   **LKR 12.03Tr**

2012   2013   2014   2015   2016   2017   2018   2019   2020   2021   2022

Source: IMF Estimates, World Bank

AGEWISE POPULATION GROWTH RATE

Age wise population distribution

2001: 18.8 mn

Age	%
0-9	17%
10-19	19%
20-29	17%
30-39	15%
40-49	13%
50-59	9%
60-69	5%
70+	4%

54%

2015: 21 mn

Age	%
0-9	17%
10-19	16%
20-29	15%
30-39	15%
40-49	13%
50-59	11%
60-69	8%
70+	5%

54%

% Working Population   Non-Working Population   Working Population

Source: Central Bank of Sri Lanka

PER CAPITA INCOME

Per Capita Income (LKR 1000)

2006	2008	2010	2012	2014	2016
256.3	285.5	314.4	367.3	392.5	423.2

CAGR: 5.1%

Source: Economist Intelligence Unit (EIU), IMF

- Sri Lanka is expected to be among the top five countries by 2050 in terms of per capita income.
- Rising income levels is leading to the growth of middle class segment, with high disposable income.

SINGLE DIGIT INFLATION RATE

Inflation Rate (CPI, annual variation in %)

2011	2012	2013	2014	2015
6.7%	7.5%	7.0%	2.8%	2.2%

CAGR: -24.3%

Source: Central Bank of Sri Lanka

- Sri Lanka has witnessed economic growth since the beginning of the new century.
- Inflation rate has been reduced to low single digits over the past few years as a result of successful monetary management by the monetary authority which has resulted in containing demand pricing pressure.
- As a result, progress has been made towards reducing poverty and improving social indicators.

SRI LANKA: ICT INDUSTRY OVERVIEW

ICT GENERATES SIGNIFICANT IMPACT ON THE GROWTH OF THE SRI LANKAN ECONOMY

ICT market size

LKR 189 Bn

CAGR: 15.2%

LKR 93 Bn

2014	2019
15.0	33.0
18.0	41.0
60	115

Source: Central Bank of Sri Lanka, BMI Research, export.gov, Sri Lanka Export Division Board

- Information and communication technology (ICT) is one of the fastest growing sectors in Sri Lanka. The ICT sector has grown significantly over the past few years making it one of the largest foreign exchange earner for Sri Lanka.
- The factors responsible for country's growth in ICT are:
    - Improvement in local telecommunication sector
    - High literacy rates
    - Low billing rates and salaries

	FY14 %	FY19 %	CAGR
Software	16.1%	17.5%	17.1%
IT Services	19.4%	21.7%	17.9%
Hardware	64.5%	60.8%	13.9%

Note: Telecom sector market size is not available on any public source

ICT EXPORTS ARE STEADILY INCREASING

ICT exports (LKR Bn)

2006	2008	2010	2012	2014	2016
17.8	26.6	39.8	59.6	89.1	133.3

CAGR: 22.3%

Source: Sri Lanka Export Development Board

- Sri Lanka is proving to be good IT outsourcing destinations because of low cost English speaking workforce and stable business environment.
- North America, EU, Australia, East Asia, Middle East, Africa and Nordic countries are the major export destinations for Sri Lankan software products and services.
- Many foreign companies such as HSBC, Industrial and Financial Systems (IFS), Amba Research, RR Donnelley, WNS, Quattro, Virtusa, and Millennium IT (London Stock Exchange) have also invested in Sri Lanka for IT support services.

SLASSCOM HAS SET AMBITIOUS TARGETS FOR SRI LANKA IT/ BPM INDUSTRY GROWTH

Employment

2007	2013	2022E
33,702	75,107	200,000

Export revenues (USD mn)

2007	2013	2022E
213	850	5,000

No. of start-ups

2007	2013	2022E
171	225	1,000

Source: Slasscom "Vision 2022" document
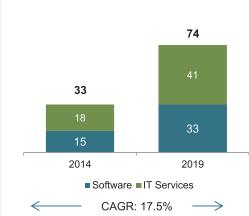
SRI LANKA: IT SERVICES AND SOFTWARE

IT MARKET SIZE IS EXPECTED TO INCREASE DRASTICALLY BY 2022
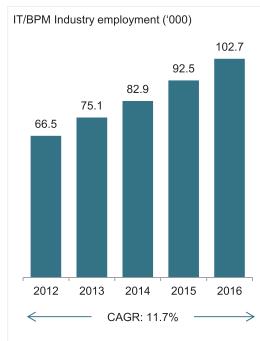
Software and IT services sales (LKR Bn)

33

2014: Software 15, IT Services 18

74

2019: Software 33, IT Services 41

■ Software ■ IT Services

CAGR: 17.5%

- Earnings from exports of IT-BPM sector have shown a steady upward trend during the past decade. As per SLASSCOM's 'Vision 2022', Sri Lankan IT sector plans of becoming a $ 5 billion industry.
- The BPO sector includes financial and accounting services, investment research, engineering services, and UK-based legal services. According to the World Bank, Sri Lanka has relatively low labor costs compared to other BPO destinations.
- There are over 300 IT and BPM companies that operate in Sri Lanka, mostly small and medium companies and few large global players.

Source: BMI Research, SLASSCOM Strategy Document 2016

SHORTFALL IN ICT EMPLOYMENT NEEDS TO BE ADDRESSED IN ORDER TO MEET 2022 TARGETS

IT/BPM Industry employment ('000)

2012: 66.5
2013: 75.1
2014: 82.9
2015: 92.5
2016: 102.7

CAGR: 11.7%
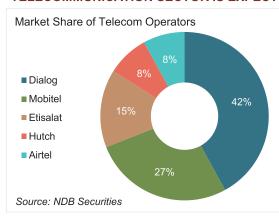
- Sri Lanka Association of Software and Service Companies shows annual IT graduates number rising from 3,800 in 2007 to 7,000 in 2014. However, with revenue growth rising more than 200%, the industry may need to boost the flow of skilled graduates to keep pace with continued expansion.
- According to the IBPO, the industry revenue growth forecast can be realized only if BPO talent-pool is increased by at least 15,000-20,000 annually for the next 2-3 years. The workforce is stable with very low attrition rates ranging from 10-15%.
- As per SLASSCOM's 'Vision 2022', Sri Lankan IT sector plans to create 200,000 direct jobs.
- Sri Lanka has relaxed foreign investments in the education sector due to which many international universities plan to set up campuses in Sri Lanka. This will enable in increasing tech graduates output and also improve the quality of education. University of Central Lancaster will have its first campus in South Asia by 2015.
- (SLASSCOM) has launched "Future Careers" platform focused on creating awareness among youth about the benefits of selecting IT or BPM as a career path.

Source: Slasscom Strategy Document 2016, Central Bank of Sri Lanka

SRI LANKA: TELECOMMUNICATION

TELECOMMUNICATION SECTOR IS EXPECT TO UNGERGO CONSOLIDATION TO IMPROVE

Market Share of Telecom Operators

- Dialog
- Mobitel
- Etisalat
- Hutch
- Airtel

42%
27%
15%
8%
8%

Source: NDB Securities

- Currently, Dialog, Mobitel, Etisalat, Airtel and Hutch are the major mobile phone operators along with 3 fixed-line operators, 10 external gateway operators, 15 ISPs.
- The market is likely to consolidate with the smaller companies exiting or getting merged with larger players due to substantial taxes.
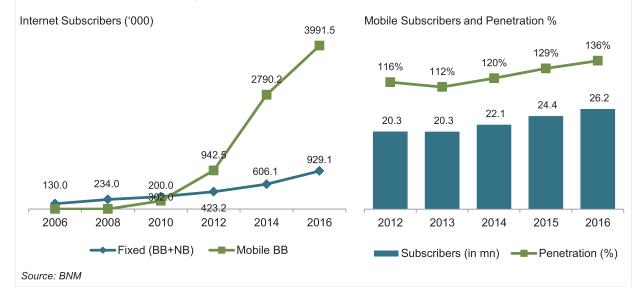
NATIONAL BROADBAND NETWORK TO COVER 329 DISTRICTS BY FIBRE OPTIC NETWORK BY 2018

- Sri Lanka Telecom (SLT) has been awarded contract to lay fibre optic cables under National Broadband Network (NBN) in 2013.
  - Phase 1 of the study was completed in Nov'14 by laying 20,000-km fiber network cables delivering 8 TB of capacity with download speeds of up to 100 Mbps.
  - For Phase 2, SLT partnered with Ruckus Wireless and Alepo in Jul'15 to deliver Wi-Fi hotspots in public areas and under served rural areas.
- The Local Government Network (LGN 2.0) is to be done by the Information and Communication Technology Agency of Sri Lanka (ICTA) during 2016-2018 at a cost of Rs12.7 billion.

Source: News articles

HIGH PENETRATION OF 3G AND 4G NETWORKS
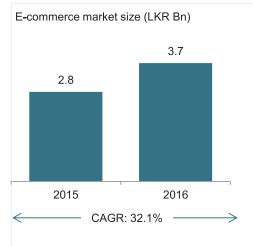
- 3G and 4G technologies cover 75% of the population and is expected to grow further. High demand for data services has driven players to invest in new infrastructure and acquire smaller operators to expand their networks.
- With increased data consumption, the companies are now shifting from legacy revenue (Voice and Messaging) model to data service revenue model.
- Google's Project Loon will provide Sri Lanka with affordable Internet solutions, further boosting the country's connectivity in both urban and rural areas. The project ran into controversy with regard to the landing of the balloon and the success of its preliminary tests.

Internet Subscribers ('000)

3991.5
2790.2
942.5
606.1
929.1
130.0 234.0 200.0
302.0
423.2

2006   2008   2010   2012   2014   2016

- Fixed (BB+NB)
- Mobile BB

Mobile Subscribers and Penetration %

116%   112%   120%   129%   136%
20.3   20.3   22.1   24.4   26.2

2012   2013   2014   2015   2016

- Subscribers (in mn)
- Penetration (%)

Source: BNM

SRI LANKA: E-COMMERCE

STEADY GROWTH OF THE SRI LANKAN E-COMMERCE SECTOR

E-commerce market size (LKR Bn)

2.8   2015

3.7   2016

CAGR: 32.1%

- The share of e-commerce in the overall retail sales is expected to grow from 1% in 2015 to 3% in 2018 driven by the increasing number of smartphones and disposable income in the growing middle class.
- The online retail industry growing fast due to lack of physical infrastructure like shops and malls. Unlike other countries where e-commerce has developed as a third retailing option after high streets and malls, Sri Lanka is already seeing the emergence of online retail even as its high streets and malls remain in a nascent stage.
- The range of products purchased through e-commerce portals in Sri Lanka is small with home appliances and electronic products being sold the most. E-ticketing which typically has a large share in e-commerce has a small share in e-commerce.

Source: Ceylon Chamber of Commerce
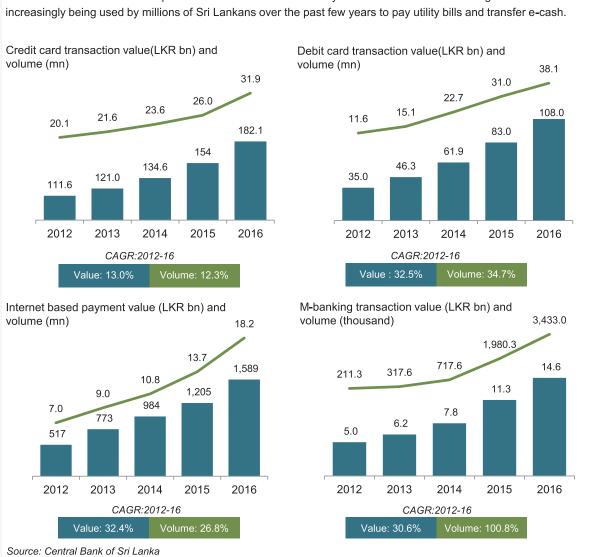
LESS FAVOURABLE REGULATORY ENVIRONMENT FOR COMPANIES

- Existing government policies make it very difficult to leverage the full potential of the internet. Outdated laws are holding back innovation in the Sri Lankan e-commerce and payments sector.
- Whichever the government that comes in to power lacks the motivation to make use of all the potential opportunities that we have got in terms of the Internet
- The government's plan to regulate businesses operating in the e-commerce sector to operate under the accounts of locally based banks will act as a deterrent for e-commerce growth.

SRI LANKA: FINTECH

HEALTHY GROWTH OF CONVENTIONAL AND MODERN CASHLESS PAYMENT METHODS

Electronic payment transactions are finding acceptance due to their convenience of use, rise in computer literacy, increase in PC and broadband penetration and internet availability at affordable rates. M-banking and wallets are increasingly being used by millions of Sri Lankans over the past few years to pay utility bills and transfer e-cash.

Credit card transaction value(LKR bn) and volume (mn)

	2012	2013	2014	2015	2016
Value	111.6	121.0	134.6	154	182.1
Volume	20.1	21.6	23.6	26.0	31.9

CAGR:2012-16

Value: 13.0% Volume: 12.3%

Debit card transaction value(LKR bn) and volume (mn)

	2012	2013	2014	2015	2016
Value	35.0	46.3	61.9	83.0	108.0
Volume	11.6	15.1	22.7	31.0	38.1

CAGR:2012-16

Value : 32.5% Volume: 34.7%

Internet based payment value (LKR bn) and volume (mn)

	2012	2013	2014	2015	2016
Value	517	773	984	1,205	1,589
Volume	7.0	9.0	10.8	13.7	18.2

CAGR:2012-16

Value: 32.4% Volume: 26.8%

M-banking transaction value (LKR bn) and volume (thousand)

	2012	2013	2014	2015	2016
Value	5.0	6.2	7.8	11.3	14.6
Volume	211.3	317.6	717.6	1,980.3	3,433.0

CAGR:2012-16

Value: 30.6% Volume: 100.8%

Source: Central Bank of Sri Lanka

SRI LANKA AIMS TO REDUCE CASH PAYMENT THROUGH MULTI-CHANNEL BANKING STRATEGIES

- Despite having a banking penetration of over 80% today and a high debit card penetration, cash continues to dominate in the overall transactions. Hence, chip and pin technology cards have been introduced in 2017 to address the security concerns with debit cards.
- Fintech in Sri Lanka has some restrictive regulations which limit the growth of fintech companies.
- Unimpaired working capital of LKR 150 mn stipulated by the government for financial service providers.

SRI LANKA: DIGITAL TRANSFORMATION INITIATIVES

To increase the digital inclusiveness in Sri Lanka, an eight point plan has been prepared by the government. Several initiatives have been launched for each of these eight focus points.

AN 8 POINT PLAN FOR A DIGITALLY INCLUSIVE SRI LANKA

Digital Content

Digital Jobs and Opportunities

Digital Society

Digital Connectivity

DIGITALLY INCLUSIVE Sri Lanka

Digital Commerce

Digital Legislation

Digital Government

Digital Security

Source: Digital Sri Lanka

POINTS	INITIATIVES
Digital Connectivity	• Free WiFi to citizens initiative • Increase international connectivity (Digital Hub) • Lanka Government Cloud 2.0 with Big Data Analytics • Government Data Centre
Digital Society	• Digital Identity for every citizen • Digital wallet for every citizen • e-Literacy • e-Participation
Digital Content	• Government information to be digitized and made available online • Seamless generation and availability • Next Gen Education Content Portal • Local Language Content
Digital Commerce	• Encouraging all financial transactions to be digital and cashless • National Payment Platform for Digital Commerce • Facilitating Private Commodity Exchanges • Facilitating Fulfillment Services managed by private sector for Digital Commerce
Digital Government	• Fully integrated government facilitated by transparent workflow automation • E-services e.g. citizen certificates, licenses, permits, etc. issued digitally • Data sharing policy • Adopt open standards for government solutions
Digital Security	• National Cyber Security Operations Center to be established • Sri Lanka Cyber Emergency Response Team (SLCERT) to be expanded to meet next generational challenges • National Digital Certification Authority to be activated
Digital Jobs and Opportunities	• 360,000 ICT professionals in next 60 months • 300,000 ICT jobs in next 60 months • New business opportunities for entrepreneurs • Digital Education
Digital Legislation	• Data Protection Laws to be established • UN Electronic Communications Convention • Right to Information Laws to be implemented within the digital framework • Adoption, effective usage and harmonization of ICT laws

Source: Roadmap for Digital Sri Lanka

SRI LANKA: DIGITAL TRANSFORMATION INITIATIVES

The Open Government Partnership has been launched to improve digital governance and promote open data. It has three main objectives and has set eight milestones to achieve those.

OPEN GOVERNMENT PARTNERSHIP (OGP)
Sri Lanka National Action Plan 2015 to 2017

ENHANCE THE SERVICES OF GOVERNMENT INFORMATION CENTER (GIC- 1919) FOR INCLUSIVE, TRANSPARENT, ACCOUNTABLE AND EFFICIENT GOVERNANCE, USING ICT AS ENABLER

Responsible Agency: Ministry of Telecommunication and Digital Infrastructure

Timeline: July 2016- Dec 2017

Main Objective	Milestones to fulfill the commitment
1. Increase citizens' awareness of citizen services through the GIC–Call centre + website + SMS alerts system etc. 2. Effectively and efficient use of ICT to provide government information as a part of RTI commitments	1. To make 250 institutions covered under the Government Information Centre (GIC – 1919) Call Centre facility from 194 and to introduce at least 2 additional services per institutions offered through the facility by 2017 with the assistance of ICTA – E.g. Tracking status of requests, personalized email feedback, text messages and social media upon subscription 2. Enhance the service platform of the GIC (www.gic.gov.lk) along with updating Citizens' Service Charter Information (produced by each organization in consultation with their internal and external stakeholders to reflect the changes in standard of services) for 10 key services (identified by ICTA using GIC call registries). 3. To make citizens aware of GIC services and assess their key needs by engaging the Divisional Secretariats, Nenasala/Telecentre network (eg.by "IT Yahamaga" of Sarvodaya Fusion and ICTA's "Smart Social Circles") and to produce one survey report for every 6 month, and to make them publicly available. 4. Training of the Chief Innovative Officers (CIOs) of government agencies to develop institutional knowledge bases related to public services 5 sessions, 50 CIOs to be trained in each session, covering all key government organizations (Ministries, Departments, District Secretariats, Provincial Councils and Key Statutory bodies. If required, training could be expanded to Divisional Secretariats and Local Authorities too)

PROMOTE THE OPEN DATA CONCEPT AND DELIVER THE BENEFITS TO CITIZENS THROUGH ICT

Responsible Agency: Ministry of Telecommunication and Digital Infrastructure

Timeline: July 2016- July 2018

Main Objective	Milestones to fulfill the commitment
1. Promote Open Data using ICT platforms and ensure citizens get its benefits using similar technologies	1. Survey on citizens' demand on government data sets (through Nenasala/Smart Social Circles) 2. Open consultation on Data and Services Classification (with Open Data/Data Sharing Policy) based on the draft prepared by ICTA. 3. Enhance the current 89 data sets of various government institutes and increase it to 200 by end of 2016 and 500 by July 2018 (by ICTA) 4. Revise website www.data.gov.lk with already available data sets of different government agencies (by ICTA Project #24)

Source: Open Government Partnership National Action Plan Sri Lanka

TAIWAN

TAIWAN: EXECUTIVE SUMMARY

ICT OVERVIEW

- Taiwan's ICT industry is expected to grow 3.96% in 2017 owing to rising demand for high-tech devices. Taiwan's ICT makrket size in 2016 is NTD 4.8 bn of which IT hardware manufacturing contributed almost 90%. Mainly, ICT focuses on exports and has become one of the critical supply chains in global ICT industry.

- Information Services is expected to grow due to increased focus by government to welcome new technologies like Cloud, IoT, Big Data etc. Taiwan's computer services and software market relies heavily on imports.

- Taiwan is world's biggest manufacturer of IC Foundry & Package and world's second largest semiconductor industry, Taiwan accounted for 22.2% of the global chip design market in 2015. The demands of hardware are driven by high worldwide smartphone penetration and Internet of Things sector.

- Taiwan has a developed dynamic telecommunications industry with an excellent infrastructure and a competitive mobile market. The market revenue had been declining due to steep decline in revenue of fixed-line voice services. The government aims to master 5G key technologies, software, and application services by 2025

- Taiwan is among the world leaders in terms of ecommerce penetration — roughly 62% of residents have purchased products online. Taiwan's geographical proximity to China and Japan has led Taiwanese shoppers to buy from Chinese and Japanese vendors. Taiwanese shoppers also prefer foreign vendors due to affordability.

DIGITAL AGENDA

- Realizing the need for digital transformation, Taiwan recently launched its 8-years Digital Nation Plan (2017-2025), named DIGI+, to develop its high-tech economy and propel digitalization among companies.

- The goal of DIGI+ is to increase Internet bandwidth, bridge the digital divide between urban and rural areas, and strengthen Taiwan's position in the global information sector. The strategic plan is aimed at helping Taiwan attain a digital economy valued at NT$6.5 trillion (US$205.9 billion, 29.9% of GDP) and be among the top ten countries in the world for information technology by 2025.

