Knowledge Series on ICT for Development

Digital Strategies for Development Forum 2017

December 2017

50 YEARS

ADB

KNOWLEDGE SUMMARY

Digital Strategies for Development Forum 2017
7-8 September 2017, Asian Development Bank
Manila, Philippines

Digital technologies greatly impact the economic and societal development of nations. With the advent of the Fourth Industrial Revolution (4th IR), many changes are bound to happen: people's way of doing things, commuting to and from work, learning, teaching, and meeting others. With the change comes questions that may challenge those who are in the middle of all these successive disruptions.

According to a United Nations (UN) report released in 2016, "by end 2016, 3.5 billion people will be using the Internet, up from 3.2 billion last year and equating to 47% of the global population."

However, even with these staggering facts, it still remains true that while billions are online, a sizable part of that population may not be using the Internet to its full potential. And this problem needs to be addressed early on, as knowledge of the digital world has been proven to solve the biggest issues in two of the biggest sectors today: education and transportation.

The Asian Development Bank (ADB) notes that adoption of digital technologies can allow developing countries to leapfrog over traditional development pathways—from resource-based economies and labor-intensive industries to the production of knowledge-based products and services.

In line with this, ADB hosted the 2017 Digital Strategies for Development Forum (DSDF) on 7-8 September 2017 at the ADB Headquarters in Manila, Philippines. Established in 2014 as the Digital Strategies for Development Summit, the event has become a venue for high-impact discussions on ICT for Development. It tackles country, sectoral and thematic development strategies toward Digital Economy in Asia and the Pacific.

DSDF 2017 focused on both areas of education and smart cities, in the context of digital technologies development within the 4th IR. It also served as a venue for organizations to discover ways to be prepared on adaption within the 4th IR backdrop.

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About the Forum

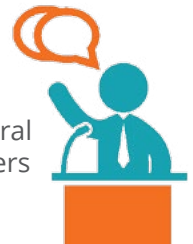| Forum Dates:	Forum Delegates:	Speakers:
7-8 September 2017	**300+** from all over the region	**40+** International ICT and sectoral thought leaders and speakers

Organisers:

Asian Development Bank	Asia-Pacific Telecommunity	Asia Society for Social Improvement and Sustainable Transformation	Department of Information and Communications Technology	United Nations Educational, Scientific and Cultural Organization

DAY 1	7 September 2017		
Time		**Speaker/Organisation**
08:00 - 09:00 a.m.	Registration	
09:00 - 09:15 a.m.	**Welcome Remarks**	Stephen Groff *Vice President (Operations 2),* *Asian Development Bank (ADB)*
09:15–09.45 a.m.	**Opening Address**	Areewan Haorangsi *Secretary General,* *Asia-Pacific* *Telecommunity (APT)*
	Message from the DICT Secretary	John Henry Naga *Assistant Secretary, Department of* *Information and Communications* *Technology (DICT), Philippines*
THE FOURTH INDUSTRIAL REVOLUTION		
10:15-10:45 a.m.	**Keynote Speech** "The Fourth Industrial Revolution: Its Impact on Business, Society and Development" In his keynote speech, Sandeep Aneja talked about the impact of the 4th IR on various sectors — business, social, and development — and how these will be shaped by the revolution.	Sandeep Aneja *Managing Partner* *Kaizen Private* *Equity*
10:45 - 12:30 p.m.	**Plenary Session** "How Ready are We? Digital Strategies for the 4th IR" The session highlighted various digital strategies in private and public spaces as the 4th IR happens.	Moderator: Sreenivas Narayanan *Managing Director, Asia Society for Social Improvement and Sustainable Transformation (ASSIST)* Ramanathan Ramanan *Senior Vice President* *TATA Consultancy Services* Shrikant Sinha *CEO, National Association of Software and Services Companies (NASSCOM) Foundation* Simon Gee *Managing Director* *TechSoup Asia-Pacific* Rey Lugtu *President and Managing Director,* *The Engage Philippines* Emanuela Lecchi *Head, Public Policy, GSMA* Shirin Hamid *Principal Director, Office of Information Systems of Technology (OIST), ADB*
12:30 - 1:30 p.m.	**Lunch**	