- The government has earmarked a budget of NT$11 billion for 2017 and NT$20 billion each year from 2018 to 2025. This budget is being channeled into six development strategies:

  - DIGI+ Infrastructure: Setting up of infrastructure conducive to digital innovation

  - DIGI+ Talent: Cultivation of digital experts

  - DIGI+ Industry: Support for cross-industry upgrades via digital innovation

  - DIGI+ Rights: Making Taiwan a country featuring digital human rights and an open-network society

  - DIGI+ Cities: Making cities and rural areas smart

  - DIGI+ Globalization: Accelerating Taiwan's global status in terms of digital service economics

TAIWAN: EXECUTIVE SUMMARY

KEY INITIATIVE
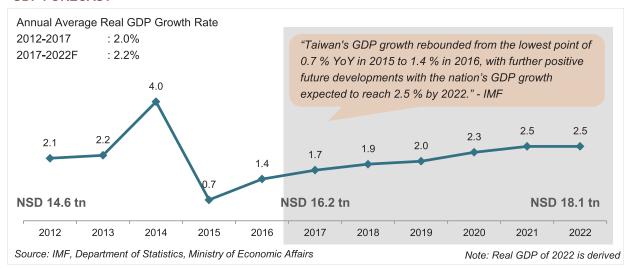
- Taiwan's internet penetration rate in 2015 was around 85%. With the rise of the IoT in the recent years, more devices will be connected and this highlights an urgent need for the government to make efforts providing internet access for its citizens and businesses to keep up with the global trend and ensure its relevance in the increasingly competitive business landscape.
    - The digital nation plan seeks to improve access to broadband Internet for rural residents, as well as develop a 5G mobile services network, which is expected to be ready by 2020, along with an IoT network. The target is to achieve 90% broadband services coverage nationwide.
    - The government's goal is to achieve a download speed of 1 terabit per second (Tbps) for fixed-line broadband services by 2020 and 2Tbps by 2025.
    - To ensure the rights of economically disadvantaged people to access the Internet, the target plan is to provide them with broadband services with download speeds of 10 megabits per second (Mbps) by 2020 and 25Mbps by 2025.
- The digital nation initiative is also expected to raise the overall usage rate of digital services from 25.8% to 80% by 2025 and significantly improve Taiwan's technology readiness.
- Under the pillar for IoT is a flagship program called the Asia Silicon Valley Development Plan, which aims to establish Taiwan as the hub between the Asia region and Silicon Valley, particularly in IoT development, and for making the country a global center for tech entrepreneurship. The plan supports Taiwan's goals of increasing its global IoT market share from 3.8% in 2015 to 5% in 2025, which according to Gartner's projections could be worth US $11 trillion by 2025.

CHALLENGES
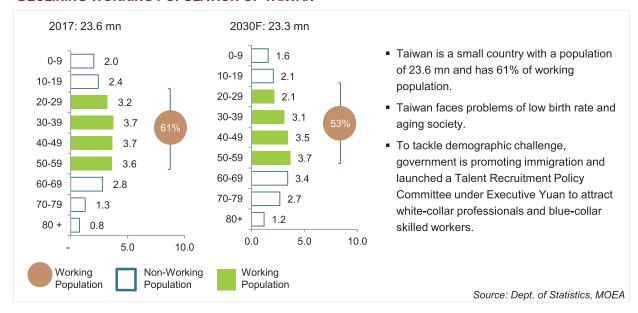
- Regulatory environment has been very rigid and didn't keep up with changes in the digital economy.
- Shortage of cross-discipline talent within the digital economy - New university graduates lacking the training to meet industry needs.
- Insufficient transnational operational capabilities of the digital economy industry along with slow progress in cross-industry integration and development of innovative applications
- Inertia among leading hardware manufacturers is impeding the labor market, regulatory policy, and forward thinking among industrial management.

TAIWAN: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate
2012-2017   : 2.0%
2017-2022F   : 2.2%

"Taiwan's GDP growth rebounded from the lowest point of 0.7 % YoY in 2015 to 1.4 % in 2016, with further positive future developments with the nation's GDP growth expected to reach 2.5 % by 2022." - IMF

4.0

2.1   2.2

1.4   1.7   1.9   2.0   2.3   2.5   2.5

0.7

NSD 14.6 tn   **NSD 16.2 tn**   **NSD 18.1 tn**

| 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |

Source: IMF, Department of Statistics, Ministry of Economic Affairs   *Note: Real GDP of 2022 is derived*

DECLINING WORKING POPULATION OF TAIWAN

2017: 23.6 mn

Age	Value
0-9	2.0
10-19	2.4
20-29	3.2
30-39	3.7
40-49	3.7
50-59	3.6
60-69	2.8
70-79	1.3
80 +	0.8

61%

2030F: 23.3 mn

Age	Value
0-9	1.6
10-19	2.1
20-29	2.1
30-39	3.1
40-49	3.5
50-59	3.7
60-69	3.4
70-79	2.7
80+	1.2

53%

- Taiwan is a small country with a population of 23.6 mn and has 61% of working population.
- Taiwan faces problems of low birth rate and aging society.
- To tackle demographic challenge, government is promoting immigration and launched a Talent Recruitment Policy Committee under Executive Yuan to attract white-collar professionals and blue-collar skilled workers.

Working Population   Non-Working Population   Working Population

Source: Dept. of Statistics, MOEA

SERVICES IS THE MAJOR SHAREHOLDER IN DOMESTIC PRODUCTION – PROPORTION TO GDP

	2012	2013	2014(r)	2015(r)	2016
Service	65.6%	64.9%	63.4%	63.2%	63.1%
Industry	32.8%	33.5%	34.8%	35.1%	35.1%
Agriculture, Forestry, Fishing and Animal Husbandry	1.7%	1.7%	1.8%	1.7%	1.8%

- Services holds the major share of proportion to GDP by domestic production in which wholesale trade and retail trade plays a major role.
- Manufacturing, in Industry, contributes around 30% to the GDP.

Source: DGBAS Executive Yuan.

IT HARDWARE HAS HIGHEST SHARE IN ICT MARKET

ICT Market Size (NTD bn)

	2012	2013	2014	2015	2016
Total	4878.8	4827.3	5087.2	4832.5	4758.7
Telecommunication	379.7	386.9	378.0	378.9	363.6
IT Hardware	4259.9	4193.2	4457.6	4198.6	4129.3
IT Services	239.1	247.3	251.6	255.1	265.8

CAGR: -0.6%
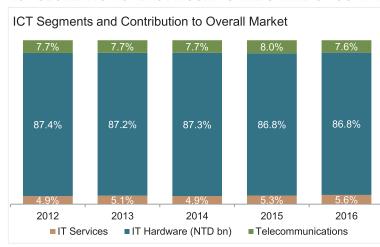
- Taiwan's ICT industry is heavily dependent on hardware industry and other sectors are majorly dependent on hardware's growth.
- Taiwan has been a worldwide leader in hardware manufacturing keeping high focus on exports and has become one of the critical supply chains in global ICT industry.
- Taiwan's ICT market is stagnant and growing slowly due to domestic saturation and fierce foreign competition.

CAGR 2012-16:

Telecommunication: -1.1%	IT Hardware: -0.8%
IT Services: 2.7%	

Source: Dept. of Statistics, MOEA
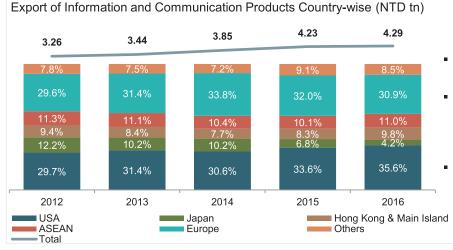
ICT SEGMENTS HOVERS AROUND SAME SHARE OF CONTRIBUTION

ICT Segments and Contribution to Overall Market

	2012	2013	2014	2015	2016
Telecommunications	7.7%	7.7%	7.7%	8.0%	7.6%
IT Hardware (NTD bn)	87.4%	87.2%	87.3%	86.8%	86.8%
IT Services	4.9%	5.1%	4.9%	5.3%	5.6%

- IT Hardware contributes almost 87% to overall ICT industry and 25% to Real GDP of Taiwan.
- Information Services is expected to grow due to increased focus by government to welcome new technologies Cloud, IoT, Big Data etc.

Source: Dept. of Statistics, MOEA

COUNTRYWISE EXPORTS OF INFORMATION AND COMMUNICATION PRODUCTS

Export of Information and Communication Products Country-wise (NTD tn)

	2012	2013	2014	2015	2016
Total	3.26	3.44	3.85	4.23	4.29
Others	7.8%	7.5%	7.2%	9.1%	8.5%
Europe	29.6%	31.4%	33.8%	32.0%	30.9%
ASEAN	11.3%	11.1%	10.4%	10.1%	11.0%
Hong Kong & Main Island	9.4%	8.4%	7.7%	8.3%	9.8%
Japan	12.2%	10.2%	10.2%	6.8%	4.2%
USA	29.7%	31.4%	30.6%	33.6%	35.6%
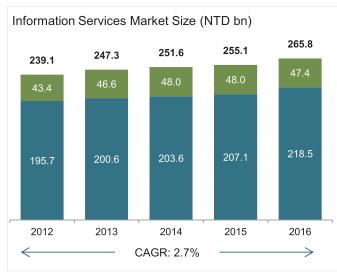
- ICT industry of Taiwan is heavily dependent on exports.
- Due to well established infrastructure, many large companies are present and export worldwide.
- Increasing demands are coming from consumers in USA followed by Europe.

Source: Dept. of Statistics, MOEA

TAIWAN: INFORMATION SERVICES

MORE GROWTH COMING FROM MANUFACTURING SECTORS'S EXPANSION

Information Services Market Size (NTD bn)

	2012	2013	2014	2015	2016
Total	239.1	247.3	251.6	255.1	265.8
Green	43.4	46.6	48.0	48.0	47.4
Blue	195.7	200.6	203.6	207.1	218.5

CAGR: 2.7%

Data Processing and information Supply Services
CAGR: 2.8%

Computer Systems Design Services
CAGR: 2.2%
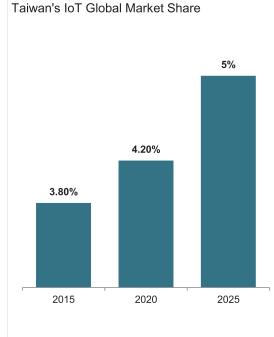
- Taiwan's computer services and software market is heavily dependent on imports.
- The demand in information service and software is expected to grow due to expansion of manufacturing, finance and logistics sectors locally and globally.
- Personal Information Protection Act and International Financial Reporting Standards are expected to drive the demand of information service.

Source: Dept. of Statistics, MOEA, expot.gov

GOVERNMENT FOCUSES ON IOT TO ACHIEVE 5% GLOBAL SHARE BY 2025

Taiwan's IoT Global Market Share

2015	2020	2025
3.80%	4.20%	5%

- Government aims to strengthen the IoT market and has structured a framework:
  - Build an IoT and start-up ecosystem with heavy focus on R&D.
  - Integrate Taiwan's hardware advantages into software applications.
  - Relax restrictions on attracting foreign and overseas students.
- The framework aims to cover 5% of global share in IoT market till 2025 and grow 100 successful companies in the segment. Also, they aim to create an online learning platform for the IoT related sectors.

Challenges in IoT development in Taiwan-
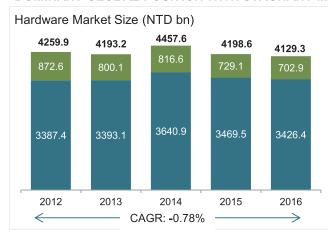
- Lack of comprehensive development plans.
- Little connections to international IoT standards organizations brings less opportunities to grow.
- Insufficient integration and lack of cooperation of local IoT communities.

Source: National Development Council

TAIWAN: HARDWARE

DOMINANT GLOBAL POSITION WITH STAGNANT MARKET SIZE

Hardware Market Size (NTD bn)

Year	Electronic Parts	Computers, Electronic	Total
2012	3387.4	872.6	4259.9
2013	3393.1	800.1	4193.2
2014	3640.9	816.6	4457.6
2015	3469.5	729.1	4198.6
2016	3426.4	702.9	4129.3

CAGR: -0.78%
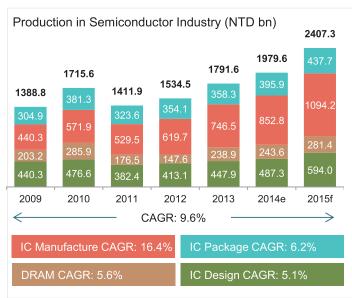
- Taiwan has been dominating the hardware manufacturing industry in many segments such as PCs, motherboard, all branches of ICs, etc.
- Taiwan generally exports almost twice as much as it imports.

Computers, Electronic and Optical Products CAGR: 0.3%

Electronic Parts and Components Manufacturing CAGR: -5.3%

Source: Dept. of Statistics, MOEA

WORLD'S BIGGEST ICT HARDWARE MANUFACTURER AND STILL GROWING STRONG

Production in Semiconductor Industry (NTD bn)

Year	IC Design	DRAM	IC Package	IC Manufacture	Total
2009	440.3	203.2	440.3	304.9	1388.8
2010	476.6	285.9	571.9	381.3	1715.6
2011	382.4	176.5	529.5	323.6	1411.9
2012	413.1	147.6	619.7	354.1	1534.5
2013	447.9	238.9	746.5	358.3	1791.6
2014e	487.3	243.6	852.8	395.9	1979.6
2015f	594.0	281.4	1094.2	437.7	2407.3

CAGR: 9.6%

IC Manufacture CAGR: 16.4% | IC Package CAGR: 6.2%
DRAM CAGR: 5.6% | IC Design CAGR: 5.1%
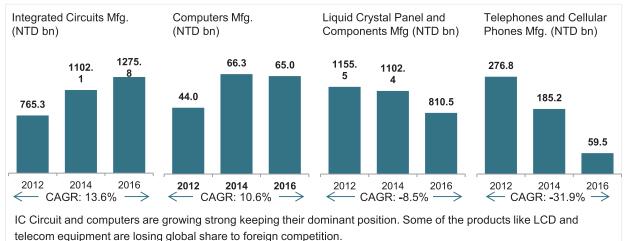
- Taiwan is world's biggest manufacturer of IC Foundry and Package and world's second largest semiconductor industry, Taiwan accounted for 22.2% of the global chip design market in 2015.
- Taiwan pioneered the system in which each stage is performed by a separate company, as opposed to the integrated model used by companies such as Intel.
- The demands are driven by high worldwide smartphone penetration and Internet of Things sector.
- TSMC and ASE are world's biggest IC Foundry and IC Package manufacture company. 5 out of 20 top IC Design firms in the world are Taiwanese.

Source: Dept. of Statistics, MOEA, MIC Reports
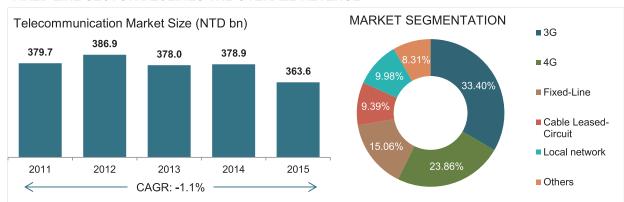
IC'S AND COMPUTERS LEADING IT HARDWARE MANUFACTURING GLOBALLY

Integrated Circuits Mfg. (NTD bn)

2012	2014	2016
765.3	1102.1	1275.8

CAGR: 13.6%

Computers Mfg. (NTD bn)

2012	2014	2016
44.0	66.3	65.0

CAGR: 10.6%

Liquid Crystal Panel and Components Mfg (NTD bn)

2012	2014	2016
1155.5	1102.4	810.5

CAGR: -8.5%

Telephones and Cellular Phones Mfg. (NTD bn)

2012	2014	2016
276.8	185.2	59.5

CAGR: -31.9%

IC Circuit and computers are growing strong keeping their dominant position. Some of the products like LCD and telecom equipment are losing global share to foreign competition.

Source: Dept. of Statistics, MOEA

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TAIWAN: TELECOMMUNICATION

FIXED LINE SECTOR DECLINES THE OVERALL REVENUE

Telecommunication Market Size (NTD bn)

2011	2012	2013	2014	2015
379.7	386.9	378.0	378.9	363.6

CAGR: -1.1%

MARKET SEGMENTATION

- 3G: 33.40%
- 4G: 23.86%
- Fixed-Line: 15.06%
- Cable Leased-Circuit: 9.39%
- Local network: 9.98%
- Others: 8.31%

- Taiwan has a developed dynamic telecommunications industry with an excellent infrastructure and a competitive mobile market.
- The market revenue had been declining due to steep decline in revenue of fixed-line voice services. Mobile telecom has stagnant growth resulting in overall decline of revenue.

Source: NCC

STAGNANT PENETRATIONS HAS RESULTED INTO TOUGH COMPETITION

Penetration of Mobile and Broadband

	2011	2012	2013	2014	2015
Mobile	124.8%	126.9%	127.6%	128.4%	125.0%
Mobile Broadband	76.9%	76.4%	77.4%	81.0%	81.2%
Landline	54.6%	53.2%	52.3%	51.4%	50.6%
Fixed-Line	23.8%	27.7%	30.0%	31.7%	32.4%

- Fixed broadband market is seeing a transition from DSL to fibre access based platforms. The segment is dominated by Chunghwa Telecom despite competition.
- High penetration in mobile market has resulted into tough competition amongst the 6 service providers to gain new subscribers.

Source: NCC

5G TO SERVE AS FOUNDATION TO IOT AND DIGITAL ECONOMY GROWTH

- The 5G network has large bandwidth, high connectivity, and seamlessness. This will serve as the foundation for the application of IoT and boost growth in the digital economy.
- It is estimated that by 2025, the economic impact of 5G will be as high as NT$160 trillion and the 5G industry would be worth NT$4.9 trillion. The 5G hardware industry would be worth NT$41.1 trillion, and the 5G service application industry would be worth NT$114 trillion.
- The government aims to master 5G key technologies, software, and application services by 2025 to take advantage of this potential economy and leverage Taiwan's experience in exporting.

Source: NCC

TAIWAN: E-COMMERCE

RAPIDLY GROWING E-COMMERCE MARKET, HIGH E-COMMERCE PENETRATION

E-commerce Market Size (US$ bn)

2014	2015	2016
29.3	34	37.6

CAGR: 13.3%
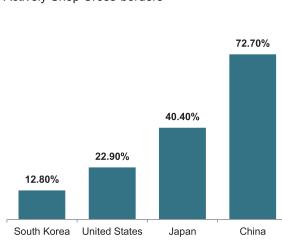
- Taiwan is among the world leaders in terms of ecommerce penetration which is roughly 62%.— the percentage of residents that have purchased products online.
- The e-commerce market in Taiwan has grown at a rapid pace over the past few years, with a 5-year average growth rate of 10-20%.
- It is predicted that Taiwan's online retail platforms will eventually overtake sales in physical retail stores, accounting for more than half of the multi-billion dollar retail sector.

Source: export.gov

HIGH CROSS BORDER SHOPPING DRIVEN BY AFFORDABLE PRODUCTS

Countries Where Taiwan Online Shoppers Most Actively Shop Cross-borders

South Korea	United States	Japan	China
12.80%	22.90%	40.40%	72.70%
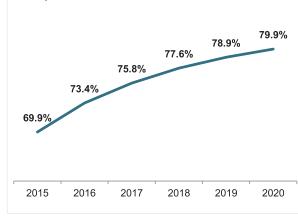
- Taiwan's geographical closeness to Japan and China has steered Taiwanese online shoppers to buy from Chinese and Japanese vendors. Also, the two foreign lands are preferred by Taiwanese shoppers due to affordability.
- 40% of all online purchases in Taiwan were from overseas seller's and 84.3% of online shoppers were willing to buy from foreign vendors.
- Yahoo Hong Kong recently announced the launch of its Yahoo Hong Kong-Taiwan cross-border ecommerce platform for Taiwanese brands can sell their goods in Hong Kong market.
- The most popular sites were Taobao/Tmall, Rakuten, Amazon and eBay, respectively.

Source: SP ecommerce, export.gov

M-COMMERCE

Smartphone Penetration

2015	2016	2017	2018	2019	2020
69.9%	73.4%	75.8%	77.6%	78.9%	79.9%
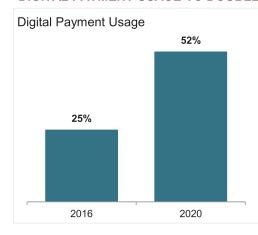
- 31% of Taiwanese respondents claimed they used their mobile device to purchase a good, while 31% also made a purchase of a service within the past half year.
- Considering the rapid growth of e-commerce in Taiwan, mobile e-commerce is likely to continue to expand as well.
- One of the main obstacles to this expansion is a reluctance by Taiwan consumers to pay using mobile devices, preferring instead to use cash.

Source: Nielson Report

TAIWAN: FINTECH
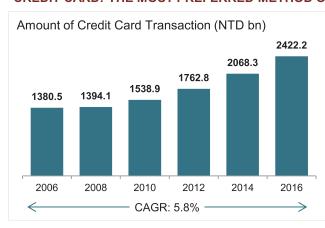
DIGITAL PAYMENT USAGE TO DOUBLE IN NEXT 5 YEARS

Digital Payment Usage

- Taiwan has a good basic infrastructure, and it provides this tiny little island with all necessary foundations.
- There are more than 50 banks competing for fintech market resulting into high market saturation.
- Mobile payments accounts for 26% of total electronic payments.

Source: Financial Supervisory Commission

CREDIT CARD: THE MOST PREFERRED METHOD OF ONLINE PAYMENT

Amount of Credit Card Transaction (NTD bn)

Around 76% of consumers used credit card as their preferred method of online payment. Convenience store pickup increased by 20% in 2014 to 66.4% in 2016. Another popular option is ATM bank transfers.

CAGR: 5.8%

Source: Dept. of Statistics, MOEA

GOVERNMENT PAVES WAY FOR FINTECH STARTUP

- Finance Supervisory Commission in Taiwan has announced following actions to develop fintech in Taiwan –
  - First, all domestic banks must offer 12 online financial services.
  - Second, they announced 11 big data application projects, govt. open data in real estate credit evaluation, stock market transaction data, personal credit card transactions, and fraud statistics along with over 900 other finance-related datasets.
  - Third, the banks' shareholding ratio was relaxed from 5 to 100% for fintech company investments.
  - Fourth, they set up a fintech office, promotion funds and a startup base.
- The Taiwanese government is taking bold steps to stimulate the local fintech industry. It launched "FinTech Base", it will be assisting the "FinTech Development Foundation" with investments in startups, as well as providing courses and international accelerator resources and services.
- The FSC has launched 4 promotion strategies to build up a stronger Asian presence- "Regulatory relaxation", "Enhanced supervisory cooperation", "Talent cultivation" and "Database for overseas presence information".
- The FSC is prioritizing the implementation of a "regulatory sandbox" that would enable both financial institutions and fintech developers to test new products and services for a trial period of up to nine months.

Source: Financial Supervisory Commission

TAIWAN: DIGITAL TRANSFORMATION INITIATIVES

2012-2016 NATIONAL INFORMATION AND COMMUNICATION INITIATIVE (NICI)

- The 2012-2016 National Information and Communication Initiative (NICI) was developed in accordance with national developmental needs and global trends in ICT development. The focus of the initiative was on transforming Taiwan into a "smart" nation—one that enjoys a safe, convenient, healthy, and culturally driven internet society.
- The five central provisions of the initiative are as follows:
  - Convergence Network Construction: Construct a wireless broadband and digital convergence network and promotion of IoT.
  - Government Services Innovation: Use ICT to integrate and innovate government services and encourage resident participation.
  - Application Services: Promote services and applications in the areas of food, health care, housing, and transportation and also energy saving and carbon reduction goals.
  - Smart Life Industries: Accelerate the promotion of industries such as disaster prevention, smart healthcare, smart transportation; offer research incentives to local governments and companies.
  - Digital Care Penetration: Benefit the disadvantaged groups with digital opportunities and create an inclusive information society.

GOALS AND PROGRESS

Area	Goals set for 2016	Results as of end of 2015
Convergence Network Construction	7.2 million FTTx users by 2015; 80% of households with internet access of 100Mbps	98% of households having gained access to 100Mbps high-speed broadband; 4.73 million FTTx users; 17.92 million wireless broadband internet subscribers
Government Services Innovation	Satisfaction rate of 70% on e-government services	Satisfaction rate of 77.35% on on-line government services
Applications	65% of residents aged 15 years and older with access to innovative services with satisfaction rate of 70%	62.9% of residents aged 15 years and older with access to innovative services with user satisfaction rate of 72%
Smart Life Industries	NT$100 billion in private investment (2010-2014)	NT$268.6 billion in private in-vestment (2010-2015)
Digital Care Penetration	Internet penetration rate of 72% in rural areas 117,000 senior citizens instructed in computer training	Internet penetration rate of 58.9% in remote rural areas reaches Internet penetration rate of 74.5% in rural areas

Source: Taiwan E-Competitiveness Annual Report

TAIWAN: DIGITAL TRANSFORMATION INITIATIVES

DIGITAL NATION AND INNOVATIVE ECONOMIC DEVELOPMENT PLAN

About DIGI+ 2025

- In 2015, President Tsai Ing-wen, laid light on Taiwan technology policy and stated that Taiwan needed a ground-breaking innovative thinking a better environment for its younger generation, and ways to accelerate the transformation of economic structures.

- In 2016, Digital Nation and Innovative Economic Development Plan (aka DIGI+ 2025) was released which is Taiwan's one of the most important development strategy. Emerging technologies like cloud technologies, Big Data, 5G, and IoT would be used to instill new drive within Taiwan's economy.

- The aim is to create a first-rate digital economy, digital government, network society, and smart urban and rural areas, the plan looks to build a digital nation and innovative economic ecosystems that will serve as a critical foundation for the development of innovative industries and entrepreneurship.

DIGI+ GLOBALIZATION

DIGI+ CITIES

DIGI+ RIGHT

DIGI+ 2025

Development:: Stable Infrastructure

Innovation:: Digital Economy

Governance:: Smart nation

Inclusion:: Civil Society

DIGI+ INDUSTRY

DIGI+ TALENT

DIGI+ INFRASTRUCTURE

Source: Taiwan E-Competitiveness Annual Report

Digital Nation and Innovative Economic Development Plan 2017-2025 Development Framework

Developing a safe, healthy, and prosperous digital nation
Nurturing innovative and vibrant national digital strengths

Cyber Physical Systems
Experience Economy

"Asian Silicon Valley"
Biotech
Smart Machinery
Green Energy
National Defense

Active Trading
Digital Finance

Sustainable Society
Circular Economy

New Agriculture
Healthy Diet

Creation of quality digital nation and innovative economic ecosystems (international links)

Digital Economy

Digital Government

Network Society

Smart Urban and Rural Areas

Consolidation of support measures for the foundation of a digital nation

Build a friendly regulatory environment
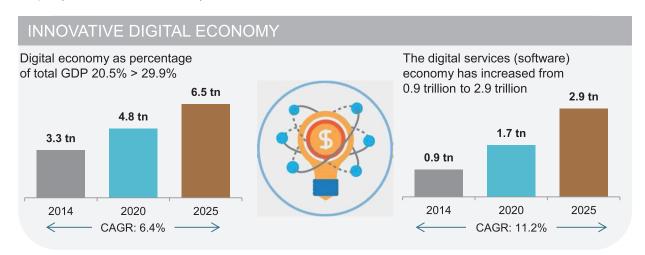
Foster cross-discipline digital talent
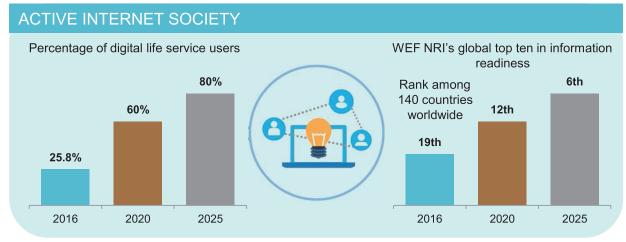
Develop advanced digital technology
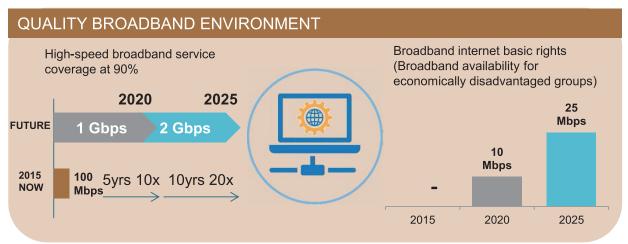
Construction of an infrastructure beneficial for digital innovation

Source: Taiwan E-Competitiveness Annual Report

TAIWAN: DIGITAL TRANSFORMATION INITIATIVES

DIGITAL NATION AND INNOVATIVE ECONOMIC DEVELOPMENT PLAN 2017-2025 DEVELOPMENT GOALS

In order to achieve the vision of "developing an active internet society, promoting a high-value innovative economy, and developing an affluent digital nation", the Digital Nation and Innovative Economic Development Plan looks to achieve the following developmental goals in the areas of innovative digital economy, active internet society, and quality broadband environment by 2025:

INNOVATIVE DIGITAL ECONOMY

Digital economy as percentage of total GDP 20.5% > 29.9%

- 3.3 tn — 2014
- 4.8 tn — 2020
- 6.5 tn — 2025

CAGR: 6.4%

The digital services (software) economy has increased from 0.9 trillion to 2.9 trillion

- 0.9 tn — 2014
- 1.7 tn — 2020
- 2.9 tn — 2025

CAGR: 11.2%

ACTIVE INTERNET SOCIETY

Percentage of digital life service users

- 25.8% — 2016
- 60% — 2020
- 80% — 2025

WEF NRI's global top ten in information readiness

Rank among 140 countries worldwide

- 19th — 2016
- 12th — 2020
- 6th — 2025

QUALITY BROADBAND ENVIRONMENT

High-speed broadband service coverage at 90%

2020 **2025**

FUTURE — 1 Gbps — 2 Gbps

2015 NOW — 100 Mbps — 5yrs 10x — 10yrs 20x

Broadband internet basic rights (Broadband availability for economically disadvantaged groups)

- - — 2015
- 10 Mbps — 2020
- 25 Mbps — 2025

Source: Executive Yuan

THAILAND

THAILAND: EXECUTIVE SUMMARY

ICT OVERVIEW

- The Thailand ICT industry is valued at US$ 18.9 bn as of 2016 and has seen a steady growth between 2012-15. The ICT industry aims to reach US$ 25bn by 2020.

- Software sector's growth is steady and had market value of US$ 1.44bn in 2015. Service subsector covers almost 75%(2015) of overall revenue. Mobile communication constitutes a major share in telecom sector. Also, Thailand's digital content industry is one of the best in the world due to high quality, skilled personnel and low production cost.

- Telecommunication sector of Thailand is driven by a sharp increase in internet and broadband penetration since 2010. Mobile communication constitutes a major share in telecom sector. Telecommunication industry is improving their broadband network infrastructure to cater the government's plan to double internet penetration by 2018.

- Thailand is the 2nd largest producer and exporter of hard disk drives in the world, growing at 28.3% CAGR 2011-16. Thailand's computer hardware revenue has shown a gradual drop at –8.2% CAGR 2011-15 due to tough competition from Asian countries.

- E-commerce grew at 31.1% CAGR 2011-15 driven mostly by accommodation and food services sector. Share of cross border e-commerce is also increasing and is likely to propel e-commerce logistics too.

- Fintech in Thailand is at nascent stage. Digital transactions are expected to be driven by payment cards. E-payment transaction are growing due to government initiatives such as PromptPay. Mobile transactions are a popular mode of transactions in Thailand.

DIGITAL AGENDA

- Digital Thailand was announced in Apr-2016. It aims for long-term development and sustainability, in accordance with the country's 20-year strategy. It has been split into four phases of 1.5 years, 5 years, 10 years and 10-20 Years. Some of the major initiatives include:
  - Nationwide roll out of high-quality broadband will cover all villages, hospitals, economic zones and digital community centers. Broadband subscription rate will be priced less than 2% of GNP per capita.
  - Achieve 100% digital literacy.
  - Thailand will be placed in the top 30 of the World Competitiveness Scoreboard.
  - Providing free Wi-Fi at 10,000 locations, including schools (reaching 2,000,000 students) and Digital Community Centers all over the country.
  - Building 5 Smart Cities within 3 years.

KEY INITIATIVES

- Thailand recently unveiled a 4.0 economic model to develop Thailand into a valued-based economy. The initiative presents an economic model focused on attracting and supporting innovative, high-tech companies. Under Thailand 4.0, Thailand plans to increasing infrastructure investments, focusing on workforce training, stimulating entrepreneurial creativity, and reshaping the professional culture of a country that's only at the start of its technology revolution. Thailand 4.0 will change the country's traditional farming to smart farming, traditional SMEs to smart enterprises, and traditional services to high-value services. Some of the major initiatives are:
  - PromptPay, is a major initiative of National E-payment initiative launched in Jan'17. It is an interbank mobile payments system allowing registered users to transfer funds using mobile or citizen ID number. It enables users to receive payments from government i.e. social security benefits and tax refunds.
  - As of 2016, broadband access reaches 40,000 villages, or 80% of Thailand's population. That number is expected to increase to 95% by 2020.
  - There is the huge push for the single payment ID called AnyID. It uses a phone number or citizen ID and its associated PromptPay electronic money system.
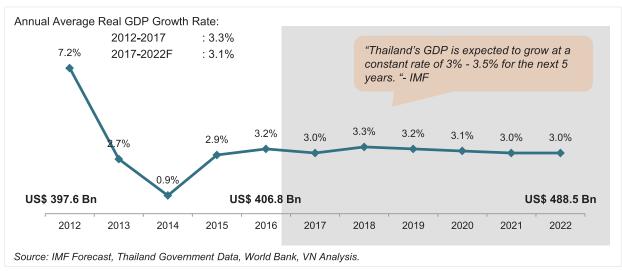
CHALLENGES
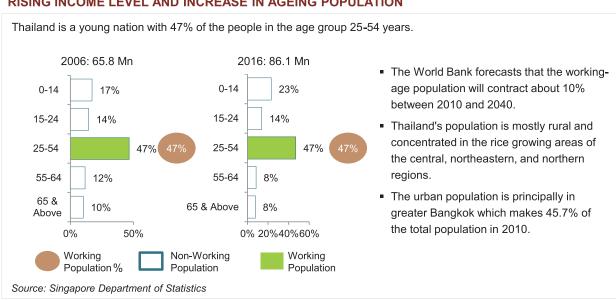
- Thai people lack security awareness and are hesitant to shift to digital mode due to threat of cyber security.

- IT budgets for cyber security are typically low compared to scale of initiatives planned to be implemented.

- Shortage of skilled professionals to deal with cyber security is another major problem in Thailand.

  - According to the Digital Economy Ministry's Electronic Transactions Development Agency (EDTA), the country received almost 4,300 cyber-attacks in 2015. Around 87% of companies have experienced data or monetary loss due to cyber-attacks. According to Allianz Global, Thailand is the second most popular country for cybercrime. Microsoft puts the country in the top 25 for malware infection.

  - The government has established ThaiCERT, under the electronic transactions development agency that works on cyber threats and forensics. The Ministry of Defence has established a cyber-offence unit and a cyber-security operations center. But there is no clear outline on which division will lead the battle against cyber threats as each focus on specific threat areas.

  - In terms of legislation, Thailand has introduced Cybercrime Act, a new e-commerce bill, cyber security protection bill and a data protection bill to enforce cyber security and achieving the objectives digital Thailand.

  - The (ICT) Ministry in Thailand has canceled the plan to build national data centers for the IT systems of government agencies citing high investment as the reason.

THAILAND: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate:

2012-2017	: 3.3%
2017-2022F	: 3.1%

"Thailand's GDP is expected to grow at a constant rate of 3% - 3.5% for the next 5 years. "- IMF

7.2%
2.7%
0.9%
2.9%
3.2%
3.0%
3.3%
3.2%
3.1%
3.0%
3.0%

US$ 397.6 Bn   US$ 406.8 Bn   US$ 488.5 Bn

2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

Source: IMF Forecast, Thailand Government Data, World Bank, VN Analysis.

RISING INCOME LEVEL AND INCREASE IN AGEING POPULATION

Thailand is a young nation with 47% of the people in the age group 25-54 years.

2006: 65.8 Mn

Age	%
0-14	17%
15-24	14%
25-54	47%
55-64	12%
65 & Above	10%

47%

0%   50%

2016: 86.1 Mn

Age	%
0-14	23%
15-24	14%
25-54	47%
55-64	8%
65 & Above	8%

47%

0% 20% 40% 60%

Working Population %
Non-Working Population
Working Population

- The World Bank forecasts that the working-age population will contract about 10% between 2010 and 2040.
- Thailand's population is mostly rural and concentrated in the rice growing areas of the central, northeastern, and northern regions.
- The urban population is principally in greater Bangkok which makes 45.7% of the total population in 2010.

Source: Singapore Department of Statistics

SHARE OF SERVICE SECTOR IS HIGHEST IN GDP AND EXPECTED TO INCREASE IN FUTURE

Sectoral Share of GDP (%)

	2006	2008	2010	2012	2014	2016
Service	51.3%	50.3%	49.5%	51.1%	53.0%	55.8%
Industry	39.3%	39.6%	40.0%	37.4%	36.9%	35.8%
Agriculture	9.4%	10.1%	10.5%	11.5%	10.1%	8.3%

■ Agriculture ■ Industry ■ Service

- The service sector employs as many as 40% of the work force and produces 50% of GDP. In comparison, the manufacturing sector employs only 15% of the work force and produces as much as 35% of GDP.
- Services are the major contributor and its share is expected to increase in the future.

Source: World Bank

THAILAND: ICT INDUSTRY OVERVIEW

FLAT GROWTH OF THE ICT SECTOR DUE TO A DECLINE OF THE HARDWARE MARKET

Thailand ICT Revenue Split (US$ Bn)
CAGR: 0.7%

	2012	2013	2014	2015
Total	18.1	18.4	19.1	18.5
Telecom	13.7	14.2	15.2	14.9
Software Services	1.1	1.1	1.2	1.1
Packaged Software	0.3	0.3	0.4	0.4
Hardware	3.0	2.7	2.4	2.2
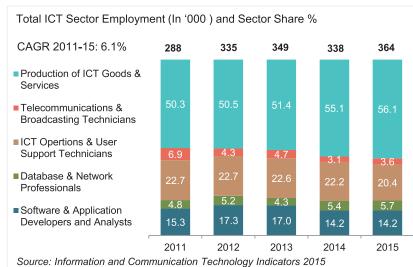
■ Hardware ■ Packaged Software ■ Software Services ■ Telecom

Note: The values may not exactly match up due to rounding off and slight variation in any in exchange rate used.

Source: Thailand's IT Market – Embassy of India, IDC-Thailand
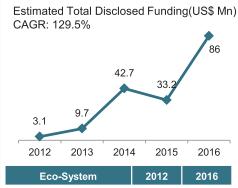
- The market is expected to recover and reach US$25 bn by 2020 with CAGR 2016-20 of 6.8% mainly driven by adoption of technologies like cloud, mobility and big-data analytics.
- The Thai IT market in 2015, including the sales of hardware, software, services and telecom is a major contributor to GDP. 2015 was a relatively rough year for the market as the total revenue including export dropped by 7.2%.
- IT spending has declined over the last few years due to the low priced smartphones and voice packages of telecom operators, delayed government projects, lower exports, politics and low GDP growth.

GOODS AND SERVICES PRODUCTION SEGMENT CONSTITUTES 56% SHARE OF ICT EMPLOYMENT

Total ICT Sector Employment (In '000) and Sector Share %

CAGR 2011-15: 6.1%

■ Production of ICT Goods & Services
■ Telecommunications & Broadcasting Technicians
■ ICT Opertions & User Support Technicians
■ Database & Network Professionals
■ Software & Application Developers and Analysts

	2011	2012	2013	2014	2015
Total	288	335	349	338	364
Production of ICT Goods & Services	50.3	50.5	51.4	55.1	56.1
Telecommunications & Broadcasting Technicians	6.9	4.3	4.7	3.1	3.6
ICT Opertions & User Support Technicians	22.7	22.7	22.6	22.2	20.4
Database & Network Professionals	4.8	5.2	4.3	5.4	5.7
Software & Application Developers and Analysts	15.3	17.3	17.0	14.2	14.2

Source: Information and Communication Technology Indicators 2015

- Availability of low cost skilled and qualified human resource is enabling Thai companies in controlling production cost.
- IT technicians and programmers lack English speaking skills which acts as a hurdle in communicating with international clients
- ICT sector adder 76,000 jobs over the last 5 years.

STARTUPS IN THAILAND HAVE SHOWN VERY RAPID GROWTH IN THE PAST FEW YEARS.

Estimated Total Disclosed Funding(US$ Mn)
CAGR: 129.5%

2012	2013	2014	2015	2016
3.1	9.7	42.7	33.2	86
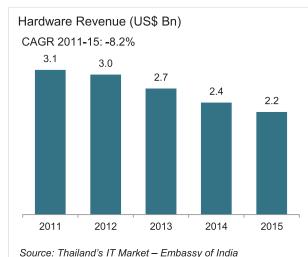
Eco-System	2012	2016
Funded startups	3	75
Number of VC's	1	60

- Thailand's startup environment is known for its strong digital content sector and growing customer demand.
- Thailand's is still very young in startup scene, with angel investors and VCs focusing on seed stage. Thai government believes 2016 will be a golden year for its startups.
- In Aug 2016, government announced venture fund worth US$570 mn for young local tech startups and aims to grow the community from 2,500 start-ups to 10,000 by 2018-19.
- The fastest growing startup sectors are e-commerce, fintech and logistics. These sectors grew rapidly in terms of the number of startups operating as well as in funding.

Source: Thailand Board of Investment, Tech in Asia, Innovation is Everywhere
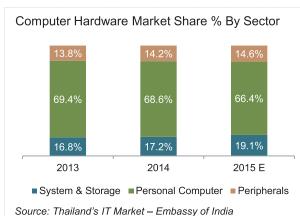
THAILAND: HARDWARE

COMPUTER HARDWARE REVENUE HAS DRASTICALLY DECLINED OVER THE LAST 5 YEARS

Hardware Revenue (US$ Bn)

CAGR 2011-15: -8.2%

2011	2012	2013	2014	2015
3.1	3.0	2.7	2.4	2.2
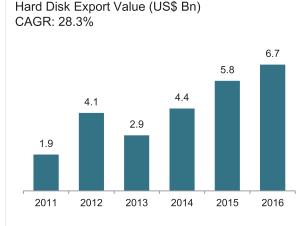
- After witnessing a strong growth in recent years, Thailand's computer hardware market is now decelerating at a rapid rate due to the economic slowdown and increase in housing debt, which is stopping consumers from spending on IT.
- The companies are shifting to cloud based solutions and cutting down on hardware investments.
- Global slowdown and competition from other Asian countries like Taiwan, Singapore, Malaysia, Korea, Japan and China have impacted the hardware exports.

Source: Thailand's IT Market – Embassy of India

SHARE OF PERSONAL COMPUTER SUB SEGMENT IS DECREASING OVER THE LAST 3 YEARS

Computer Hardware Market Share % By Sector

	2013	2014	2015 E
Peripherals	13.8%	14.2%	14.6%
Personal Computer	69.4%	68.6%	66.4%
System & Storage	16.8%	17.2%	19.1%

■ System & Storage ■ Personal Computer ■ Peripherals

- The decline of the computer hardware market in Thailand also indicates a shift in user habits, with more consumers forgoing personal computers to directly purchase mobile devices.
- In 2015, mobile devices sales in Thailand grew by 11% to reach 11.8 mn units.
- Share of system and storage has increased due to government support. Thailand is expected to be one of the major manufacturers of storage devices.