Time	Speaker/Organisation
FUTURE SKILLS AND EDUCATION	
01:30-03.00 p.m.	**Plenary Session** Future Skills and Education The two presentations in this segment examined transformation, trends, and implications of ICT in the whole learning system — from management to delivery of interventions. "E-ducation: The Future of Education and Training" "Transformation of Education and Skills Development Preparing for the 4th Industrial Revolution Era" 	 Moderator: Brajesh Panth *Technical Advisor, Education, ADB* Vincent Quah *Business Lead, Asia Pacific & Japan, Global Public Sector, Amazon Web Services* Holly Clark *Educational Strategist, EdTechTeam* Peck Cho *Distinguished Professor, Sookmyung Women's University, Republic of Korea*
03:00-03:30 p.m.	**Networking Break**	
03:30-05:00 p.m.	**Breakout Sessions** Education These breakout sessions tackled the opportunities through which ICT has been contributing to improved access to education, the delivery of quality learning and teaching, and overall education administration.	
	4A. Teaching Teachers: Preparing Trainers for ICT in Education The session looked at how the teachers and trainers can fully be prepared to reap the benefits of ICT in the education sector. 	Moderator: John Ruero *President, Philippine Society for IT Educators (PSITE)* Jonghwi Park *Programme Specialist, Educational Innovation and Skills Development, United Nations Educational, Scientific and Cultural Organization (UNESCO)* Holly Clark *Educational Strategist, EdTechTeam* Samuel Harris *Educational Specialist, Amazon Web Services* Sungsup Ra *Director, South Asia Department (SARD) Human and Social Development Division (SAHS), ADB*

DAY 1 | 7 September 2017		
Time		**Speaker/Organisation**
03:30 - 05:00 p.m.	**4B. Beyond the Books: e-Learning Contents and Digital Technologies at Classrooms** The session tackled trends in digital classroom tools that are meant to facilitate more efficient and more engaging learning processes. 	Shanti Divaharan *Associate Dean, Pedagogical Development and Innovations, National Institute of Education, Singapore* Rabi Karmacharya *Executive Director, Open Learning Exchange (OLE) Nepal* Eiko Izawa *Unit Head, Project Administration, Social Sector Division, Central and West Asia Department, ADB* Moderator: Natalie Jorge *Executive Director, Bato Balani Foundation*
	4C. Localized ICT4E: Integrating ICT in Education Sector Development Program The session featured case studies on the roles and methods that ICT has played in various national government educational reform programs — in both the traditional classroom-oriented setting, and in non-classroom setup and vocational education. Representatives from various countries showed how their organizations managed to apply ICT in their local education context. 	Aida Yuvienco *Director for Information and Communications Technology Service Department of Education (DepEd), Philippines* Yeshey Lhendup *Deputy Chief Programme Officer, Ministry of Education, Bhutan* Dae Joon Hwang *Professor, Sungkyunkwan University, Republic of Korea* Norman LaRocque *Principal Education Specialist, Central and West Asia Department, ADB* Shanti Jagannathan *Senior Education Specialist, South Asia Department, ADB* Moderator: Lovelaine Basillote *Executive Director, Philippine Business for Education*
06:00 p.m.	**Welcome Dinner hosted by DICT Philippines** Venue: Ballroom BCDE, Crowne Plaza Manila Galleria	

Programme

Time		Speaker/Organisation
DAY 2	**8 September 2017**	
08:00 - 09:00 a.m.	Registration	
09:00 - 09:30 a.m.	**Introductory Session**	
09:30-11:30 a.m. Chaired by Bambang Susantono *Vice President for Knowledge Management, ADB* 	**Roundtable Discussion on High Level Technologies—Implication for Development** In his keynote speech, Ramanathan Ramanan analyzed how the adoption of high-level technologies help address development challenges. Sector representatives in the panel discussion discussed challenges and opportunities that high-level technology may present in their respective industries. 	**Keynote Speech** Ramanathan Ramanan *Senior Vice President* *TATA Consultancy Services* **High-Level Roundtable Discussion** Ramanathan Ramanan *Senior Vice President* *TATA Consultancy Services* Jeffrey Tung *Head of R&D, Singapore & Southeast Asia, 3M* Sandeep Aneja *Managing Partner, Kaizen Private Equity* Holly Clark *Educational Strategist, EdTechTeam* Vincent Quah *Business Lead, Asia Pacific & Japan, Global Public Sector, Amazon Web Services*
SMART CITIES AND SMART MOBILITY		
01:00 – 02:30 p.m.	**Breakout Sessions** Smart Mobility These breakout sessions took a closer look at how ICT can affect certain smart city components, and how it aims to empower organizations to utilize these tools for the improvement of their business and the industry as a whole.	
11:00 – 11:15 p.m.	**6A. What Makes Urban Transportation System Smart?** This breakout session discussed the key components of the transportation systems of the future, particularly cloud-based services and e-payment services, which are being steadily adopted for their convenience and simplicity. 	Bryan Wong *Public Sector Lead – ASEAN, Amazon Web Services* Silvester Prakasam *Director, Fare System, Land Transport Authority, Singapore* Shigetoshi Tamoto *Senior Vice President, ITS Japan* Moderator: Akihiko Katayama *Director, Strategy and Emerging Technology, PwC Hong Kong, China*