Source: Thailand's IT Market – Embassy of India

FOCUS ON MAINTAINING AND IMPROVING ON HARD DISK MANUFACTURING COMPETENCY

Hard Disk Export Value (US$ Bn)
CAGR: 28.3%

2011	2012	2013	2014	2015	2016
1.9	4.1	2.9	4.4	5.8	6.7

- Thailand was ranked 2nd largest global producer and exporter of hard disk drives in 2016.
- The Hard Disk Drive Industry Research Program aims to encourage Thailand to be a competitive R&D hub for hard disk drives in the region.
- Supporting and promoting R&D work on technology that will increase production efficiency and technology for testing hard disk drives and their parts.
- Supporting Thai SMEs in their designing and manufacturing efforts so that they can compete and meet the automation-related needs of local and international manufacturers.
- Focus R&D work on the production processes of hard disk drives of 5-10 Tbpsi, which is the new technology that will impact the hard disk drive industry worldwide.

Source: Thailand Board of Investment

THAILAND: IT SERVICES AND SOFTWARE
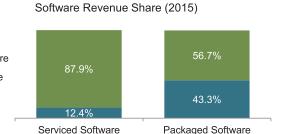
THAILAND'S SOFTWARE SECTOR REVENUE HAS BEEN ALMOST STAGNENT IN LAST 4 YEARS

- The software sector comprises of 870 companies and employ around 40,000 qualified software engineers (2015).
- Software-enabled services, cloud computing, the Internet of Things (IoT), big data and analytics are the main factors driving software-market growth. DST, Microsoft Thailand, Reuters Software and SAS Software, together with Thai players (Geomove, Neo Invention, Larn Gear, Phuket Software Factory and ThaiQuest) are leading the Thai software market.
- The government accounted for a third of domestic software consumption, while the private sector made up the rest. The financial industry was the biggest spender on software.

Software Revenue Split (US$ Bn)
CAGR 2010-15: 1.2%

	2012	2013	2014	2015
Total	1.39	1.47	1.55	1.44
Packaged Software	0.34	0.34	0.37	0.37
Serviced Software	1.05	1.13	1.18	1.07

CAGR 2010-15: 0.6%   CAGR 2010-15: 2.9%

Software Revenue Share (2015)

	Serviced Software	Packaged Software
Local Software House	87.9%	56.7%
International Software House	12.4%	43.3%

Source: Thailand's IT Market – Embassy of India, Thailand Board of Investment

EMBEDDED SOFTWARE DEMAND IS EXPECTED TO INCREASE DUE TO DIGITAL TRANSFORMATION
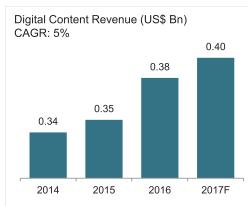
Embedded Software Value (US$ Mn)
CAGR 2013-17: 1.2%

2013	2014	2015	2016 F	2017 F
165	166	172	180	193

- The demand for internet of things (IoT), big data analytics, cyber security, industrial software and embedded software systems and design are growing since they are widely used by many leading businesses to increase productivity and efficiency.
- Various global firms are currently using Thailand as their production hub for embedded software due to its readiness of skilled labor combined with a lower wage rate.

Source: Thailand Board of Investment, Tech in Asia, Innovation is Everywhere

REVENUE OF THAILAND'S DIGITAL CONTENT SEGMENT IS INCREASING

Digital Content Revenue (US$ Bn)
CAGR: 5%

2014	2015	2016	2017F
0.34	0.35	0.38	0.40

- Thailand is one of the world's top digital content hubs due to world-class production quality, talented personnel, low-production costs and knack for innovation. Large number of US, European and Asian multinational organizations outsource work to Thai companies.
- Thai software and animation companies helped boost the country's digital industry to an estimated US$ 0.38 bn (13.6 bn baht) in 2016 by excelling both as subcontractors and original creators.
- Thailand's emerging animation and gaming sector is supported by an increasingly diverse educational infrastructure, government assistance through relevant agencies, and projects designed to spur innovation and creativity.
- Thai animation and gaming are among the most thriving sectors in the Thai digital content arena.

Source: DEPA, Nation Multimedia, Press Reader, SIPA, Bangkok Post

THAILAND: TELECOMMUNICATION

REVENUE EXPECTED TO STEADILY GROW DRIVEN BY WIRELESS INTERNET SUB-SEGMENT

Telecom Service Revenue (US$ Bn)

	13.9	14.2	15.2	14.9
Equipment	5.0	5.1	6.1	6.3
Service	8.7	9.1	9.1	8.6
	2012	2013	2014	2015

■ Service   ■ Equipment

CAGR 2012-15: 3%   CAGR 2012-15: 12.2%

Source: Information and Communication Technology Indicators 2015
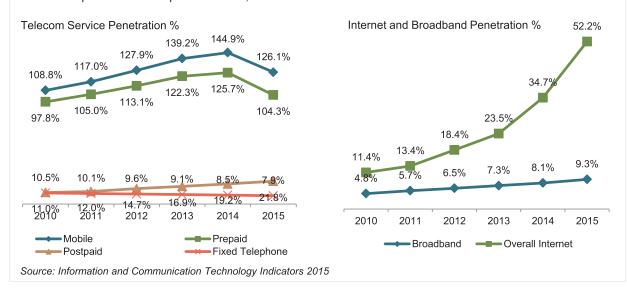
- Mobile communication constitutes a major share in telecom sector and its share is expected to grow at a higher rate compared to fixed line sub segment.
- Revenue of service providers is expected to decline due to tougher competition, slow revenue growth and larger capital expenditure for network investment and spectrum payments.
- The government's plans to invest 10 bn baht towards improving the nation's telecom infrastructure as part of its digital economy strategy.

INTERNET PENETRATION HAS RAPIDLY INCREASED BY 4 TIMES IN THE LAST 5 YEARS

- Telecom industry has undergone a period of strong growth which has started to moderate in the last few years.
- Wireless Mobile Internet is the major growth driver for increase in internet penetration. Mobile postpaid subscribers are steadily growing over the last 5 years.
- Broadband network infrastructure growing quickly, but its contribution to overall internet penetration is on a lower side. The government aims to double Thailand's internet-connected population to 40 mn users by 2018.
- Consumption of mobile data will continue to increase rapidly and by 2020, the usage will reach 192,265 MB for one individual per month in comparison with 72,351 MB for one individual in 2015.

Telecom Service Penetration %

	2010	2011	2012	2013	2014	2015
Mobile	108.8%	117.0%	127.9%	139.2%	144.9%	126.1%
Prepaid	97.8%	105.0%	113.1%	122.3%	125.7%	104.3%
Postpaid	10.5%	10.1%	9.6%	9.1%	8.5%	7.9%
Fixed Telephone	11.0%	12.0%	14.7%	16.9%	19.2%	21.8%

◆ Mobile   ■ Prepaid   ▲ Postpaid   ✕ Fixed Telephone

Internet and Broadband Penetration %

	2010	2011	2012	2013	2014	2015
Overall Internet	11.4%	13.4%	18.4%	23.5%	34.7%	52.2%
Broadband	4.8%	5.7%	6.5%	7.3%	8.1%	9.3%

◆ Broadband   ■ Overall Internet

Source: Information and Communication Technology Indicators 2015

HIGH SPEED INTERNET SHARE HAS INCREASED WITH WIRELESS AS MAJOR GROWTH DRIVER

Share of Internet – By Speed

	2013	2014	2015
Mobile Telephone-2G	17.0%	8.9%	5.1%
Low Speed Internet-Ex Mobile Telephone	12.3%	5.8%	3.6%
High Speed Internet-Ex Mobile Telephone	54.2%	45.5%	25.9%
Mobile Telephone-3G	16.5%	40.3%	65.4%

■ Mobile Telephone-2G
■ Low Speed Internet-Ex Mobile Telephone
■ High Speed Internet-Ex Mobile Telephone
■ Mobile Telephone-3G

- High speed internet growth is majorly driven by of wireless internet.
- Low price, increased availability and reach of faster 3G wireless and Broadband network are the major growth drivers for high speed internet over the last 3 years.

Source: Information and Communication Technology Indicators 2015

THAILAND: E-COMMERCE

THAILAND ON FAST TRACK TO BECOME REGIONAL E-COMMERCE LEADER

E-Commerce Market Revenue (US$ Bn)

CAGR: 31.1%

CAGR 2011-15: 48.7.0%

CAGR 2011-15: 53.9%

CAGR 2011-15: 10.3%

- E-commerce spending growth over the next five years is estimated at 18.2%.
- E-commerce in Thailand is growing rapidly and is set to become a main driver of internet development.
- 3G and 4G is major driver for the transformation, as it will be improve high speed internet connectivity to a large, nationwide pool of consumers.
- The highest contribution was by accommodation and food services sector, at US$19.8 bn, followed by manufacturing at US$10.5 bn and retail and wholesale at US$9.8 bn.
- High internet penetration and increase of disposable income are two major growth drivers for e-commerce.
- Thai E-Commerce Association's president Pawoot Pongvitayapanu says, Thailand is the fastest growing e-commerce market in Southeast Asia. Currently, there are over 500,000 e-commerce users in Thailand.

Source: ICT Indicators-2015, Survey of e-Commerce Status in Thailand-NSO, Thailand's IT Market – Embassy of India

SHARE OF INTERNATIONAL CROSS BORDER E-COMMERCE IS INCREASING

E-Commerce Market % - Domestic and International
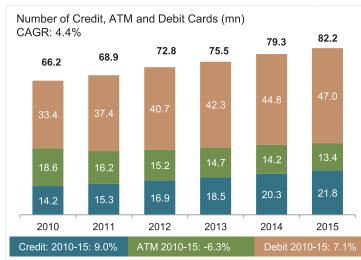
- Increasing international e-commerce sales and high potential domestic market will attract major international e commerce players to enter Thailand.
- The e-commerce logistic market in Thailand is likely see to increased investment and a rise of one-day-delivery system propelled by consumer demand.
- International logistics giant DHL entered the market in 2016, aCommerce still possess the largest share in e-commerce logistics.
- Share SME"s in international e-commerce is expected to grow as new neighboring markets generate additional demand.

Source: E-Commerce Survey in Thailand 2016

THAILAND: FINTECH
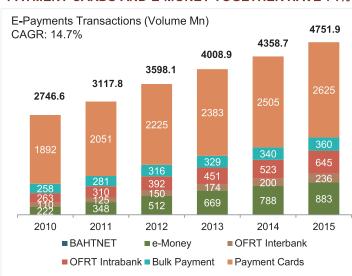
DUE TO INCREASE IN DEBIT AND CREDIT CARDS, DIGITAL PAYMENTS ARE EXPECTED TO GROW

Number of Credit, ATM and Debit Cards (mn)
CAGR: 4.4%

Year	Credit	ATM	Debit	Total
2010	14.2	18.6	33.4	66.2
2011	15.3	16.2	37.4	68.9
2012	16.9	15.2	40.7	72.8
2013	18.5	14.7	42.3	75.5
2014	20.3	14.2	44.8	79.3
2015	21.8	13.4	47.0	82.2

Credit: 2010-15: 9.0%   ATM 2010-15: -6.3%   Debit 2010-15: 7.1%

- Fintech in Thailand is at a nascent stage.
- Thailand is set to be one of Southeast Asia's next Fintech Hubs. The 'fintech' startups has spurred the development of a complete payments ecosystem.
- Increase in number of payments cards is expected to promote digital transactions.
- Thai National E-payment initiative was rolled out in Dec'15 to promote digital payments.

Source: Electronic Transactions Development Agency (ETDA), Fintech News, e27, finews, Bank of Thailand, Statista
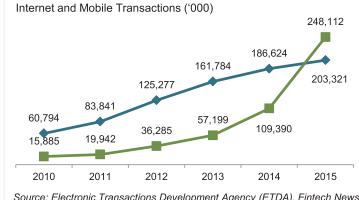
PAYMENT CARDS AND E-MONEY TOGETHER HAVE 74% OF E-PAYMENT SHARE

E-Payments Transactions (Volume Mn)
CAGR: 14.7%

Year	BAHTNET	e-Money	OFRT Interbank	OFRT Intrabank	Bulk Payment	Payment Cards	Total
2010	222	110	263	258	—	1892	2746.6
2011	348	125	310	281	—	2051	3117.8
2012	512	150	392	316	—	2225	3598.1
2013	669	174	451	329	—	2383	4008.9
2014	788	200	523	340	—	2505	4358.7
2015	883	236	645	360	—	2625	4751.9

- E-payments transactions are rapidly growing due to government initiatives to drive digital payments.
- PromptPay, is a major initiative of National E-payment initiative launched in Jan'17. It is an interbank mobile payments system which allows registered users to transfer funds using mobile or citizen ID number. It also enables users to receive payments from government i.e. social security benefits and tax refunds.
- Cyber security is a major concern for e-payment services. Since launch, the pace of those registering for PromptPay has been relatively slow, despite intense promotion from Thai banks.

Source: Electronic Transactions Development Agency (ETDA), Fintech News, e27, finews, Bank of Thailand

MOBILE TRANSACTIONS HAVE OUTNUMBERED INTERNET TRANSACTIONS IN 2015

Internet and Mobile Transactions ('000)

Year	Internet	Mobile
2010	60,794	15,885
2011	83,841	19,942
2012	125,277	36,285
2013	161,784	57,199
2014	186,624	109,390
2015	203,321	248,112

CAGR

Internet Banking: 9.0%   Mobile Banking: -6.3%

- For the first time, mobile transactions have outpaced internet transactions in Thailand. This is a major milestone in transformation of Thailand's fintech sector.
- Thailand has introduced Financial Sector Master Plan Three (2016-20) to promote electronic financial, payment services and build financial infrastructure

Source: Electronic Transactions Development Agency (ETDA), Fintech News, e27, finews, Bank of Thailand

THAILAND: DIGITAL TRANSFORMATION INITIATIVES

"Digital Thailand refers to the country's brilliance in taking full and creative advantage of digital technology to develop infrastructure, innovation, data capability, human capital, and other resources, thus propelling the country's economic and social development towards stability, prosperity, and sustainability."

Improve UN
e-Government ranking
(currently 102 of 193; target top 50)

Nationwide digital access to stable and reliable public records and services

Public participation in policy decisions through Connected Governance and enhanced connectivity to justice system

Nationwide access to digital knowledge and skills for Livelihood

Presence of broadband, appropriate technology, and instruction in every public educational facility and information center

Digital skills increased across the workforce in every sector

Regulation allowing more variety of secure electronic formats for e receipts/e-tax invoices and investments on IT system capacities for Revenue Department

Online Safety Education standard for public ICT school curriculum K-12

Digital Economy laws implemented transparently and through public consultation

Ensure future allocation Of spectrum through transparent and competitive auction; independent NBTC in place

Digital Infrastructure

e-Government Initiatives

Digital Innovation Ecosystem

Human Capital

Holistic Frameworks for a Digital Thailand

Digital Technology for an Equitable Society

133% broadband internet Penetration

GDP increase of US $23 bn (THB 730 bn)

100% 4G coverage

100% of Thais connected

Target top quartile of Global Competitiveness Index

Target top quartile of Networked Readiness Index

Thailand in Top 20 in Compass Global Startup Ecosystem ranking

Increased public/private partnership for ecosystem Development

50% SME contribution to GDP

Enhanced security to citizens and their assets through digital technology

Nationwide access to digital knowledge and skills for Livelihood

Equivalent quality of connection across the country
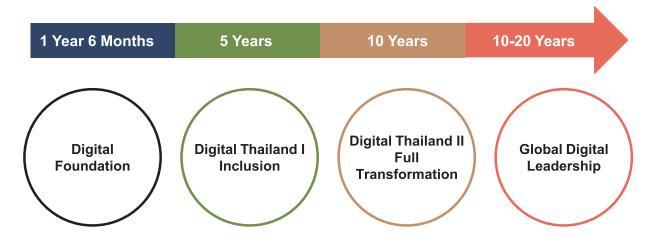
Source: Realizing Digital Thailand – Roadmap to 2020, DTAC, Digital Thailand

THAILAND: DIGITAL TRANSFORMATION INITIATIVES

TRANSFORM TOWARDS DIGITAL THAILAND

"Digital Thailand refers to the country's brilliance in taking full and creative advantage of digital technology to develop infrastructure, innovation, data capability, human capital, and other resources, thus propelling the country's economic and social development towards stability, prosperity, and sustainability."

20-YEAR DIGITAL LANDSCAPE OF THAILAND

The Digital Thailand Plan aims for long-term development and sustainability, in accordance with the country's 20-year strategy. Digital technology is changing fast and it requires the digital landscape to be structured in phases as follows:

1 Year 6 Months	5 Years	10 Years	10-20 Years

| Digital Foundation | Digital Thailand I Inclusion | Digital Thailand II Full Transformation | Global Digital Leadership |

Digital Foundation (1 Year 6 Months)

In this phase, Thailand will focus on investing and building digital foundation to reap the benefits in later years. The MICT is now launching priority projects in all strategies as well as introducing new digital laws and institutional reforms.

Digital Thailand I: Inclusion (5 Years)

At the end of this phase, the country will become Digital Thailand, in which everyone can access and make full use of digital technology, both socially and economically. This phase will focus on inclusive growth and development.

Digital Thailand II: Full Transformation (10 Years)

This is a phase of full transformation, in which Thailand will be driven by digital technology and innovation. All the 4-dimension goals must be achieved in this phase.

Global Digital Leadership (20 Years)

The goal of long-term development here will be aligned with that of the National Strategy, which sets the course for Thailand to become a developed country in 20 years. Digital technology will be used to create value in a long-term and sustainable manner.

Source: Digital Thailand

THAILAND: DIGITAL TRANSFORMATION INITIATIVES

The Government of Thailand has drafted the following strategies and set these initiatives to carry out a digital transformation of the country.

STRATEGIES AND INITATIVES

Build country-wide high-capacity digital infrastructure
- Ensuring accessibility, availability, and affordability

Boost the economy with digital technology
- Driving New S-Curve
- Raisin Competitiveness
- Building new businesses Creating values

Build trust and confidence in the use of digital technology
- Updating laws and regulations
- Encouraging investments
- Ensuring security

Transform into digital government
- Creating open government Facilitating people/ businesses
- Integrating into One Government

Develop workforce for the digital era
- Developing skilled workforce Creating jobs
- Building strength from within

Create a quality and equitable society through digital technology
- Building participation
- Ensuring inclusiveness

Build country-wide high-capacity digital infrastructure

Actions
- Roll out nation-wide broadband infrastructure.
- Thailand into an ASEAN connectivity hub.
- Develop digital infrastructure policy.
- Reform state-owned enterprises.

Goals
- High-quality broadband will be rolled out country-wide, covering all villages, all municipalities and economic zones, all schools, all Tambon hospitals, and all digital community centers.
- Broadband subscription rate will be priced under 2% of GNP per Capita.
- Thailand will become one of the Internet connectivity hubs.
- Mobile services will be provided in all villages, communities, and tourist attractions.

Boost the economy with digital technology

Actions
- Raise competitiveness of Thai businesses with Digital Technology.
- Provide economic opportunities for farmers and community enterprises.
- Create and foster digital technology startups.
- Strengthen digital industries and related sectors.

Goals
- Overall competitiveness of Thai businesses will be increased.
- More SMEs in agriculture, manufacturing, service sectors will leverage digital technology to compete regionally and globally.
- Thailand will be placed in the top 30 of the World Competitiveness Scoreboard.
- Digital sector will contribute at least 25% to the country's GDP.
- Thailand's digital industry will become one of the regional leaders.

Source: Digital Thailand

THAILAND: DIGITAL TRANSFORMATION INITIATIVES

STRATEGIES AND INITATIVES

Create a quality and equitable society through digital technology

Actions
- Ensure inclusive and equal access to digital technology.
- Develop digital literacy/ media and information literacy.
- Create local digital content and knowledge resources.
- Provide education opportunities with digital technology.
- Increase access to healthcare with digital technology.

Goals
- People of all groups and abilities will be able to access and make use of digital technology.
- All Thais will become digitally literate.
- Education, healthcare, and essential public services will be accessed via digital means.

Transform into digital government

Actions
- Migrate to citizen-centric smart services.
- Increase efficiency and good governance with digital technology.
- Promote open data and civic participation.
- Develop government service platforms to encourage new services.

Goals
- Government services will meet the demands of people and businesses with respect to convenience, speed, and accuracy.
- People will be able to easily access government data to ensure transparency and civic participation.
- Government infrastructure and data will be integrated to link governmental functions and provide effective services to the people.

Develop workforce for the digital era

Actions
- Improve digital skills of workforce in all sectors.
- Develop digital specialists needed for the digital era.
- Enhance appropriate skills of CEOs for digital leadership.

Goals
- Digital specialists, especially in highly-needed categories, will be developed in both quantity and quality.
- 20,000 new jobs and new businesses will be generated.
- Workforce in all sectors will become digitally competent.

Build trust and confidence in the use of digital technology

Actions
- Develop standards, rules, regulations, laws, and facilitating systems to ensure ease of doing business.
- Put in place appropriate digital laws.
- Build trust and confidence in online transactions.

Goals
- People will have trust and confidence in online transactions.
- Digital laws and regulations will be updated to meet the demands of the digital era.
- Data standards will be introduced and implemented to ensure seamless online transactions.

Source: Digital Thailand

THAILAND: DIGITAL TRANSFORMATION INITIATIVES

DIGITAL THAILAND AND SMART THAILAND 2020 GOALS

IMPLEMENTATION MECHANISMS – PRIORITY ACTIVITIES IN PHASE - I

Infrastructure

- Deploying broadband to all villages to ensure equal access to technology, content, and services.
- Upgrading International bandwidth for better reliability and capacity to meet the demands of growing economic activities.

Digital Governance

- Reducing all government processes and providing smart services for citizens.
- Developing a mobile government communication system (G- Chat).
- Introducing digital laws and institutional reform to create trust and confidence in online transactions.

Digital Economy

- Promoting online community stores via digital community centers.
- Coaching SMEs to go online and standardizing product items.
- Developing digital cluster under the government's super cluster policy. (i.e., providing investment incentives)
- Encouraging digital technology startups to innovate and create new products and services.

Digital Society

- Upgrading digital community center to provide public access to digital services as well as online learning and trading opportunities.
- Providing Massive Open Online Courses (MOOCs) for the public both in education and non-education settings.
- Training digital literacy to people of all groups, including children students, teachers, parents, seniors, and people of underprivileged groups.
- Piloting a Smart Safety City in Phuket. (CCTV for safety+ Smart Transportation)

ICT 2020 DEVELOPMENT TARGETS – SMART THAILAND 2020

The ICT2020 Policy Framework takes off with 'Smart Thailand 2020', a vision with clear and tangible objectives recognizing ICTs as the key building blocks of a sustainable information society offering equal opportunities for all of its citizens. The vision states that "ICT is a key driving force in leading Thai people towards knowledge and wisdom and leading society towards equality and sustainable economy".

2014-15

Smart Foundation
- Enhanced ICT Literate People
- Enhanced e-Rural Community
- e-Service Reach-Out to the people
- Enhanced Public-Private Collaboration

2016

Smart AEC Collaboration
- Joined-up People to AEC
- Joined-up Connection to AEC
- Joined-up e-Service to AEC
- Joined-up e-Business Transaction to AEC

2017

Smart Community
- Collaborative Community
- Connected Community Networks
- Connected e-Service Community
- Connected e-Business Community

2018

Smart Global Services
- Mobilized People
- Global Connectivity
- Seamless e-Government
- Global e-Business

2019-2020

Smart Thailand
- Participatory People
- Optimal Infrastructure
- Smart Government
- Vibrant Business

Source: Digital Thailand, IDC-Thailand

THAILAND: DIGITAL TRANSFORMATION INITIATIVES

DIGITAL THAILAND: 1.5 YEAR PRIORITY ACTIVITIES

NATIONAL E-PAYMENT

- Creating data standards for the National e-Payment System.
- covering people's daily activities and hence reducing up to 75,000 mn baht in costs and expenses.

SMART CITIES

- Building 5 Smart Cities within 3 years(Phuket and Chiangmai).
- Smart Economy

  Digital Industry Hub + Innovation Park.

  5,000 Certified Digital Workers.
- Smart Living

  CCTV for public safety.

  Control Center to manage environment and disaster incidents.

ECONOMY: DIGITAL INITIATIVES

- Yearly fostering 1,500 digital startups, SMEs, and Micro SMEs.
- 300 ready-to-commercialize prototypes.
- Building 10,000 online community stores via digital community centers.
- Piloting smart farms for organic product traceability.
- Producing 1,600 digital farmers.
- Coaching 15,000 SMEs to trade online and standardizing 100,000 product items.
- Building Tourism Thailand Open Platform (B2B).
- Linking to global platforms for Tourism SMEs.

EDUCATION AND LIFELONG LEARNING

- Providing Massive Open Online Courses (MOOCs) for the public both in education and non-education settings.
- Building an English-learning mobile application/ system for people (prepare for AEC).
- Piloting a digital package (Internet, and e-Learning) in 20 most marginalized schools to bridge the digital divide.

Source: Thailand Digital Policy -MDES

INFRASTRUCTURE

- Providing Free Wi-Fi at 10,000 locations, including schools (reaching 2,000,000 students) and Digital Community Centers all over the country.
- Doubling International bandwidth to meet the demands of growing economic activities
- Setting up Digital Thailand Infrastructure Fund.
- Deploying broadband to all villages.

HEALTHCARE

- Developing a Personal Health Record system.
- Link all country-wide hospitals to benefit 1mn people.
- Expect 150,000 people in the first year.

DIGITAL LITERACY

- Training digital skills for vocation/ income generation to 8,000 people of disadvantaged groups and elderly
- Providing online vocational contents to 700,000 students in vocational schools and 400,000 people
- Training digital literacy to 600,000 people

GOVERNMENT

- Developing an e-Government law that mandates digital government plan.
- Establishing/ upgrading Government Shared Infrastructure/ Data Center, government cloud and government mail system
- Creating at least 79 smart services
- Building a platform to facilitate entrepreneurs to start businesses.
- Developing a mobile communication system (G Chat) (accommodate at least 15,000 users)

Proving a government one-stop portal that can be accessed in 3 modes:

- Via websites (govchannel.co.th, egov.go.th, data.go.th, info.go.th).
- Via mobile applications on smart devices.
- Smart Government Kiosk in all provinces (including systems that track/ show health benefits or electricity user data).

THAILAND: DIGITAL TRANSFORMATION INITIATIVES

The Third ICT Master Plan (2014-18) and Smart Thailand have been set with the goal of providing digital inclusiveness to all Thai citizens and uplifting the quality of its workforce. They have set the goals described below.

THIRD ICT MASTER PLAN (2014-2018)

Optimal Infrastructure

Smart Government

Inclusive Affordable Reliable

Open Seamless Anticipated

2014

Creative Green Productive

Sufficient Innovative Professional

2018

Vibrant Business

Participatory People

- Thailand's the Third ICT Master Plan (2014-2018), having been delayed due to 2014 coup d'état and domestic political instability, has been drafted in line with ICT2020 Policy Framework and the Second ICT Master Plan. The Third ICT Master Plan's vision is to shape-up Smart Thailand toward Digital Society with four development strategies as shown in the figure.
- By 2015, 80 % of the population will be able to access the broadband, which will increase to 95 % by 2020.
- At least 75 % of the population will have IT literacy. The proportion of ICT professionals will increase to at least 3 % of the workforce.
- ICT value added contribution at least 18% of GDP.
- At least 50 % of the population will be aware of the importance and role of ICT in environmentally-friendly growth.

SMART THAILAND 2020

Strategy	Details
■ Universal and secure ICT and broadband infrastructure	■ The main aim of this strategy is for ICT infrastructure to become a basic utility in Thailand by 2020, and will be accessible by all people, with high quality and world-class security.
■ ICT human resources and ICT competent workforce	■ The important aim of the strategy is to allow Thailand to have sufficient high-quality manpower that is capable of developing and using ICT efficiently in order to be prepared for national development in the era of the service economy and creative economy. This includes ICT personnel as well as personnel in all fields.
■ ICT industry competitiveness and ASEAN integration	■ This strategy aims for the Thai ICT industry to strengthen and grow continuously, becoming a leader in the ASEAN region and one of the top generators of economic value and foreign revenue.
■ Smart government: ICT for government service innovation and good governance	■ This strategy aims at smart government that is characterized by intelligence, integration, inclusion (offers opportunities to all sectors to participate in setting public policy and format of government service in order to ensure that benefits accrue equitably to all), and good governance.
■ ICT for Thailand competitiveness and vibrant economy	■ This strategy aims to use ICT as an important driving force for creating knowledge, creativity and innovation in goods and services for which Thailand has an advantage.
■ ICT to enhance social equality	■ This strategy aims to allow people to have secure rights in accessing and making use of telecommunications services and information in order to create economic, social and cultural opportunities in a comprehensive and just manner
■ ICT and Environment: the Green ICT	■ The main aim of the strategy is to make ICT an important driving force in green economic and social development

Source: IDC-Thailand

VIETNAM

ASOCIO

VIETNAM: EXECUTIVE SUMMARY

ICT OVERVIEW

- The Vietnamese ICT industry is valued at VD 1,618 tn as of 2016. The industry has grown rapidly at 30.5% CAGR since 2010. The government has set its ICT Masterplan in 2011 of making Vietnam a developed ICT nation by 2020.
- ICT Hardware which has a size of VD 1,164 tn and a 71.9% share of the overall ICT industry as of 2016. It has grown at 48.5% CAGR from 2010-16. The government policy of reduced taxation has successfully attracted multinational companies like Samsung and Intel who have set up manufacturing facilities in the countries.
- Mobile phone penetration in Vietnam is very high at 134.5% in 2016. The Vietnamese people have rapidly adopted 4G services which have been introduced in 2017.

DIGITAL AGENDA

- Vietnam Master Plan on information technology was approved in 2011. The objective is to turn Vietnam into a developed country in ICT by 2020. The plan has set targets for nationwide broadband telecommunications infrastructure; efficient application of information technology in socio-economic, defense and security related domain. The plan has six broad objectives:
  - IT human resource development
  - Develop the IT industry
  - Broadband telecommunication infrastructure
  - Information universalization
  - Application of information technology
  - Building information and communication technology enterprises and developing the information and communication technology market.

DIGITAL INITIATIVES

The Vietnam Master Plan has the following goals to develop and improve the ICT landscape:

- **ICT human resource development:**
  - Have 30% of the ICT workforce with a good command of foreign languages and are professionally capable of participating in international markets by 2015 and 80% by 2020.
  - Have a total ICT workforce of 1 mn by 2020.
- **ICT infrastructure:**
  - Have a broadband coverage of 85% by 2015 and 95% by 2020.
  - Access to computers and broadband internet in 30% of the households by 2015 and in 60% of them by 2020.
- **Digital services:**
  - Be among the top 3 countries in the world for e-government readiness by 2020.
- **ICT R&D and industrial development:**
  - Form strong industry oriented ICT R&D organizations fully capable of conducting new hi-tech product research and development.
  - Increase research into the design and production of key ICT hardware like ICs and become fully capable of designing and manufacturing components to meet domestic consumption and export demands.
- **Establish Vietnam Multi-Media Communications Group (VTC).**
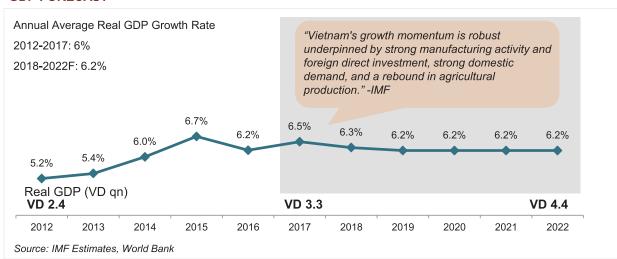
CHALLENGES

The completion status of the targets is unknown as it has not been disclosed by the Vietnamese government to any public source.

VIETNAM: ECONOMIC SNAPSHOT

GDP FORECAST

Annual Average Real GDP Growth Rate

2012-2017: 6%

2018-2022F: 6.2%

"Vietnam's growth momentum is robust underpinned by strong manufacturing activity and foreign direct investment, strong domestic demand, and a rebound in agricultural production." -IMF

Real GDP (VD qn)

			6.7%		6.5%					
	5.4%	6.0%		6.2%		6.3%	6.2%	6.2%	6.2%	6.2%
5.2%										

VD 2.4   **VD 3.3**   **VD 4.4**

| 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |

Source: IMF Estimates, World Bank

EXPORT AND IMPORT OF GOODS AND SERVICES

Import and Export of Goods (VD tn)

CAGR:2010-15

Export: 17.5%   Import: 14.3%

					165.6
	106.7	113.8	132.0	147.8	162.0
84.8		114.5	132.0	150.2	
72.2	96.9				

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |

Import and Export of Services (VD tn)

CAGR:2010-15

Export: 11.4%   Import: 13.6%

	249.4		291.3	320.8	365.5
193.4		230.2			
	182.8	200.4	225.8	236.3	249.2
145.4					

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |

Source: General Statistics of Vietnam

- Imports of raw materials and intermediate goods have increased as a result of rising import prices and increasing export orders.
- Highly competitive foreign enterprises, in labor-intensive manufacturing sectors such as electronics, textiles, and apparel, generate about 70% of Vietnam's exports by value. The rise in Vietnam's trade exports, reflect overall cost competitiveness and the ability to attract multinational companies.
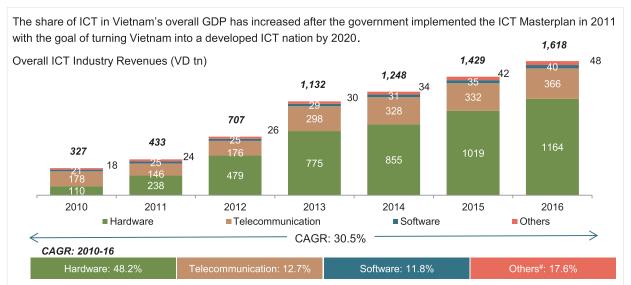
VIETNAM PER CAPITA INCOME GROWTH HAS BEEN THE HIGHEST IN THE WORLD IN THE 2000'S

Per capita income (VD mn)

CAGR:7.6%

2016	43
2014	38
2012	35
2010	31
2008	28
2006	20

Source: IMF

- Despite uncertainties in the global environment, Vietnam's economy remains resilient.
- Growth has been equitable which has led to a dramatic reduction in poverty. In 1993, over 50% of the population lived in absolute poverty. As of 2016, this has fallen to 3%.
- More than 40 million people have been uplifted from poverty in two decades.

VIETNAM: ICT INDUSTRY OVERVIEW

VIETNAM'S ICT INDUSTRY HAS BEEN GROWING RAPIDLY

The share of ICT in Vietnam's overall GDP has increased after the government implemented the ICT Masterplan in 2011 with the goal of turning Vietnam into a developed ICT nation by 2020.

Overall ICT Industry Revenues (VD tn)

CAGR: 30.5%

CAGR: 2010-16

| Hardware: 48.2% | Telecommunication: 12.7% | Software: 11.8% | Others#: 17.6% |
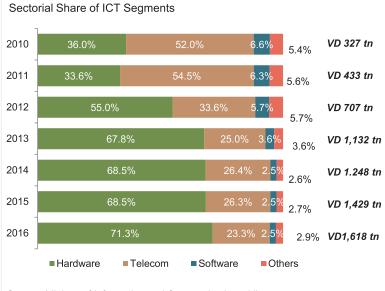
Source: Ministry of Information and Communications, Vietnam

Note: Segmental percentage shares for 2016 are kept similar to 2015 splits due to unavailability of data.

#*Others consists of Digital content and gaming*

SHARE OF HARDWARE IN OVERALL ICT IS RAPIDLY INCREASING

Sectorial Share of ICT Segments

- Growth of the ICT hardware sector has outpaced that of the telecommunication to become the largest sector in the Vietnamese ICT industry.
- Agreements such as the Vietnam-EU Free Trade Agreement (EVFTA) and ASEAN Economic Committee (AEC) have brought down trade barriers and greatly increased the trade volume between Vietnam and the large consumption markets.
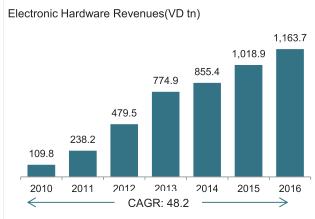
Source: Ministry of Information and Communications, Vietnam

THE GOVERNMENT IS TAKING SEVERAL STEPS TO MULTINATIONAL ICT COMPANIES

- Government has provided support measures such as tax incentives and simplified administration procedures for ICT companies operating in Vietnamese market. Zero tax for the first 4 years of operation and thereafter, a 50% reduced corporate tax for the next 5 years is a major taxation initiative being offer by the government to companies for setting operations in Vietnam. This has attracted ICT companies and has led to the rapid development of Vietnam as a high-tech hub.
- With a to goal to become an important destination for IT services, the government has lent financial support to have 19 IT parks by 2020.

VIETNAM: IT HARDWARE

VIETNAM HAS BECOME A FAVORED DESTINATION FOR ICT HARDWARE MANUFACTURERS

Electronic Hardware Revenues(VD tn)

2010	2011	2012	2013	2014	2015	2016
109.8	238.2	479.5	774.9	855.4	1,018.9	1,163.7

CAGR: 48.2

- Availability of low cost labour in abundance has made Vietnam an attractive destination for ICT hardware manufacturers to set up their manufacturing units. Major global firms such as Samsung, LG Electronics and Panasonic have set up units in Vietnam.
- ICT hardware which consists of electrical and electronic equipment has the largest share in Vietnam's overall exports.

Source: Ministry of Information and Communications, Vietnam

EXPORT VOLUME OF KEY ICT HARDWARE HAS INCREASED TREMENDOUSLY

Export and Import Figures for key ICT Hardware (VD tn)

CAGR:2010-16

Export: 49.1%   Import: 34.3%

- Vietnam has been a net exporter of ICT hardware since 2012.
- The high import figures are due to the fact that Vietnam uses imported components to manufacture and re-export the finished ICT hardware.
- The setting up of ICT hardware manufacturing factories by multinational companies has helped Vietnam to move further into high-value exports, from low-margin export industries such as textiles.

Source: Ministry of Information and Communications, Vietnam

THE SEMICONDUCTOR MARKET IN VIETNAM IS GROWING FAST
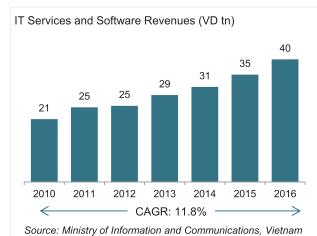
- Vietnam's proximity to China and ASEAN countries is propelling the growth of the semiconductor industry.
- Consumer electronic semiconductors has 80% market share driven by a rising smartphones and tablet sales.
- Blue-chip companies such as NXP Semiconductors, Intel and Microelectronics are investing heavily in Vietnam. 80% of Intel semiconductor chips used worldwide are produced in Vietnam.

Semiconductor Industry Revenues (VD tn)

CAGR
2011-19: 12.7%

2011	2012	2013	2014	2015	2016	2017F	2018F	2019F
37.9	42.1	46.7	51.9	57.6	65.8	75.3	86.0	98.3

Source: U.S. Department of Commerce, Frost & Sullivan , Research and Markets
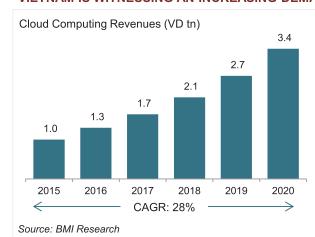
VIETNAM: IT SERVICES AND SOFTWARE

VIETNAM IS RAPIDLY EMERGING AS A GLOBAL DESTINATION FOR SOFTWARE OUTSOURCING

IT Services and Software Revenues (VD tn)

						40
21	25	25	29	31	35	
2010	2011	2012	2013	2014	2015	2016

CAGR: 11.8%

Source: Ministry of Information and Communications, Vietnam
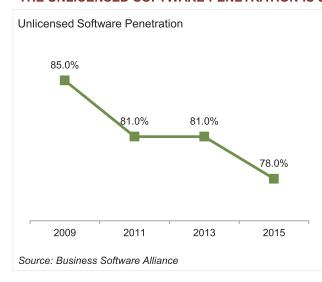
- Rising demand for digital infrastructure projects in banking, telecoms, energy, smart agriculture and government segments has gained attraction from global IT services leaders to invest more in Vietnam.

- The cybersecurity infrastructure is being improved to provide assurance to enterprises looking to outsource to Vietnamese companies. It is important to Vietnam due to increased threats and growing awareness among the government and ICT companies.

VIETNAM IS WITNESSING AN INCREASING DEMAND FOR CLOUD SERVICES

Cloud Computing Revenues (VD tn)

					3.4
1.0	1.3	1.7	2.1	2.7	
2015	2016	2017	2018	2019	2020

CAGR: 28%

Source: BMI Research

- Cloud computing has one of the highest growth rates in the ICT sector increased due to an increase in higher productivity industries such as electronics manufacturing and outsourcing.

- The cost of cloud services is paramount to the Vietnamese SME's while the greatest concerns for State agencies are security and privacy. So, SME's are using public cloud services while private cloud services have found more adoption among State agencies.

- Lack of knowledge about the benefits of cloud computing and doubts over security are major concerns that are being addressed to increase cloud computing adoption.

THE UNLICENSED SOFTWARE PENETRATION IS SLOWLY GOING DOWN

Unlicensed Software Penetration

85.0%	81.0%	81.0%	78.0%
2009	2011	2013	2015

Source: Business Software Alliance
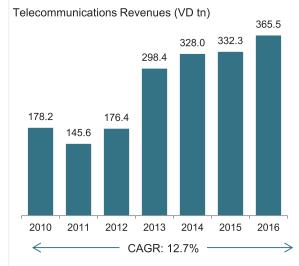
- The Vietnamese software market is highly cost-sensitive with low-cost local suppliers having a 75% share of the market. Illegal pirated software is widely accessible for domestic and business uses.

- The government has taken several measures to combat software piracy:
  - It has joined the Paris Convention on Industrial Property and the Berne Convention on Copyright and has worked to meet its commitments under these international treaties.
  - The Intellectual Property law was amended in 2009 and the Penal Code in 2015 to impose criminal penalties for intellectual property right violations.

VIETNAM: TELECOMMUNICATION

STEADY INCREASE IN OVERALL TELECOM REVENUES

- Mobile phone penetration rate in Vietnam is extremely high because of the aggressive price and promotion competition among operators.
- To sustain growth, telecom service providers are improving service offerings and are investing heavily in infrastructure and promotions.