Time		Speaker/Organisation
01.00 - 2.30 p.m.	**6B. 5G, IoTs, and Sensor Networks: The Bloodstream of Smart Cities** The breakout session delved deeper into the importance of broadband internet, 5G, Internet of Things, and sensor networks in a true smart city. It will analyze how different components of a smart city function and stay connected anytime, anywhere.	Duncan Macintosh *CEO & Executive Director* *APNIC Foundation* Dai Young Jung *Assistant Director* *Busan Metropolitan City* Arun Ramamurthy *Senior Public Management Specialist,* *Sustainable Development and Climate* *Change, ADB* Moderator: Guillaume Mascot *Head of Government Relations & APJ India,* *NOKIA*
	6C. Plugged-in: Building Out Electric Vehicles and Charging Infrastructures The session presented the current technologies being applied on electric vehicles and charging infrastructure, and how these have been working in advanced cities in different parts of the globe.	Terence Siew *Regional Manager, Asia, Greenlots* Edmund Araga *Vice President, Electric Vehicles Association of the Philippines (eVAP)* Anthony Agoncillo *EV Project Manager, Meralco* Yongping Zhai *Technical Advisor, Energy, Asian Development Bank (ADB)* Moderator: Marie Danielle Guillen *Senior Advisor, Transport & Climate,* *Deutsche Gesellschaft Fur Internationale* *Zusammenarbeit (GIZ) GmbH*
03.00-04.00 p.m.	**Closing Plenary** "Networks for Networks: The Role of Stakeholders and the Need for Integration, Collaboration, and Cooperation" The session linked together all the information from the two-day Forum by putting at the fore ways on how the attendees can work together and maximize the opportunities for collaboration. Through the panelists, the delegates were urged to go beyond the conventional partnership ideas and instead forge smart partnerships for a smarter future.	Ramanathan Ramanan *Senior Vice President, TATA Consultancy* Akihiko Katayama *Director, Strategy and Emerging Technology, PwC Hong Kong, China* Monchito Ibrahim *Undersecretary, Department of Information and Communications Technology (DICT)* Gil-Hong Kim *Senior Director concurrently Chief Sector Officer, SDCC Sector Advisory Service, ADB* Areewan Haorangsi *Secretary General, Asia-Pacific Telecommunity* Moderator: Sreenivas Narayanan *Managing Director, Asia Society for Social Improvement and Sustainable Transformation (ASSIST)*
04.00 - 04:15 p.m.	**Closing Remarks**	

Asia in the 4th Industrial Revolution

Stephen Groff, ADB's Vice President (Operations 2), during his opening remarks

Fintech, artificial intelligence, nanotechnology. We are bombarded daily with news of the latest disruptive technology.

Many people fear that greater use of artificial intelligence and robots could eliminate a wide range of jobs; not only in manufacturing, but also in the service sector.

ICT is also expected to have disruptive impacts on urban areas — which currently drive economic growth — and where more than 40% of the population resides. By 2050, more than two-thirds of the region's population will reside in urban centers.

The scale, speed, and density of Asia's urbanization present many challenges. For example, the rapid increase in motorized vehicles is creating more congestion, air pollution, traffic accidents and greenhouse gas emissions.

We are indeed facing extraordinary challenges.
How can we cope with these changes?
How can we protect jobs?
How can we make our economies more competitive?