Telecommunications Revenues (VD tn)

Mobile Phone, Internet and Smartphone Penetration

Year	Revenue
2010	178.2
2011	145.6
2012	176.4
2013	298.4
2014	328.0
2015	332.3
2016	365.5

CAGR: 12.7%

Mobile Phone: 2013: 135.0%, 2014: 147.1%, 2015: 130.6%, 2016: 134.5%

Internet Penetration: 2013: 38.5%, 2014: 41.0%, 2015: 43.5%, 2016: 46.5%

Smartphone: 2013: 23.0%, 2014: 24.2%, 2015: 32.7%, 2016: 38.8%

Legend: Mobile Phone, Internet Penetration, Smartphone
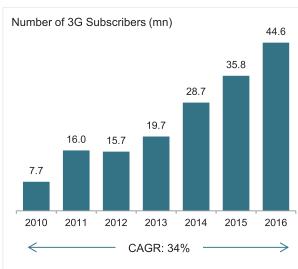
Source: Ministry of Information and Communications, Vietnam

RAPID ADOPTION OF 4G SERVICES IN VIETNAM

Number of 3G Subscribers (mn)

Year	Subscribers
2010	7.7
2011	16.0
2012	15.7
2013	19.7
2014	28.7
2015	35.8
2016	44.6

CAGR: 34%

- 4G operations started in Vietnam in 2017. Vietnam had 6.3 million subscribers, within six months of the launch of 4G services. An estimated 17 mn 4G subscribers will be there by early 2018.
- 4G connectivity is positioned as a key determinant of an economy's digital advancement. Vietnam is rapidly increasing 4G coverage as it wants to catch up with other economies in the digital revolution.
- Telecom operators are rapidly building infrastructure to increase the 4G population to 95% from the current 70% by April 2018.
- High smartphone penetration, cheap tariffs and free network upgrades offered by service providers is driving the rapid growth of 4G services.

Source: Vietnam Telecommunications Authority

PROSPECTIVE LIBERALIZATION OF THE TELECOM SECTOR

- Vietnam's fixed line and internet access markets are both largely dominated by state-controlled operators such as Vietnam National Post & Telecommunications Corp. (VNPT) and Viettel, as well as major international competitors. The telecom sector is is one of the largest contributors to the nation's GDP.
- Privatisation of the leading service providers such as Mobifone is expected to attract global operators who would help in faster adoption of advanced technology and improve the service offering and quality.
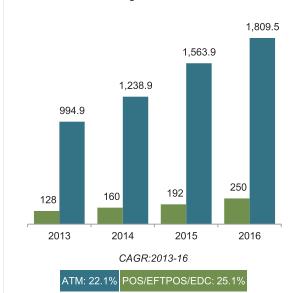
VIETNAM: FINTECH

HEAVY DEPENDENCE ON CASH

- Vietnam has one of the most cash dominated economies in the world, with almost 90 % of all transactions being conducted in cash.
- The Vietnamese fintech sector is in its nascent stages with only 30 companies in 2016
- Banking penetration in Vietnam is very low. Only 20% of the people have a bank account as of 2016.The share of card transactions was recorded at 3.1% in 2013. With low banking penetration, lack of ATMs and cashless systems, complexities of digital payment systems, and lack of consumer trust, consumers are compelled to fall back to cash based transactions.

RISE OF FINTECH SOLUTIONS

Transaction Value through ATMs and POS/EFTPOS/EDC (VD tn)

CAGR:2013-16

ATM: 22.1%   POS/EFTPOS/EDC: 25.1%

Source: State Bank of Vietnam

- Fintech services have immense potential in Vietnam as the internet and mobile penetration is high but banking penetration is low. The growth of e-commerce will complement the e-payments growth as well.
- Payment solutions dominate among the different fintech segments in Vietnam. The Bankcard and e-wallet market have also grown steadily driven by services such as online bill payment, shopping, and money transfer.
- Fintech companies are expected to move into more sophisticated banking services.
- Investments in fintech are on the rise. In 2016, a total of VD 2,937bn was invested 9 in Fintech companies which was 60% of the total investments made.

THE GOVERNMENT IS COMMITTED TO INCREASING FINTECH ADOPTION

- The government plans to bring down the share of cash in overall transactions to 10% by 2020 and so, is taking measures to promote the adoption of fintech:
  - According to Circular 39 issued by the State Bank, e-wallet services are officially recognised as a payment service like other collection and payment services.
  - Banks have been instructed to replace magnetic cards by EMV-standard chip cards by 2020 to increase security and prevent fraud.
  - Vietnam Silicon Valley is an incubator by the Ministry of Science and Technology and the government to promote tech startups.

VIETNAM: E-COMMERCE

FAST GROWTH OF THE E-COMMERCE MARKET

- High internet and smartphone penetration are will drive the growth of the e-commerce sector.
- The share of e-commerce in overall retail sales is expected to increase to 5% in 2020 from the current 2.8% in 2015.
- E-commerce startup investment in 2016 is estimated to be VN 790 bn spread across 12 deals.

E-commerce Market Size (VD tn)

2015	2016	2017	2018	2019	2020
90.2	108.5	130.6	157.2	189.2	227.7

CAGR: 20.4%

E-commerce Per Capita Spending (VD mn)

2015	2016	2017	2018	2019	2020
3.64	4.26	4.98	5.83	6.81	7.97

CAGR: 16.9%

Source: Vietnam E-commerce and Information Technology Agency, Association of Vietnam Retailers

RAPID INFRASTRUCTURE DEVELOPMENT AND ADOPTION OF E-COMMERCE BY BUSINESSES
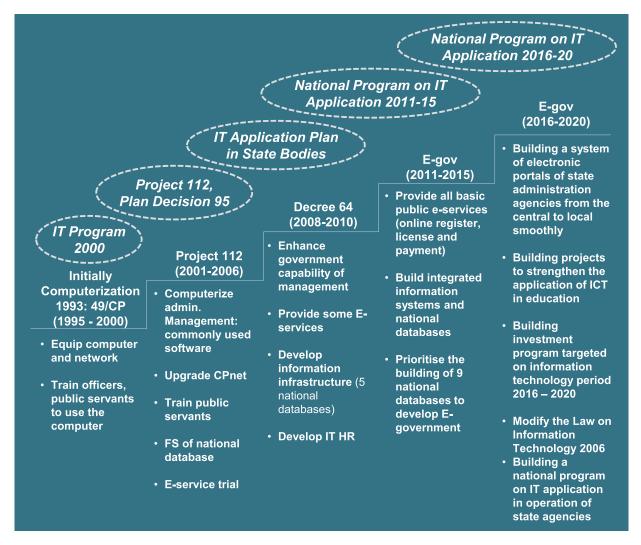
- ICT businesses have made the effort to develop ICT infrastructure and boost IT applications in daily life and economic development. The Vietnam E-Commerce and Information Technology Agency (VECITA) saw a boom in e-commerce applications from 2010-2015.
- Businessmen have readily taken to selling on e-commerce portals in a bid to increase their revenue. As of 2016, more than 20,000 businesses have their own websites, accounting for 45 % of businesses in the nation. About 18% have mobile sales applications.

Source: Vietnam E-Commerce and Information Technology Agency (VECITA)

VIETNAM: DIGITAL TRANSFORMATION INITIATIVES

THE NATIONAL PLAN ON IT APPLICATION, 2016-2020 GIVES SPECIAL FOCUS ON ICT SECTOR AND HAS ACCORDINGLY DECIDED KEY ASPECTS TO BE COVERED UNDER THE PLAN.

Source: Decision No. 1755 / QD-TTG on Vietnam ICT Master plan

ICT MASTERPLAN – KEY REGULATIONS

The Vietnam ICT Masterplan of 2011 lists out the following plans and objectives:

- The master plan on development of information technology human resources through 2015 and orientations towards 2020 (under the Prime Minister, Decision No. 698/QD-TTg of June 1, 2009).
- Programs and plans on the development of the information technology industry in the 2011-2020 period.
- Program on development of broadband telecommunications infrastructure.
- Planning on safe development of national digital information (under the Prime Minister Decision No. 63/QD-TTg of January 13, 2010).
- Program on introduction of digital information devices to households.
- Programs and plans on application of information technology to activities of state agencies in the 2011-2020 period.
- Program on scientific research and technological innovation capacity building in the field of information and communication technologies.
- The National master plan of development of digital information security to 2020, and the Law on Internet Security.

VIETNAM: DIGITAL TRANSFORMATION INITIATIVES

Vietnam Master Plan on information technology is the government's blueprint to develop and improve ICT industries and infrastructure in Vietnam. It was approved in 2011, to turn Vietnam into a developed country in ICT by 2020. The overall target of the plan emphasizes international standards for ICT human resources and the role played by the industry in the development of the country. It also sets goals to establish broadband telecommunications infrastructure nationwide; to efficiently apply information technology in every socio-economic, defense and security domain.

MASTER PLAN TARGETS 2015-20

Improve Information Technology human resource quality

80% of ICT graduates will be qualified to fill international market openings by 2020 up from 30% in 2015

Information Universalization

Almost all households will be able to use digital services. 60% of households will have computers and Internet access

Infrastructure Development
Increase broadband penetration to cover 95% of the population with broadband mobile information waves.
The number of Internet users will account for over 50% of the population by 2015 and over 70% by 2020.

KEY OUTCOMES

Vietnam is set to emerge among the one-third of leading nations in the UN ranking in readiness for e-Government; and its e-Government initiatives are set to rank above average in the world.

ICT industry is expected to contribute around 8-10% of the country's GDP and its revenue growth to 2 or 3 times the GDP growth rate by 2020.

By 2020 software industry and processing services will be strongly developed, putting the country among 10 countries leading in software and digital content service provision.

Source: Decision No. 1755 / QD-TTG on Vietnam ICT Master plan

VIETNAM: DIGITAL TRANSFORMATION INITIATIVES

The Vietnam Master Plan on Information technology has set the following targets for its three main focus areas.

DEVELOP QUALIFIED ICT HUMAN RESOURCE

- To encourage the teaching in English for information technology students at universities.
- To expand the form of on-line training on broadband telecommunications infrastructure.
- By 2020: 80% of information and communication technology graduate students will be professionally qualified and have good command of foreign languages for participation in international labor markets.
- The total labor in the information technology industry will reach one million.

INCREASE THE CONTRIBUTION OF ICT TO THE GDP

- Giving priority to Vietnam's leading ICT enterprises to be general contractors for major information and communication technology projects financed by state budget capital or capital originating from the state budget.
- To further improve the legal environment and policy mechanisms of breakthrough nature for the development of the information technology industry.
- To form strong information and communication technology research and development organizations, which will be fully capable to carry out new hi-tech product research and development.
- Software industry and processing services will strongly develop, putting the country among 10 countries leading in software and digital content service provision. Vietnamese software, digital content and information technology service enterprises will dominate the domestic market and participate in export.

DEVELOP ICT INFRASTRUCTURE

- To further improve the exclusive telecommunications networks for Party and State agencies
- To establish national database systems for the development of an e-government.
- To build technical infrastructure to ensure national digital information safety
- To enhance information technology research and development capabilities of institutions as well as enterprises.
- To build a number of key common laboratories nationwide on chip technology, sensory technology, core software, open-source software, embedded software, digital content, Vietnamese language processing, and information safety.

Source: IDC ICT Market Landscape Study, 2016

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

SIGNIFICANCE OF DIGITAL TRANSFORMATION

- As the digital revolution sweeps across the globe, we have seen definite evidences of digitalization impacting several aspects of the economy as well as the society. It is restructuring economies and societies today and will continue to do so in the future.

- Adoption of technologies and innovation are seen to have a positive impact on services and also help address policy challenges in several areas such as education, health, agriculture, governance, tax, and transportation among others. Information and communication technologies contribute not just to innovation in products, but also to innovation in processes and organizational arrangements.

DIGITAL TRANSFORMATION BENEFITS SEVERAL ASPECTS OF THE ECONOMY / SOCIETY

- Greater financial inclusion of the poor
  - A large part of Asia's population is still unbanked. Nearly 73% of the population in Southeast Asia's is unbanked. Digital initiatives are popularizing the cashless transaction model by expanding branchless and digital banking and financial services.
  - Governments across all countries are working to improve the online infrastructure and increase internet connectivity. One of the direct gainers of such digital transformation initiatives would be the financial sector.

- Ease of doing business
  - Digital technologies are enabling businesses to scale up and introduce innovative products and services in the market. They are also reshaping the value chains, sharpening market intelligence, improving efficiency, reducing time-to-market and enhancing customer satisfaction.
  - Further, with the aid of digital technology, SMEs are able to cater to the overseas markets and talent pools. Even in government dealings, digital technologies help eliminate bureaucracy and red tape. Digitization in e-governance initiatives is bolstering the overall business environment.

- Access to finance for SMEs
  - Around 70% of all micro, small and medium-sized enterprises (MSMEs) in emerging markets lack access to finance. SMEs, which are important engines of growth for most developing economies, are usually denied finance by the traditional financial institutions such as banks due to high costs and risks associated with these businesses.
  - The reluctance by banks has encouraged these enterprises to consider alternative financing channels such as crowd funding platforms.

- Curbing tax evasion
  - As per 2016 FICO survey findings, 1 in 5 APAC banks are of the opinion that tax evasion will more than double in 2017. 68% of respondents indicated that they do not currently have the resources to identify and report tax evasion.
  - Many APAC countries have started to use technology and digital solutions such as artificial intelligence, cyber security, etc. to prevent fraud and tax evasion.

- Improved standard of living
  - Digital tools and technologies can help in bringing about improved health, along with better and safer care for patients and social well-being.
  - Disruptive technologies can transform healthcare delivery through remote health services and digitally-enabled healthcare workers who can tap expert systems to conduct basic protocols via smart phones and the mobile internet. With smart cities using IoT and smarter infrastructure facilities, the quality of living of the people is improving.

- Wide access to education
  - Digitization in the education sector is bringing about radical changes to learning and teaching. While it is encouraging active learning among students, it is also allowing teachers to remotely connect and communicate with students in different locations. Digital learning is enabling personalization, accessibility and efficiency in educational experiences.
- Wide access to business / employment opportunities
  - Investment in digital infrastructure is driving innovation and creating job opportunities in new and international markets as well as newer business sectors. Use of smart phones, tablets and other mobile devices has enabled employees to stay connected and collaborate with peers.
- Wealth creation

DIGITALIZATION CHALLENGES FOR POLICY MAKERS

While digitalization has significant benefits, it could also be highly disruptive. It has a transformational effect on the way individuals connect with one another and with society more broadly and to a great extent changes the structure and business models of the economy.

Digitalization must address critical policy challenges related to security, infrastructure, and jobs, among others. Failure to effectively address these issues may lead to economic inefficiencies. Governments would be forced to come up with policies which would be reactive in nature. This may further affect the social fabric by impacting the already prevalent inequalities in the society, consequently resulting in slower growth.

The challenge for policy makers is to identify the policy mix that will enable their economies to best maximize the benefits of an increasingly digitalized global economy and adequately address the resulting challenges.

To do so, it is essential to ensure access to, and participation in, the digital economy for everyone in all countries in the region; maximize the contribution of technological and ICT innovations to productivity and inclusive growth, job creation and well-being; and build trust and resiliency for networks and users.

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

POLICY ACTIONS AND CO-OPERATION OBJECTIVES

Regional policy formulation would necessitate coordination among different levels of government and ministries as well as participation from all concerned stakeholders.

- Firstly, it is imperative for the concerned authorities of respective countries to share best practices and lessons learned regarding the impacts of digitalization and policy approaches.

- Identify business models that are scalable or replicable in nature and drive their success by ensuring strategic investments in the digital economy.

- Prioritize innovative business models and frameworks which would be enablers for the sharing economy, workforce digitalization and financial inclusion.

- Cooperate to improve regional digital economic development to help bridge the digital divides in the fields of infrastructure, innovation, data security and digital skills and capacity building.

- Initiate a 'Digital Asia Project' that essentially focuses on the development of the regional cooperation model in Asia to implement region-wide digital projects in several areas such as e-commerce, smart cities, cyber security etc. among others and to facilitate collaboration for R&D, HRD, financing.

EIGHT PLUS ONE OBJECTIVES AND ACTION PLANS FOR A POTENTIAL DIGITAL ASIA INITIATIVE

Below is the objective framework covering specific action steps to support strategic national & regional digital initiatives:

1) Promoting Fast and Ultra Fast "Internet for All"

- Despite the rapid spread of the Internet, nearly 55% of Asia's population still remains offline and is unable to directly reap digital dividends.
- It is critical for many Asian countries to expand their broadband infrastructure beyond urban areas and into rural and remote areas; and upgrade their networks to successfully match the fast-paced digital revolution.
- Typical obstacles to the deployment of high-speed networks are high capital expenditure and spectrum management, coupled with issues related to administrative and regulatory policies. In some countries, rural areas lack basic infrastructure - such as electricity, for example. These are some of the common stumbling blocks.
- Countries that are likely to be impacted by high costs of Internet transit need to design a strategic long-term internet infrastructure plan and borrow ideas from countries such as Korea, Singapore, Malaysia, Taiwan and Japan. These countries have a more developed infrastructure and are now considering 5G network as one of their priorities.

Action Plan **>> An important area for policy action involves establishing strategic national broadband roadmaps / plans with well-defined targets and reviewing them periodically. This is to ensure that the key technical enablers are in place.**

- o These plans should tackle the barriers to the deployment of high-speed networks and services. They should comprise measurable targets to address the concerned policy challenges.
- o One of the most critical objectives while planning a nation's digital transformation policy is to enhance e-government services for the public. This is to ensure increased engagement and on-time delivery of services across administrative verticals of the government.

Action Plan **>> Increasing internet connectivity through infrastructure development.**

- o A robust infrastructure is necessary to provide seamless connectivity to corporates and citizens. It is essential to fully exploit and harness the potential of digital transformation.
- o Targets must be set for the development of technical enablers, such as access to internet exchange points, developing submarine cable systems, internet gateways, data center networks and spectrum.
- o Viability of satellite systems (space technology) should be tested for next-generation broadband network deployments in rural and remote areas since they might be inaccessible through traditional network infrastructure.
    - Terrestrial technologies are commercially viable in densely populated urban areas, whereas satellite internet could provide a better business case for sparsely populated regions.

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

2) Robust Digital Ecosystem for Start-ups and SMEs

Start-ups are usually more impacted due to inefficiencies in the regulatory frameworks, compared to large firms, limiting their growth and reducing overall business dynamism. Hence, appropriate policy action to boost the growth prospects of digital start-ups and SMEs is essential.

Action Plan >> Create an 'Asia Digital Hub', which will be a common platform, aimed at nurturing talent and encouraging innovation in order to build a more sustainable regional digital economy. It will also include an 'Asia Accelerator Program' aimed at promoting regional digital innovation by encouraging not only national but also cross-border business possibilities.

o Set up of 'Asia Digital Hub' access centers in the already recognized ICT hubs in each of the Asian countries, such as Bangalore in India, Cyberjaya in Malaysia, Fukuoka in Japan, etc., to extend the physical reach and cover major tech start-ups in the partner countries.

o Develop accelerator programmes for local as well as international start-ups under the 'Asia Digital Hub' with a focus on expertise and R&D projects among member start-ups.

o Asia Digital Hub will help in establishing business and knowledge networking in multiple geographies which will enable the start-ups develop and access a wider talent pool of like-minded and innovative digital age entrepreneurs. Asia Digital Hub can also act as a recruitment portal for hiring international talent.

o Connect with VCs and angel investors in all the member countries. This will increase the opportunities to assess alternative financing options such as crowd funding through expanding reach, and provide access a to larger population.

o Develop an online portal for registration and participation in live streaming of entrepreneurial seminars conducted across various member countries.

Action Plan >> Encourage private companies to develop incubation programmes for start-ups across Asia through a favourable ecosystem.

○ A favourable ecosystem is necessary to encourage private companies to mentor and guide start-ups across APAC economies. These companies should focus on imparting domain-specific skills to start-ups.

○ Incubation programmes would lead to better resource usage and facilitate allocation of relevant domain-specific incubators for start-ups.

Action Plan >> Establish "Start-up Incubation & Mentorship" programme through corporate-educational institutions tie-up to identify and groom high potential start-ups.

○ Provide assistance to start-ups with digital innovation ideas for commercialization of prototypes into commercial products.

○ The focus of incubation support should be on refining the idea and building product prototypes for testing. The prototypes can be further improved into commercial products and supported in the actual market launch.

○ Assessing the commercial viability and market size, and designing the go-to-market strategy for the start-up should be a part of the incubation support along with raising seed funding.

Action Plan >> Build an APAC Start-Up Map to identify every concerned entity in the start-up ecosystem.

○ The map is aimed to identify all relevant stakeholders in the startup ecosystem. This is needed to identify accelerators, incubators, investors, corporations, universities and public administrations at various locations.

○ APAC start-up map will provide an overview to major stakeholders to collaborate and become a member of the start-up ecosystem. Start-ups and corporates can thus establish contacts, share experiences and raise funding.

○ It will also help promote the best practices across APAC economies by making them public thereby facilitating sharing.

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

Case Example: Startup India

A flagship initiative of the Government of India, intended to build a strong ecosystem for nurturing innovation and start-ups in the country. The NASSCOM 10,000 Startups Warehouse is a one-of-its-kind incubation and co-working space programme in the world that helps early stage technology start-ups from India.

Case Example: Malaysia Digital Hub

Malaysia Digital Economy Corporation (MDEC) introduced the Malaysia Digital Hub initiative, to support tech and digital co-working spaces, their start-ups and communities with government support to connect to ASEAN and global digital ecosystem. Malaysia has also introduced the Global Acceleration and Innovation Network (GAIN) programme to promote and expand local technology SMEs that have the potential to become global players.

Case Example: Startup SG and Other Startup Initiatives

Singapore SG positions Singapore as a leading start-up hub. It provides entrepreneurs with a launch pad and platform to connect to the global stage and access local support initiatives.

- Other countries have also introduced initiatives for building a strong start-up ecosystem. E.g. SIPA Tech Startup Club in Thailand, Startup Bangladesh by Government of Bangladesh, Asian Silicon Valley for IoT development in Taiwan, etc.
- Various other accelerator programmes have been introduced to promote and grow start-ups - such as the Xeleration accelerator initiative under Startup Sri Lanka by SLASSCOM.