Fortunately, we have experience to draw on. The First Industrial Revolution replaced horsepower with steam power. The Second Industrial Revolution replaced steam engines with electricity. The Third Industrial Revolution harnessed information technology and automation. And now we are on the precipice of the Fourth Industrial Revolution.

While formidable, 4IR offers great potential for inclusive growth as it is marked by the fusion of digital technologies with biotechnologies, by exponentially fast processing power and machine learning, and by the Internet of Things linking assets and data worldwide. Advancements in technology permeate every aspect of social and economic activity and, indeed, human life.

A great example of how ICT can bring about inclusive development through skills training and entrepreneurship in urban areas is ADB's work in Myanmar.

In a country where only one in five people have internet access, ADB is supporting telecom companies to develop mobile apps for agriculture, finance and health (including maternal health). We are also supporting Geek Girls Myanmar, a network which teaches women how to use the internet and offers support for women entrepreneurs and innovators, with the aim of bringing female tech geeks to the forefront of change in the country.

Another important element of good governance is transparency or the ability of the public to access information using mobile and information technologies. This is helping both officials and citizens track progress on construction of infrastructure assets, on learning outcomes for students, and the targeting of social transfer payments through ICT and biometrics.

The 4th Industrial Revolution offers huge potential to tackle Asia's development challenges. If we use new technologies better, the benefits of the digital revolution could be massive. New innovations like cloud computing, big data, and the internet of things are already improving our daily lives through their use in e-commerce, healthcare, and trade.

I hope this Forum will produce recommendations on how Asia can better prepare for 4IR and benefit from the opportunities it offers for equitable, inclusive and sustainable growth. I wish you a warm welcome to ADB, and to the 2017 Digital Strategies for Development Forum.

Areewan Haorangsi (right, with microphone), Secretary General of the Asia-Pacific Telecommunity (APT), with Monchito Ibrahim (2nd from right), Undersecretary of the Philippines' Department of Information and Communications Technology, and other distinguished speakers from various ICT-related organizations, during the closing plenary.

Bridging the Digital Divide

Information and communications technology (ICT) may have helped boost economic growth, expand opportunities for citizens and businesses, and improve service delivery in many parts of the world, but its actual impact remains unevenly distributed.

More than four billion people still do not have access to the internet, and 90 percent are from the developing world. Bridging this digital divide is crucial to ensure equal access to information and knowledge, as well as foster innovation and entrepreneurship.

In her opening address, Secretary General Areewan Haorangsi of the Asia-Pacific Telecommunity (APT), said making the internet as widely accessible globally should thus be a priority. She said this will also be aligned with meeting one the UN Sustainable Development Goals which is to significantly increase access to ICT and strive to provide universal and affordable access to the internet in least developed countries by 2020.

APT, which serves as the organization for ICT in the region, welcomes a collaboration with other stakeholders to turn this goal into reality.

For the next three years, she said APT will focus on five strategic pillars: connectivity, innovation, trust, capacity building, and partnership — which are all closely related to the achievement of sustainable development.

Embracing Digital Strategies

The Philippines has managed to sustain its economic momentum despite the emerging challenges in the global environment. However, for the nation to continue its growth trajectory, it must embrace enabling policies for ICT development that will help its population of more than 105 million benefit from the the onset of the 4th Industrial Revolution.

"The challenge is streamlining our investments towards an integrated digital economy," said John Henry Naga, assistant secretary of the Department of Information and Communications Technology (DICT).

Cognizant of the role of ICT in a knowledge-based society, the Government of the Philippines unveiled its "Philippine Digital Strategy" that envisions a digitally empowered, innovative, globally competitive and prosperous society where everyone has reliable, affordable and secure information access in the Philippines. A government that practices accountability and excellence to provide responsive online citizen-centered services. A thriving knowledge economy through public-private partnership."

In line with this, the DICT rolled out a National Broadband Plan in 2017 to accelerate the deployment of fiber optics cables and wireless technologies to improve internet speed in the country. "The vision is to have open, pervasive, inclusive, affordable, and trusted internet access" that will make "participatory democracy" a reality, Mr. Naga said.

# 4IR: Impact on Business, Society, and Development

The Fourth Industrial Revolution (4IR) is characterized by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and challenging ideas about what it means to be human.