3) Address Needs of ICT Human Resources

- Skills are clearly an important factor in the uptake and effective use of ICTs. Evidence suggests that despite an increasing diffusion of digital technologies in business, a large proportion of people do not effectively use digital technologies at work or do not have adequate ICT skills.
- Most countries in Asia are facing a shortage of resources in the ICT industry, particularly in the areas of cyber security, data analytics and development, and network infrastructure.

Action Plan >> Enable cross-border graduate exchange programmes aimed at leveraging each country's inherent ICT strengths

o Initiate a pilot programme for graduates from one country to work with large companies in other Asian countries to encourage students and/or graduates to acquire local ICT knowhow.

o A cross-border exchange programme will provide graduates with an opportunity to work and learn from experienced professionals in other Asian countries. These graduates could be the new and aspiring entrepreneurs of tomorrow.

o The role of both universities / colleges and that of large companies is crucial.

o Collaborative projects between educational institutes / bodies and companies that promote internships and funding schemes for young, digital-minded people can also prove essential in promoting an entrepreneurship culture.

o Likewise, it is also essential for countries to start leveraging on each other's inherent strengths with regards to the ICT industry.

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

Action Plan **>> Develop an 'Asian Tech Universities Alliance' to promote digital learning among countries in Asia**

- o Allow leading tech colleges / universities to set up campuses in other Asian countries to encourage cross-border ICT learning.
- o Although this is happening at present, it is essential to formalize student and faculty exchange between leading universities in the region.
- o The alliance must aim to enhance cooperation and communication between Asian universities, and play an important role in solving regional digital / ICT-related issues.
- o Additionally, there would be other benefits such as strengthening technology research cooperation between the faculty, and sharing policies on digital education between university presidents within the alliance.
- o There are a large number of courses offered by technology universities across Asia. A way to bring all the degrees and certificates awarded by different universities together on a common platform should also be explored.

Action Plan **>> Relax the visa requirements for highly skilled individuals wanting to work in the digital sector in Asian countries.**

- o Review the existing arrangements for visa requirements that are applicable to highly skilled individuals among Asian countries.
- o Asian countries must ease the visa requirements for highly skilled individuals keen to work in Asia's digital economy (in particular those with high STEM skills, e.g. science, technology, engineering, and mathematics).

> **Case Example: Japan's Easing of Permanent Visa Norms**
>
> By 2030, Japan will be short of 600,000 IT professionals. To address the shortfall, in Feb'17, the government announced plans to ease the process of issuing green cards to highly skilled professionals from foreign countries in IT and other cutting-edge fields. With this change, individuals with a valid visa residing and working in Japan, will be able to apply for a green card after 1-2 years, from 5-6 years earlier.

Action Plan **>> Design curriculum and online courses for key digital skills at a regional level to bridge knowledge gaps in collaboration with education institutes and the private sector**

- o Constant interaction needs to be facilitated between the ICT industry, the government and the educational institutions in order to develop and design courses that impart appropriate ICT knowledge and skills, including cognitive skills.
- o Vocational courses need to be developed for professionals as well as teachers / faculty to strengthen the constant upgrading of skills of existing resources.

> **Case Example: Malaysia's Human Resources Development Fund (HRDF)**
>
> HRDF is a pool of funds that consists of Human Resources Development levies collected from employers of the manufacturing and service sectors. It aims to provide efficient high-skilled training certification programmes and initiatives that would contribute to a 35% skilled Malaysian workforce and the creation of 1.5 million jobs by 2020. To develop local digital talent for industry, HRDF in 2017 mobilized funds worth RM203 mn for training programmes in ICT adoption, big data, and empowerment of women, through this year until 2020. HRDF is also collaborating with the National Big Data Association to promote its initiative in the Development of Digital Talent for Industry, and, to date, 28 courses have been approved.

Action Plan >> *Form a regional human resource development fund (HRDF) targeted at building local digital talent for industrial revolution 4.0*

- Development of a regional Human Resource Development Fund (HRDF) at an APAC level is crucial for the development of overall human capital focused on meeting the needs of the regional ICT industry.

- The pool of funds must consist of HRD levies collected from leading companies in the ICT industry

- Collaborate with regional ICT associations to promote digital talent and design targeted courses through which students learn advanced digital / technology skills

- Such an initiative will help accelerate human resource development in areas such as:

  o Improving the efficiency of labour

  o Providing technical and vocational education adequate to meet industry demand

  o Strengthening lifelong learning for skills enhancement; and

  o Improving the overall quality of the education system, students and institutions

4) Foster Cross-Border Investment and Digital Trade

- APAC economies have been active in the ICT sector and have developed their individual expertise in certain niche areas over the past few decades. Internet and technology are bridging the gaps between countries and hence, companies and governments both need to think of the best ways to collaborate in technology use to achieve their desired outcomes.

- The industry is constantly working on addressing ICT needs / gaps through cross-border trade but much more can be done to improve the efficiency of cross-border procedures in many countries, particularly in developing countries.

- International agencies and national policy makers, who are aware of the underlying challenges, have to ensure that the high-level commitments morph into concrete action at the country- and regional-levels.

Action Plan >> *Expand the present ASOCIO AEC E-Commerce Alliance to Digital Asia market by encouraging participation from other Asian economies*

  o The AEC e-commerce Alliance can be expanded by encouraging other economies to join the initiative. This will boost sales and have a positive impact on the GDP of the concerned economies.

  o Adding major economies to the alliance would open opportunities to a larger marketplace for many companies including SMEs and start-ups, thus implying the need for an Asian strategic e-commerce plan.

  o Specific roles and responsibilities can be assigned to each member economy to encourage active participation.

Action Plan >> *Form an ICT Working Committee consisting of government representatives & corporate IT leaders to discuss current regulatory issues related to cross-border digital trade*

  o This working group should meet at regular intervals to review cross-border digital trade, identify the shortcomings, provide action points, and recommend change / alteration in regulations and government policies.

  o Encourage private companies to take an initiative in establishing and promoting cross-border trade.

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

Action Plan >> Establishing APAC cross-border trade promotion initiatives to frame standard regulations & policies across the APAC region to promote digital trade

o   Harmonize ICT regulations necessary for cross-border transactions, and encourage national and private investments in ICT infrastructure and services.

o   This should focus on establishing common standards regulations and policies for increasing digital cross-border business trade.

Action Plan >> Create a national level e-commerce development strategy framework

o   E-commerce in Asia Pacific has witnessed significant growth over the past few years. The penetration level in Asian economies is quite low compared to other parts of the globe. This clearly suggests that the region still has ample opportunities for e-commerce companies to thrive.

o   However, it seems imperative to give some form of direction to this exponential growth.

o   Taking cues from Malaysia's National e-Commerce Strategy Roadmap, it is prudent for each country to devise their own growth plan focused on developing the entire ecosystem for e-commerce growth.

Action Plan >> Encourage cross-border FDI by industry leaders in each sub-segment of ICT

o   APAC economies must develop and harmonize ICT regulations necessary for cross-border transactions, and encourage national and private investments in ICT infrastructure and services.

o   The biggest challenge lies in overcoming the extent of digital divide across APAC economies. Member countries have to improve their national ICT competitiveness to bridge this digital divide. One way to achieve this is to identify the gaps in the current ICT needs, and create favourable FDI norms.

Case Example: Mobile Handset Manufacturing in India

India lacks ICT major hardware manufacturing capabilities. However, to promote local manufacturing of mobile handsets, the government has exempted parts, components and accessories for making mobile devices from basic customs duty and excise duty. This has led to a slew of overseas and local device makers make a beeline to set up factories in India. Some have also started local assembly, the first step towards full-scale manufacturing.

Case Example: Malaysia's National e-Commerce Strategy Roadmap (by Malaysia Digital Economy Corp)

The roadmap is aimed at doubling the country's e-commerce growth to 20.8% by 2020 from the current 10.8%. If Malaysia stays on its current course, it is estimated that e-commerce contribution to GDP would grow by about 11% over the next few years. This business-as-usual scenario translates into a GDP contribution of RM 114 bn by 2020. A focused government intervention via the Roadmap can double that growth rate: Malaysia could achieve more than 20% and a GDP contribution of more than RM 170 bn by 2020.

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5) Inter Country Collaboration to Provide impetus to Smart Cities Development

Action Plan **>> Review existing plans and bottle necks, and accordingly devise a strategic collaboration model for faster implementation**

o Many countries are now focusing on developing smart cities. As of today, there is no standard definition for a smart city. Various countries have established their own technological levels and requirements for designing a smart city concept.

o There are many differences between a smart city and a digital city; but people, and in some cases even governments, use the word "Smart City" in place of digital city.

o Building a smart city requires in-depth planning with regards to transport, sewage, water treatment, public amenities, digital connectivity and streets. In short, the best definition for a smart city is "a self-sustaining city with minimum human interference". Whereas a digital city is just a "digitally networked city providing internet access and some services through mobiles".

o "Smart City" is an evolution of Digital City. It is very difficult to establish a smart city without major infrastructure development.

o Smart & Digital, both concepts, are mainly dependent on the level of digital internet and mobile penetration for effective service delivery. As APAC has one of the highest digital penetration, it is expected to shift to "Digital City" status within a short span of time.

o Very few cities in the world actually satisfy the smart city definition mentioned above.

o Collaborating with countries having successfully built such smart / digital cities would be critical for other countries in the region and give the required push to the whole smart city development plan.

Action Plan **>> Establish a PAN Asian Smart City Alliance to monitor the progress of smart city initiatives implementation in identified cities. Committee to suggest best practices for smart city implementation by taking examples from current projects.**

o Some countries like Japan, Korea and Singapore are far ahead in building digital and smart cities. Other countries can replicate the progress they have managed to implement and can even alter some aspects to match their requirements.

o The smart city initiative is not limited to government allocation of resources for digital transformation. The critical element is about citizens planning and interpreting smartness. The smart cities should offer insights into how citizens and the government can mutually suggest best solutions to make the planning robust.

Action Plan **>> Suggest minimum standards and benchmarks for smart city implementation at country level for faster planning and implementation for other cities.**

o Collaboration with successful countries is critical to identify and establish adequate standards necessary for smart city development.

o Each country should have smart city standards defined for timely and uniform implementation across multiple cities.

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

Case Example: Japan has agreed to help India to develop Chennai, Ahmadabad and Varanasi as smart cities.

Japan expressed its interest in the urban development initiatives of the Government of India and will assist in developing Chennai, Ahmedabad and Varanasi under the smart city development initiative. Japan will share its expertise in the field of smart city development. According to Smart City Mission, the main objective is to build a "replicable model which will act like a lighthouse to other aspiring cities".

Case Example: Singapore will assist in developing Amravati as smart city.

The Indian city of Amaravati in South India is slated for development as a key centre for global investment. A Singapore consortium comprising Ascendas-Singbridge and Sembcorp Development has been formed to develop the core commercial area of Amaravati. Amaravati Development Partners, a JV between the Singapore consortium and Amaravati Development Corporation, will be formed for implementing the project.

6) Ensure Quicker Adoption of New & Emerging Technologies

o FinTech is transforming the financial system as well as economic growth of countries. It is building technological innovation in financial markets and systems to make it more efficient and consumer-focused. This will help drive traditional financial services and may further lead to disruption through innovative new products and services benefitting consumers and other economic sectors.

o If the environment is conducive to make fintech internationally competitive, it will play a major role in creating value for individuals and other sectors of the economy.

o An opportunity needs to be given to domestic as well as international fintech investors to develop and refine new products and services through a smooth regulatory system.

o Hence, it is crucial for each economy to make the fintech industry one of the key national digital growth agendas and devise the best methods to drive fintech and future economy.

Action Plan **>> Make fintech industry one of the key national digital growth agendas for Asian economies to drive greater financial inclusion.**

o Government, central bank and fintech industry players should work in collaboration to come up with policies that lead to free competition, innovative products / services and lower pricing to end consumers. This would also result in greater financial inclusion. This is essential since:

• Existing regulations in many economies are multiple, complicated and fragmented which can make it very difficult for a start-up to operate.

• Regulations need to be flexible and technology neutral to accommodate innovative business models. The authorities should take further steps to update their regulations to support innovation while continuing to manage associated risks.

o Standard practices (best practices) for fintech to operate should be developed at an APAC level taking examples from current initiatives. At present, there are a lot of inconsistencies with regards to digital initiatives and their progress across all countries in the world.

o Earning customer trust may be a challenge for fintech start-ups competing with established financial institutions. Hence, it is essential for the government to promote the development of fintech start-ups through initiatives mentioned below:

Case Example: India's Unified Payments Interface (UPI)

UPI is a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing & merchant payments under one hood. It also caters to the "Peer to Peer" collect request.

Case Example: India's Bharat Interface for Money (BHIM)

BHIM app makes payment transactions simple and quick using Unified Payments Interface (UPI). It enables instant bank-to-bank payments and collects money using a mobile number or payment address. 14.54 million BHIM apps were downloaded as of May 2017.

Case Example: Thailand's PromptPay

PromptPay, launched in Jan'17, is part of the National E-payment initiative. It is an interbank mobile payments system which allows registered users to transfer funds using mobiles or citizen ID numbers. It also enables users to receive payments from government i.e. social security benefits and tax refunds.

Action Plan **>> Setting up of APAC "Fintech Innovation Lab" for incubation and funding support to innovative fintech startups.**

- o The fintech lab will provide consultancy and support services for scaling up business operations across APAC countries.

Action Plan **>> Establish an IoT alliance to support the creation of an industry-driven IoT ecosystem at the APAC level**

- o IoT faces many challenges due to issues related to the capacity to handle diverse and large volumes of connected devices, device security, etc. Promote an interoperable IoT numbering space for a universal object identification and an open system for object identification and authentication.
- o An IoT alliance should aim to create sustainable APAC IoT ecosystems to address the above challenges including standardization, interoperability and policy issues.

Action Plan **>> Adopt and integrate new technologies into the existing ICT infrastructure at the national level**

- o Government, central bank and fintech industry players should work in collaboration to establish policies that lead to free competition, innovative products / services and lower pricing to end consumers.
- o Standard practices (best practices) for fintech to operate should be developed at the APAC level.

Case Example: Korea's Intelligent IT

The 'Intelligent IT' plan will combine Artificial Intelligence (AI) with 'information' provided by ICBM technologies (IoT, cloud, big data and mobile) to perform highly complex functions of human intelligence. Intelligent IT will add new sources of revenue from sectors such as robotics (KRW 30 tn) and data-based marketing (KRW 10 tn), reduce costs by KRW 110-200 tn, and increase consumer welfare by KRW 75-175 tn.

Case Example: Japan's IoT Acceleration Consortium

The 'IoT Acceleration Consortium' will promote the utilization of IoT in industry, government and academia, and create an IoT ecosystem by promoting global business cooperation. Schemes such as IoT Lab Demonstration, IoT Lab Selection and IoT Lab Connection will provide financial, regulatory and business matching support for IoT business.

Case Example: Malaysia's National IoT Roadmap

The 'National IoT Roadmap' aims to create a national ecosystem to enable the proliferation and industrialisation of IoT. Implementation of IoT is expected to contribute RM 42.5 bn to the country's Gross National Income by 2025. Pilot projects launched in various fields like agriculture, healthcare, environment, etc will flag areas which require attention and further countermeasures.

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

7) Use ICT to Enhance Social Welfare

Action Plan >> *Leverage digital technologies to enhance healthcare delivery*

o   Establish an ICT health (disease prevention) model – Implement a large scale social set-up using incentives in order to establish a health (disease prevention) model.

o   Expansion of EHR (Electronic Health Record) – Studying the standardization of data and system specifications of EHR and its operational rules will help achieve a significant reduction in costs

Case Example: Singapore's Smart Health Video Consultation

Integrated Health Information Systems (IHiS) launched the platform to allow doctors to "remotely and regularly monitor patients online". Smart Health Video Consultation, part of the Smart Nation initiative, focuses on digital technology to enhance access to healthcare systems and boost their productivity. Remote vital signs monitoring and tele-rehabilitation are the other such initiatives.

Case Example: India's E-Pathshala

E-Pathshala has been developed by NCERT for disseminating all educational e-resources including textbooks, audio, video, periodicals and a variety of other material through its website and mobile app. The platform addresses the dual challenge of reaching out to a diverse clientele and bridging the digital divide (geographical, socio-cultural and linguistic), offering comparable quality of e-content and ensuring its free access to students and teachers.

Case Example: Malaysia's Intelligent Plantation Management Solution

MIMOS Berhad's Intelligent Plantation Management solution, under Malaysian Ministry of Science, Technology and Innovation, provides an intelligent solution to manage vast palm oil plantations. It enables plantation managers to remotely check on the overall pollination status of the palms and informs them when ready for pollination.

Action Plan >> *An APAC digital agriculture trading platform to be established to bridge the gap between the producer and direct buyer.*

o   The agriculture trading platform will facilitate trade by providing daily market prices and stock availability information for agriculture commodities.

Action Plan >> *Online education platform to be developed for disseminating all educational e-resources including textbooks, audio, video, periodicals, etc.*

o   The platform will help bridge the digital divide (geographical, socio-cultural and linguistic), offer comparable quality of e-content and ensure free access to educational material.

8) Address the Regional Cyber Security Challenge

Action Plan >> Establish an 'Asia Cyber Security Core Committee' to monitor and devise proactive strategies towards resolving regional issues

o Shortage of cyber security professionals is a major drawback and needs to be addressed by establishing a regional cyber security centre.

o This centre should focus on training cyber security professionals and also develop proactive measures to prevent cyber attacks.

o Further, the centre should also develop reactive strategies to contain and counter cyber security threats at short notice to minimize damages in case of a cyber-attack.

o Government agencies should also ensure that authorized software packages are installed in their offices as they are most likely to be targeted by cyber criminals.

o Design citizen awareness programmes to educate the public regarding cyber threats and measures to protect their data. This will reduce the response time in identifying the attack.

o Establishing a cyber security task force with authority to act against threats and cyber criminals regardless of international physical boundaries.

Action Plan >> Establish a Computer Emergency Response Team (CERT) in each of the APAC economies to co-operate in areas of cyber security.

o Computer Emergency Response Teams (CERTs) should include cyber security experts from member countries who will train corporates in deploying best practices in cyber security.

ASOCIO is developing a standardized framework to clearly gauge the progress that Asia Pacific nations have made in carrying out digital transformation

1) MEASURE REGIONAL DIGITAL PROGRESS BY STANDARDIZING MEASUREMENT METRICS

Action Plan >> Endeavour to define key metrics to be considered and benchmarked across all Asian economies to support the evidence and policy actions

o At present there are a lot of data inconsistencies with regards to digital initiatives and their progress across all countries in the world. Also, the metrics that get tracked tend to vary a lot from country to country.

o Asian countries must work together to define key metrics in the areas of connectivity, human capital, internet use, integration of digital technologies, and digital public services.

• Areas such as e-commerce and the use of digital technologies - such as IoT, data analytics, and cloud computing, among others - should also be included.

o This will result in effective benchmarking, developing targeted policies and prioritizing reforms.

o Lastly, it will also be useful to develop and maintain an annual progress report for digitization at a regional level.