Ask which are the most populous countries in the world and the answers are obvious: China and India. "But fast forward into the future, and the answer may be different," said Sandeep Aneja, founder and managing partner of Kaizen Private Equity, Asia's first and largest education-focused fund established in 2010.

As it is, technology is already changing the valuation of assets. "Imagine this: the largest taxi company in the world — Uber — does not even own a single taxi, nor does the world's biggest hotel, AirBnb, own a single room," Mr. Aneja said. The value of owning an asset has been depleting over time and the platform creating the asset is becoming more valuable.

In his keynote speech at the Digital Strategies for Development Forum 2017, Mr. Aneja said technology has started to change the way people think, behave and interact with one another. He cited the case of Facebook, which currently has more than two billion monthly active users, which could command more loyalty than a country with billions of citizens. "Many lines are going to get blurred and disruption could be the new norm, and is already is," Mr. Aneja stressed.

He said the first three industrial revolutions, from 1784 to 1969, were all about efficiency. The 4th IR, however, delves more on intelligence — "a market shift that requires a paradigm shift," he said.
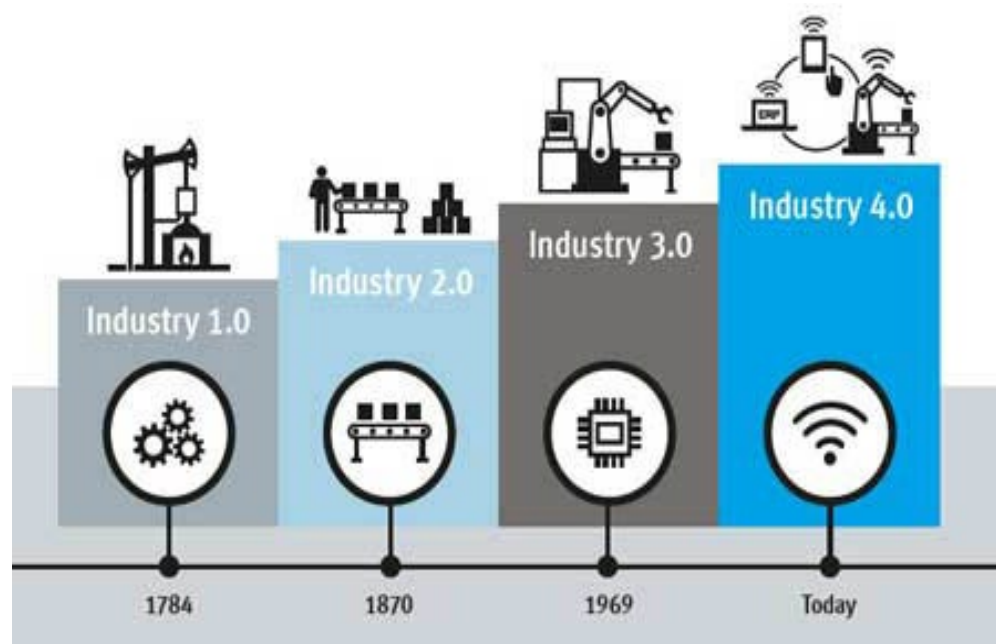
Mr. Aneja identified some game-changing trends that people and organizations should watch out and be prepared for.

1. The speed and magnitude of change is bound to be immense. Mr. Aneja said this is because nine different types of technologies — such as Big Data and analytics, autonomous robots, augmented reality, cloud, and cybersecurity — are coming together to power the 4th IR. These technologies are way more powerful than those that created the first three industrial revolutions.

2. Manufacturing will have to be nimbler. He said "on-demand" manufacturing and mass customization will change the makeup of factories in the future. "We can be in a utopian situation where we can produce customized items at a very low cost," especially with the advent of 3D printing, he added.

This has dramatic implications on business models as companies thriving on mass production will now have to contend with smarter and more technology-savvy young players. "So factories have to be nimble and ready to take up the challenge of mass customization," he said.

3. There will be no need to outsource jobs. As the cost of labor goes down, and as machines become more intelligent, the overall cost of production is expected to go down. This means offshoring will lose its advantage as the location of a factory will no longer be a cost issue. There will also be benefits to the environment as carbon footprint from locating and shipping elsewhere around the globe will be minimized or avoided.

4. Job security will be theatened. Digital disruption poses a threat to job security. According to the World Economic Forum, around 7 billion jobs will be wiped out by 2020 and 15 billion by 2025. Billions of jobs are expected to be lost over the next decade. Therefore, people's ability to solve complex problems and think critically will be as valuable and in-demand — if not more so — as hard technical skills.

5. No more walls. Collaborations will accelerate as companies look to their neighbors to address their needs for skill sets. This will bring down physical and regulatory borders and barriers. "Conducting business meetings real-time in a holographic fashion will be a norm," Mr. Aneja said.

6. People will be forced to be creative. The biggest threats to jobs are automation and artificial intelligence. For instance, drivers will lose their jobs to driver-less or self-drive cars, which can happen by 2030. So what lies for humans in the 4th IR? "To be successful, you will have to aim to be creators of goods that others will consume. People who will succeed in this revolution are those who invest, invent, and consume," said Mr. Aneja.

7. Mind the gap. Half of the world's population today has no access to the internet and a fifth does not have electricity. This means many are still in the Second or Third Revolutions. How we bridge this "digital divide" remains a huge challenge in the future.

Sandeep Aneja, managing partner of Kaizen Private Equity, discusses the technologies and trends that are transforming the way we live and work.

8. Thinking outside the box is not enough. People will have to be ready to "learn, re-learn, and unlearn at a very rapid pace" such that we can be ready for the next revolutionary opportunity. Machines can take over a lot of the work that are repetitive in nature.

9. Schools have to prepare for the future, too. The "less common, more desired" skill sets in the future are strategic thinking, creative problem solving, leadership skills, and communication skills. Curriculum design has to integrate these so that the next generation will be armed with the skill sets needed to overcome challenges in the 4th IR.

10. Regulators need to open up. For regulators, the formulation of a national policy is going to be tricky, as the future will be more transparent, borderless, and nationalities will blur. Thus the government can no longer afford to be a silo, but has to learn to work and collaborate with the private sector and other stakeholders to better prepare for the future.

"Let's go back to being lazy. Let's go back to being better creators, better innovators, and creative thinkers — people who have better empathy for each other. As we face the challenges of the 4th IR, qualities that make us human and much more are becoming more important. Let us create machines that will help each other cross all divides and effect a much better future for us in the 4th IR," said Mr. Aneja.

(L-R): Plenary moderator Sreenivas Narayanan, managing director of the Asia Society for Social Improvement and Sustainable Transformation (ASSIST), with speakers: Ramanathan Ramanan of TATA Consultancy Services; Shrikant Sinha of the National Association of Software and Services Companies (NASSCOM) Foundation; Simon Gee of TechSoup Asia-Pacific; Rey Lugtu of The Engage Philippines; Emanuela Lecchi of GSMA; and Shirin Hamid of ADB

How Ready are We for the 4IR?

The 4th Industrial Revolution (4IR) — the fusion of different technologies in the digital, physical, and biological spheres — is expected to disrupt everything, from institutional structures of government bodies to operating models of businesses.

In the plenary session, "How Ready are We? Digital Strategies for the 4th IR," panelists highlighted various digital strategies that the private and public sectors are doing to gear up for the next wave.

The panelists agreed on one thing: change is coming and it will not necessarily be a bad thing, as long as people know how to adopt to the change and turn change into an advantage.

Bridging the Digital Divide
On the plus side, Shirin Hamid, principal director, Office of Information Systems of Technology of ADB, said the 4IR will bring a "significantly brighter future," with wider access to technology creating a dramatic impact on poverty reduction, affordable health care, improved service delivery, and economic opportunities from having a shared economy, among others. On the other hand, if not used correctly, the 4IR technologies can also spawn a vast digital divide.

"Asia has an uneven landscape so there are great challenges," she said. While some developed countries have access to greater technologies, others have yet to look at how they can leapfrog using technology. She said ADB's role, therefore, is to spur collaboration among public and private institutions to identify the role of ICT in megatrends such as widening age gaps and climate change. ADB has supported ICT projects close to $15 billion from 2000-2012 and is looking at how it can further contribute, she added.

Changing the Game

Emanuela Lecchi, head of Public Policy of GSMA, said, "There are developing countries that have more connection to the web than to the grid." GSMA represents nearly 800 mobile operators with more than 300 companies in the broader mobile ecosystem worldwide.