Action Plan >> Develop regional initiatives such as Digital Transformation Index, maturity modeling, certification, etc. for sharing digital transformation progress across countries.

o Key initiatives, such as the Digital Transformation Index, will help track and measure the impact of major ICT initiatives in different economies at the APAC level

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

APAC DIGITAL TRANSFORMATION SNAPSHOT

| Objective	Action	Brief Description
Promoting fast and ultra fast "Internet for All"	Establish strategic national broadband roadmaps / plans with well-defined targets, and review them periodically - to ensure that the key technical enablers are in place.	▪ All countries should have a national broadband development plan with measurable goals.
	Increase internet connectivity through infrastructure development.	▪ Set targets for the development of technical enablers such as access to internet exchange points, developing submarine cable systems, internet gateways, data centre networks and spectrum.
Robust digital ecosystem for start-ups and SMEs	Create an 'Asia Digital Hub' which will be a common platform aimed at nurturing talent and encouraging innovation in order to build a more sustainable regional digital economy.	▪ Connect existing start-up / ICT hubs in each country ▪ Cross-border opportunities for start-ups to network with VCs / angel investors ▪ Develop an Asia-centric online portal for awareness campaigns and participation
	Establish 'Asia Accelerator Program' aimed at promoting regional digital innovation ideas by encouraging not only national but also cross-border business possibilities.	▪ Develop accelerator programmes for local and international start-ups under the 'Asia Digital Hub' with a focus on expertise and R&D projects among member start-ups.
	Encourage private companies to develop incubation programmes for start-ups across Asia through a favourable ecosystem.	▪ Incubation programmes would lead to better resource usage and most relevant incubators for start-ups as per domain of operation
	Establish "Start-ups Incubation & Mentorship" programmes through corporate-educational institutions tie-ups to identify and groom high potential start-ups.	▪ Provide assistance to start-ups with digital innovation ideas for commercialization of prototypes into commercial products
	Build APAC Start-Up Map to identify every concerned entity working in the start-up ecosystem.	▪ The map aims to identify all relevant stakeholders in the start-ups ecosystem. This is needed to identify accelerators, incubators, investors, corporations, universities and public administrations involved in the environment. ▪ Promote best practices by making them public thereby facilitating sharing and replication.
Address the needs of ICT Human Resources	Enable cross-border graduate exchange programmes aimed at leveraging each country's inherent ICT strengths	▪ Opportunity for graduates in one country to work in other Asian countries. ▪ Design of collaborative projects between educational institutes / bodies and companies that promote internships and funding schemes.
	Develop an 'Asian Tech Universities Alliance' to facilitate digital learning among countries in Asia	▪ Allow leading tech colleges / universities to set up campuses in other Asian countries to encourage cross-border ICT learning ▪ Formalize student and faculty exchange ▪ Strengthen technology research cooperation
	Relax visa requirements applicable to highly skilled individuals wanting to work in the digital sector in Asian countries.	▪ In particular for those with high STEM skills, e.g. science, technology, engineering, and mathematics and keen to work in Asia's digital economy
	Design curriculum and online courses for key digital skills at a regional level to bridge knowledge gaps in collaboration with education institutes and the private sector	▪ ICT industry, government and educational institutions to collaborate and develop courses ▪ Courses to be designed also for the faculty / teachers
	Form a regional human resource development fund (HRDF) targeted at building local digital talent for industrial revolution 4.0	▪ Develop an HRD fund at the APAC level ▪ Collaborate with regional ICT associations to promote digital talent

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION
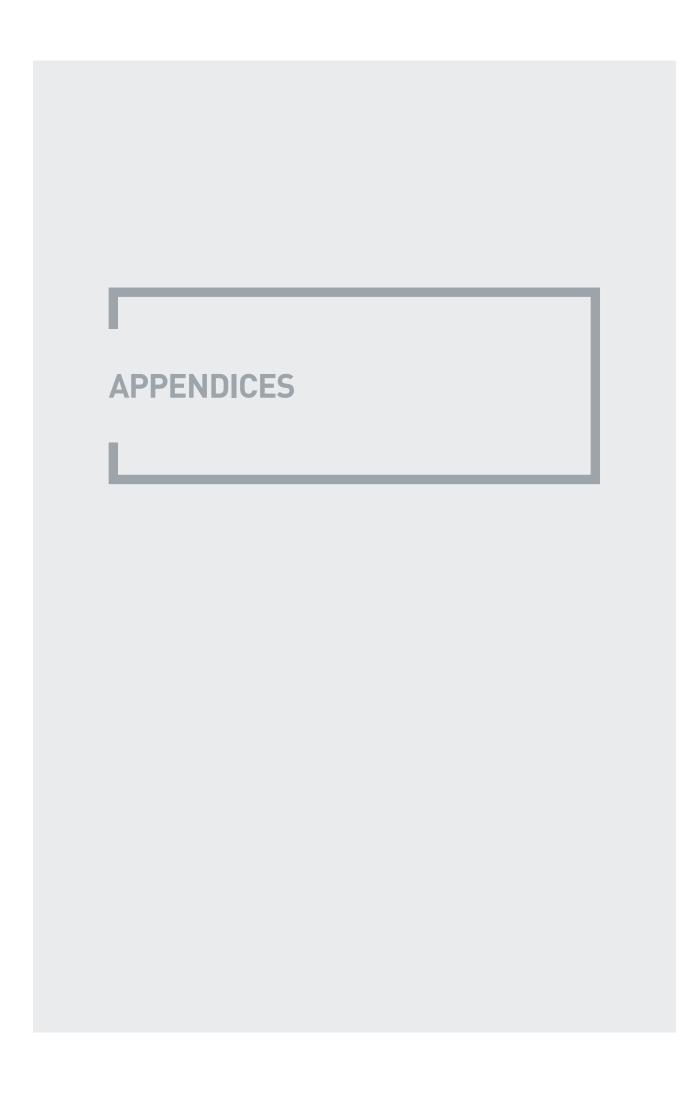
Objective	Action	Brief Description
Foster cross-border investment and digital trade	Expand the present ASOCIO AEC E-Commerce Alliance to the digital Asia market by encouraging participation from other Asian economies	▪ Adding major economies to the alliance would open opportunities to a larger marketplace, thus implying the need for an Asian strategic e-commerce plan
	Form an ICT Working Committee consisting of government representatives & corporate IT leaders to discuss current regulatory issues related to cross-border digital trade	▪ Private companies should take the initiative to establish & promote cross-border trade
	Establish an APAC cross-border trade promotion initiative to frame standard regulations & policies across the APAC region to promote digital trade	▪ Harmonize ICT regulations necessary for cross-border transactions and encourage national and private investments in ICT infrastructure and services
	Create a national level e-commerce development strategy framework for each country	▪ Considering Malaysia as an example, each country can devise their own national e-commerce roadmap focusing on building the ecosystem
	Encourage cross border FDI by industry leaders in each sub-segment of ICT	▪ Identify gaps in the current ICT needs and create favorable FDI norms to improve competitiveness
Provide an impetus to Smart Cities Development	Establish a pan-Asia Smart City Alliance to monitor the progress of initiatives implemented in select cities. Committee to suggest best practices for smart city implementation by taking examples from current projects.	▪ Asia slowly moving from digital city to smart city ▪ Countries like Japan, Korea, Singapore are front runners
	Suggest minimum standards and benchmarks for smart city implementation at the country level for faster planning and implementation for other cities.	▪ Collaboration with successful countries is critical to identify and establish adequate standards necessary for smart city development
Ensure quicker adoption of new & emerging technologies	Adopt and integrate new technologies into the existing ICT infrastructure at a national level Make fintech industry one of the key national digital growth agendas for Asian economies to drive greater financial inclusion.	▪ Government, central bank and fintech industry players should work in collaboration to come up with policies that lead to free competition, innovative products / services and lower pricing to end consumers. ▪ Standard practices (best practices) for fintech to operate should be developed at an APAC level
	Setting up of APAC "Fintech Innovation Lab" for incubation and funding support to innovative fintech start-ups.	▪ The fintech lab will provide consultancy & support services for scaling up of business operations across APAC countries.
	Establish an IoT Alliance to support the creation of an industry-driven IoT ecosystem at the APAC level	▪ IoT faces many challenges due to issues related to the capacity to handle diverse and large volumes of connected devices, device security, etc. ▪ Promote an interoperable IoT numbering space for a universal object identification and an open system for object identification and authentication.
Use ICT to enhance social welfare	Leverage digital technologies through the establishment of an ICT health (disease prevention) model to enhance healthcare delivery	▪ Implement a large scale social set-up using incentives in order to establish a health (disease prevention) model
	An APAC digital agriculture trading platform to be established to bridge the gap between the producer and direct buyer.	▪ The agriculture trading platform will provide daily market prices and stock availability information for agri commodities thereby facilitating trade.
	Online education platform to be developed for disseminating all educational e-resources including textbooks, audio, video, periodicals, etc.	▪ The platform will help bridge the digital divide (geographical, socio-cultural and linguistic), offer quality e-content and ensure free access.

RECOMMENDATIONS FOR APAC DIGITAL TRANSFORMATION

Objective	Action	Brief Description
Address the regional cyber security needs	Establish an 'Asia Cyber Security Core Committee' to monitor and devise proactive strategies towards resolving regional issues.	▪ Address the problem of skill shortage in Asia ▪ Proactive measures to be put in place to avoid cyber attacks ▪ Minimal reactive time to counter attack ▪ Strict use of authorized software packages
	Establish a Computer Emergency Response Team (CERT) in each of the APAC economies to co-operate in areas of cyber security.	▪ Computer Emergency Response Teams (CERTs) should include cyber security experts from member countries and will also train corporates in deploying best practices in cyber security.

ASOCIO is developing a standardized framework to clearly gauge the progress that Asia Pacific nations have made in carrying out digital transformation

Objective	Action	Brief Description
Measure regional digital progress by standardizing measurement metrics	Endeavour to define key metrics to be considered and benchmarked across all Asian economies to support the evidence and policy actions	▪ Asian countries must work together to define key metrics in areas such as e-commerce and the use of digital technologies such as IoT, data analytics, and cloud computing, among others.
	Develop regional initiatives such as Digital Transformation Index , maturity modeling, certification, etc. for sharing digital transformation progress across countries	▪ Key initiatives such as Digital Transformation Index will help track and measure the impact of major ICT initiatives of different economies at the APAC level

APPENDICES

APPENDICES: CURRENCY EXCHANGE RATE

This is the exchange rate of all currencies with respect to the US Dollar.

Country	Currency Code	2006	2007	2008	2009	2010	2011
Australia	AUD	1.4	1.2	1.1	1.4	1.1	1.0
Bangladesh	BDT	69.8	69.0	68.6	68.8	69.4	72.5
India	INR	44.5	43.6	40.0	50.9	45.0	44.4
Japan	JPY	117.5	117.8	99.9	99.1	93.5	82.8
Malaysia	MYR	3.7	3.5	3.2	3.6	3.3	3.0
New Zealand	NZD	1.6	1.4	1.3	1.8	1.4	1.3
Singapore	SGD	1.6	1.5	1.4	1.5	1.4	1.3
Korea	KRW	971.3	943.8	990.3	1,372.6	1,131.5	1,097.8
Sri Lanka	LKR	102.6	108.7	107.8	115.7	114.1	110.4
Taiwan	TWD	32.5	33.1	30.4	33.9	31.8	29.4
Thailand	THB	38.8	32.4	31.5	35.5	32.4	30.3
Vietnam	VND	15,922.0	16,059.5	16,100.0	17,720.0	19,080.0	20,880.0
Country	**Currency Code**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Australia	AUD	1.0	1.0	1.1	1.3	1.3	1.3
Bangladesh	BDT	81.8	78.0	77.7	77.9	78.3	80.2
India	INR	50.9	54.3	60.1	62.3	66.2	64.9
Japan	JPY	82.9	94.2	103.0	120.0	112.4	111.4
Malaysia	MYR	3.1	3.1	3.3	3.7	3.9	4.4
New Zealand	NZD	1.2	1.2	1.2	1.3	1.4	1.4
Singapore	SGD	1.3	1.2	1.3	1.4	1.3	1.4
Korea	KRW	1,132.2	1,111.9	1,062.0	1,108.8	1,139.8	1,117.7
Sri Lanka	LKR	128.1	126.7	130.7	133.0	146.6	152.1
Taiwan	TWD	29.5	29.9	30.5	31.3	32.2	30.4
Thailand	THB	30.8	29.3	32.4	32.6	35.1	34.3
Vietnam	VND	20,820.0	20,925.0	21,080.0	21,523.0	22,291.6	22,750.0

APPENDICES: LIST OF ABBREVIATIONS

Abbreviations	Full form
APAC	Asia-Pacific
ABS	Association of Banks in Singapore
ABT	Account-Based Ticketing
ACL	Australian Credit License
ADAX	ASEAN Data Analytics Exchange
ADBT	Aadhaar-based Direct Benefit Transfers
AEC	ASEAN Economic Community
AEPS	Aadhaar Enabled Payment System
AFSL	Australian Financial Services License
AGV	Automated Guided Vehicles
AI	Artificial Intelligence
APB	Aadhaar Payment Bridge
API	Application Program Interface
APS	Australian Public Service
AR	Augmented Reality
AR	Annual Report
ARPU	Average Revenue per User
ASA	Authentication Service Agency
ASE	Advanced Semiconductor Engineering
ASEAN	Association of Southeast Asian Nations
ASIC	Australian Securities and Investments Commission
ASOCIO	Asian-Oceanian Computing Industry Organization
ASSOCHAM	Associated Chambers of Commerce and Industry of India
ATM	Automatic Transaction Machine
AU$	Australian Dollar
AUA	Authentication User Agency
B2B	Business to Business
B2C	Business to Consumer
B40	Bottom 40% of households with monthly income of RM3,900 and below
BASIS	Bangladesh Association of Software and Information Services
BB	Broadband
BBNL	Bharat Broadband Network Limited
BCC	Bangladesh Computer Council
BDA	Big Data and Analytics
BDT	Bangladeshi Taka
BHIM	Bharat Interface for Money
Bn	Billion
BNM	Bank Negara Malaysia
BPM	Business Process Management
BPO	Business Process Outsourcing
BPS	Better Public Services
BSNL	Bharat Sanchar Nigam Limited
BTRC	Bangladesh Telecommunication Regulatory Commission
BWA	Broadband Wireless Access
CAA	Courts Administration Authority
CADM	Custom Application Development and Management

APPENDICES: LIST OF ABBREVIATIONS

Abbreviations	Full form
CAGR	Compound Annual Growth Rate
CATV	Community Antenna Television
CCTV	Closed-circuit Television
CELEX	Customized Education and Learning Exchange
CETRAN	Centre for the Testing and Research of Autonomous Vehicles
CIO	Chief Innovative Officer
CIS	Customer Interaction Services
COAI	Cellular Operators Association of India
COD	Cash on Delivery
CPI	Consumer Price Index
CPS	Cyber-physical System
CSCP	Civil Service Computerisation Programme
CWG	Commonwealth Games
CYREC	Cybersecurity Research Center
DDA	Digi Dhan Abhiyan
DECD	Department for Education and Child Development
DEWNR	Department of Environment Water and Natural Resources
DFAT	Department of Foreign Affairs and Trade
DFTZ	Federation of Malaysian Manufacturers
DGBAS	Directorate General of Budget, Accounting and Statistics
DIA	Department of Internal Affairs
DIGI+	Digital Nation Plan (2017-2025)
DoT	Department of Telecom
DPIRSA	Department of Primary Industries and Resources SA
DPTI	Department of Planning, Transport and Infrastructure
DRAM	Dynamic Random Access Memory
DS	Digital Spend
DSL	Digital Subscriber loop
DTAC	Total Access Communication Public Company Limited
DTH	Direct-to-Home
ECMS	Electronic Court Management System
ECMS	Electronic Court Management System
EDB	Economic Development Board
EDTA	Digital Economy Ministry's Electronic Transactions Development Agency
EHR	Electronic Health Record
EITC	Earned Income Tax Credits
EIU	Economist Intelligence Unit
EMI	Equated Monthly Installment
EMR	Electronic Medical Record
EMS	Exploration and Mining Software
EOI	Expression of Interest
ER&D	Engineering, Research & Development
eSLDP	e-Sri Lanka Development Project
ESP	eKYC eSign Service Providers
ETDA	Electronic Transactions Development Agency
EU	European Union
EVFTA	Vietnam-EU Free Trade Agreement
FASTER	Fusion Analytics for Public Transport Emergency Response
FM	Frequency Modulation
FMM	Federation of Malaysian Manufacturers

APPENDICES: LIST OF ABBREVIATIONS

Abbreviations	Full form
FSTI	Financial Sector Technology & Innovation
FTIG	Fintech and Innovation Group
FTTx	Fibre to the x (which includes all fiber technologies from fiber-to-the-kerb to fiber-to-the-home, such as FTTN, FTTC, FTTB and FTTH)
FY	Fiscal Year
GAIN	Global Acceleration and Innovation Network
GBS	Global Business Services
GDP	Gross Domestic Product
GIC	Government Information Center
GMS	Global Monitoring System
GNP	Gross National Product
GOB	Government of Bangladesh
GPS	Global Positioning System
GSMA	Global System for Mobile Association
GST	Goods and Services Tax
HBL	Hindu Business Line
HITMAP	Health IT Master Plan
HRDF	Human Resources Development Fund
IaaS	Infrastructure as a Service
IAMAI	Internet and Mobile Association of India
IAP	Investment Account Platform
IBEF	India Brand Equity Foundation
IBIS	Internet Based Inquiry system
IBM	International Business Machines Corporation
IC	Integrated Circuit
ICBM	IoT, Cloud Computing, Big Data Analysis, Mobile Technologies
ICT	Information and Communication Technology
ICTA	Information and Communication Technology Agency
ID	Identity Document
IDC	International Data Corporation
IFS	Industrial & Financial Systems
IHiS	Integrated Health Information Systems
IMD	Institute for Management Development
IMDA	Info-communications Media Development Authority
IMF	International Monetary Fund
IMPS	Immediate Payment Service
INR	Indian Rupee
IoT	Internet of Things
IP	Internet Protocol
IPA	Information-technology Promotion Agency
IPTV	Internet Protocol Television
IS	Infrastructure Services
ISP	Internet Service Provider
IT	Information Technology
IT-BPM	Information Technology-Business Process Management
ITES	Information Technology Enabled Services
ITSAT	IT Statistics of Korea
ITU	International Telecommunication Union
JAM	Jan Dhan-Aadhaar-Mobile
JETRO	Japan External Trade Organization
JPY	Japanese Yen

APPENDICES: LIST OF ABBREVIATIONS

Abbreviations	Full form
JTC	Jurong Town Corporation
KIF	Korea Institute of Finance
KISDI	Korea Information Society Development Institute
Kms	Kilometers
KOSIS	Korean Statistical Information Service
KPMG	Klynveld Peat Marwick Goerdeler
KPWKM	Ministry of Women, Family and Community Development
KRW	South Korean Won
KRX	Korea Exchange
KSA	eKYC Service Agency
KT	Korea Telecom
KUA	eKYC User Agency
KYC	Know Your Customer
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
LGN	Local Government Network
LICT	Leveraging Information Communication Technology
LKR	Sri Lankan Rupee
LRT	Light Rail Transit
LTA	Land Transport Authority
LTE	Long Term Evolution
M&A	Mergers and Acquisitions
M2M	Machine to Machine
MAIT	Manufacturers Association Of Information Technology
MAS	Monetary Authority of Singapore
MB	Mega Byte
MBIE	Ministry of Business, Innovation and Employment
Mbps	Megabits Per Second
MCI	Singapore Ministry of Communications and Information
MDEC	Malaysia Digital Economy Corporation
MEITY	Ministry of Electronics and Information Technology
METI	Ministry of Economy, Trade and Industry
MIC	Ministry of Internal Affairs and Communications
MIC	Marketech International Corporation
MICT	Ministry of Digital Economy and Society
MII	Make in India
Mn	Million
MNC	Multinational Corporation
MNO	Mobile Network Operators
MOEA	Ministry of Economic Affairs
MOOC	Massive Open Online Courses
MOSPI	Ministry of Statistics and Program Implementation
MP	Malaysia Plan
MRT	Mass Rapid Transit
MSC	Multimedia Super Corridor
MSIP	Minister of Science, ICT and Future Planning
MSO	Municipal Services Office
MSTB	Malaysian Software Testing Board
MVNO	Mobile Virtual Network Operators

APPENDICES: LIST OF ABBREVIATIONS

Abbreviations	Full form
NASSCOM	National Association of Software and Services Companies
NB	Narrowband
NBN	National Broadband Network
NBTC	National Broadcasting and Telecommunications Commission
NCC	National Communications Commission
NEA	National Environment Agency
NEC	Nippon Electric Company
NESDB	National Economic and Social Development Board
NFC	Near Field Communication
NFP	National Manufacturing Policy
NGO	Non Government Organization
NICI	National Information and Communication Initiative
NIICT	National Institute of Information and Communications Technology
NIIT	National Institute of Information Technology
NITA	National IT Agenda
NOFN	National Optical Fibre Network
NPCI	National Payments Corporation of India
NSP	National Software Policy
NSW	New South Wales
NTD/NT$	New Taiwan dollar
NTT	Nippon Telegraph & Telephone
NTU	Nanyang Technological University
NUS	National University of Singapore
NZ	New Zealand
NZIE	Net Zero Import in Electronics
O2O	Online to Offline
OECD	Organisation for Economic Co-operation and Development
OFC	Optical Fiber Communication
OLED	Organic light-emitting diode
OTT	Over-The-Top
PC	Personal Computer
PIC	Property Identification Code
PIKOM	Persatuan Industri Komputer dan Multimedia Malaysia
PIRSA	Primary Industries and Resources SA
PMGDSA	Pradhan Mantri Gramin Digital Saksharta Abhiyan
PMJDY	Pradhan Mantri Jan Dhan Yojana
POS	Point of Sale
PPP	Public-Private Partnership
Q-Tap	Quality-Test Assist Programme
R&D	Research & Development
RBI	Reserve Bank of India
RTI	Right to Information
S	Strategy
S$	Singapore Dollar
SA	South Australia
SaaS	Software-as-a-Service
SDV	Self-driving Vehicles
SEBI	Securities and Exchange Board of India
SGD	Singapore Dollar
SIM	Subscriber Identity Module

APPENDICES: LIST OF ABBREVIATIONS

Abbreviations	Full form
SIPA	Software Industry Promotion Agency
SIU	Social Investment Agency
SLASSCOM	Sri Lanka Association for Software and Services Companies
SLT	Sri Lanka Telecom
SMART	Singapore-MIT Alliance for Research and Technology
SME	Small and Medium Enterprises
SPDMF	Software Product Development Market Forecast
SPDMF	Singapore Post
ST	Singapore Technologies
Stats	Statistics
STD	Subscriber Trunk Dialing
STEM	Science, Technology, Engineering and Mathematics
SUBB	Sub-Urban Broadband
T	Thrust
TB	Tera Byte
Tbps	Terabit per Second
TCS	Tata Consultancy Services
TeSA	TechSkills Accelerator
TMON	Ticket Monster
TOC	Table of Contents
TPG	Total Peripherals Group
Tr	Trillion
TRAI	Telecom Regulatory Authority of India
TS	Traditional Spend
TSMC	Taiwan Semiconductor Manufacturing Company
UDC	Union Digital Centers
UDC	Union Digital Center
UFB	Ultra-Fast Broadband
UHD	Ultra-High-Definition
UIDAI	Unique Identification Authority of India
UPI	Unified Payments Interface
VAT	Value-added Tax
VC	Venture Capital
VD	Vietnamese Dong
VECITA	Vietnam E-Commerce and Information Technology Agency
VN	Value Notes
VNPT	Vietnam National Post & Telecommunications Corporation
VOD	Video On Demand
VoLTE	Voice over Long-Term Evolution
VR	Virtual Reality
VTC	Vietnam Multi-Media Communications Group
WA	Western Australian
WCAG	Web Content Accessibility Guidelines
WEF	World Economic Forum,
Wi-Fi	Wireless Fidelity
WIP	Work in Progress
WITSA	World Information Technology And Services Alliance
WNS	World Network Services
WofG	Whole-of-government
y-o-y	Year-Over-Year