She said the mobile industry offers a lot of opportunities for people to get connected faster, but much of its huge investment is not being recognized. For example, "legacy regulations make it difficult for mobile operators to empower digital enterprise," Ms. Lecchi added.

Once issues such as affordability of handsets and data security are resolved, she said huge opportunities from mobile technology can be unlocked. She cited mobile apps that have been developed in India that allow women to press a button to alert their families when they are in danger and a pilot mobile money project in Bangladesh that transforms every ship into a bank on connectivity for rural areas.

"Think of the mobile industry as underpinning the digital economy and thus the 4IR," she added. The industry is also present in all of the United Nations Sustainable Development Goals, proof of its important role in uplifting lives.

Simon Gee, managing director of non-profit TechSoup Asia-Pacific, said 4IR digital technologies are already starting to change the way people work and live. He cited the case in France where a 35-hour week has been implemented since 2000 for companies with more than 20 employees and since 2002 for companies with 20 employees or less. Other countries in Europe as well as Australia are also looking into the future of work and the impact of technological and other changes on jobs. With digital technology, countries can now create a working life model that is fully productive, promotes health, reduces obesity and encourages physical activity.

"In 20 to 50 years, there are not a lot of jobs that we're going to do," Mr. Gee said.

Such phenomenon may also be happening in the Philippines. Rey Lugtu, president and managing director of business consultancy The Engage Philippines, said: "It's just a matter of time before artificial intelligence (AI) eliminates call center work in the country," which relies heavily on the IT and business process outsourcing (BPO) industry for dollar receipts and employment.

Despite this, Mr. Lugtu said Philippine companies seem to have little awareness about the impact of the 4IR and its impact, and thus are unprepared for the next wave. "These technologies are used by companies for four key aspects of their business: engaging customers, transforming brands, optimizing operations, and empowering employees. What's worrying is that only a few organizations understand the opportunities that can be derived from digital transformation," he added.

Ramanathan Ramanan, senior vice president of TATA Consultancy Services and head of Atal Innovation Mission (AIM), said the $150-billion ICT industry in India is being given a "fantastic opportunity to re-imagine business" with the onset of the 4IR. This is the reason the Government of India is investing heavily into turning the 4IR "into a great opportunity than a challenge. It is asking itself: How do we create job creators of tomorrow?" he added. A huge portion of India's more than a billion population is service-oriented so turning job seekers into job creators is a major challenge.

Through AIM, its flagship initiative, the Government of India is training people and promoting innovation and entrepreneurship across the length and breadth of the country.

Shrikant Sinha, CEO of the National Association of Software and Services Companies (NASSCOM) Foundation, said educational institutions "need to wake up to the new challenge" posed by the 4IR. "Everyone of us will be working for multiple jobs, our work life has completely changed," he added.

"We need to change the very fabric of the educational system itself. Our education system is geared towards batch manufacturing processes. We talk about jobs that will be lost, but what jobs are we talking about? Tasks that can be done earlier and repetitive can be done with AI. Today what we have is machine learning," he stressed.

How India is 'Tinkering' its Way into the Future

Ramanathan Ramanan is on a great mission: he accepted a secondment from a senior position in the private sector without pay and allowances to head Atal Innovation Mission (AIM), a flagship initiative of the Government of India to promote innovation and entrepreneurship across the length and breadth of the country. He leads a revolution that dives deeper into India-centric problems to discover India-specific answers for the masses.

Mr. Ramanan said India today is on a cusp of "disruptive innovation," with the government acting as a great enabler as it puts a sharp spotlight on the Fourth Industrial Revolution (4IR) innovations.

Now the fastest growing start-up hub in the world, India's start-up ecosystem is the third largest in the world. It is projected that there will be over 20,000 functioning start-ups by 2020. According to Nasscom, until 2017, India added more than 5,200 new start-ups and was growing at an impressive rate of 7% over the previous year.

Facing Future Challenges Now

The virus of innovation and entrepreneurship has infected the entire country and across sectors like agriculture, irrigation, sanitation, healthcare, education, manufacturing, etc. These involve the use of artificial intelligence, automation and machine learning to solve inefficiencies in areas like healthcare, logistics, education and financial services.

"India has been leveraging on IR 4.0 to solve some grand challenges facing the country," Mr. Ramanan said.

From making the country sewage-free, giving universal access to drinking water and ensuring zero blackout to financial inclusion, India is using digital technology to meet the United Nations Sustainable Development Goals that create positive impact in society and the world.

Firing Up Innovation and Imagination in Schools

Mr. Ramanan is stepping up to the challenge by scaling up the problem-solving skills and cultivating innovative, curious, creative and imaginative young minds at Atal Tinkering Laboratories (ATL) that AIM established. The overall vision is for every school in India to gain access to at least one or more ATL in each district and expand it with the help of state education ministries across the country.

This means more than 700 districts across the country will have ATL-dedicated innovation workspaces of 1,000 to 1,500 square feet where the latest technologies such as 3D printers, robotics, Internet of Things (IOT), miniaturized electronics and do-it-yourself kits are installed. Students from grades 6 to 12 can tinker with these technologies and learn to create innovative solutions with them.

Atal Innovation Tinkering challenges are also regularly held in schools as well as by AIM every month to ensure students remain actively involved in solving problems in their community and in the country.

Among these events was the ATAL Tinkering Fest held for two days in July 2017 in which thousands of students participated and came up with innovative solutions such as a home anti-theft system, a water-pumping car, and light-sensor devices, said Mr. Ramanan.

In addition, the government is also building a supporting ecosystem of innovation with the establishment of Mentor India, a network of professionals and industry experts who can help mentor students at ATL and incubators or startups.

Mr. Ramanan said India has the demographic advantage but needs to nurture its young minds to become a superpower of innovation, value creation and wealth. And only when it has succeeded as a copious habitat for entrepreneurship and problem solver of future challenges will it fulfill its mission, not only for India, but for the planet.

How to Make a City Smart and Livable: The Busan experience

Busan is the second largest city in the Republic of South Korea , with 3.6 million people. It has the fifth busiest container port in the world, and is popular for ship building, maritime industry, and tourism.

In 2015, Busan became the first city in South Korea to become an Internet of Things (IoT) smart test bed. Its vision was simple: be a more livable city.

The central government allocated funds amounting to over US$12 million for the Ministry of Science and Technology. SK Telecom serves as the coordinator of this initiative.

Busan city established an Open Smart City Platform to provide the best public service. SK Telecom and Ntels develop, build, and operate the Open Smart City Platform. A consortium of around 40 companies discover and test prospective city services.

Dai Young Jung, assistant director of the Busan Metropolitan City, shared some of the smart city services that have so far been tested:

- **Smart street light.** An energy-saving type LED lamp that has CCTV functions, wi-fi connectivity, environmental sensor, among others. This is difficult and expensive to maintain so Busan City plans to keep only one or two critical functions.

- **Smart parking.** This promotes enhanced parking efficiency as it aims to reduce the number of cars moving around the city to find parking space. The enhanced image-based smart parking service uses CCTV video analytics for license plate recognition and space detection technologies which feed the data to a parking management system.

- **Safety service for children and the elderly.** This is a smart location management system, based on free, unlicensed frequencies for the disadvantaged people, such as demented elderly, disabled people, and small children.

- **Smart building energy conservation.** The building's energy consumption is monitored and used to design energy-saving measures and establish efficient energy management system.

- **Situation-aware evacuation information system.** This service automatically recognizes emergency situations and provides real-time evacuation guidance. It also helps gauge the necessary emergency response depending on the type of emergency and location.

Since 2015, Korea has tested 26 smart city services in four areas: community safety, traffic improvement, urban living, and energy conservation. Busan City has also set up a Smart City Test-bed Support Center that tests and supports commercialization activities.

(L-R): Plenary moderator Brajesh Panth of ADB, Vincent Quah of Amazon Web Services, Holly Clark of the EdTechTeam, and Peck Cho of the Sookmyung Women's University of the Republic of Korea

Future Skills and Education

The Fourth Industrial Revolution (4IR), driven by digital technology and innovation, is transforming the way knowledge and information are being shared. This makes identifying the right teaching and learning methodologies crucial in order to support the future of jobs.

During the plenary session on "Future Skills and Education," the speakers examined the transformation, trends, and implications of information communication technology (ICT) in the learning system — from management to delivery of interventions. One imperative is for teachers to be "transliterate."

Calling into question the efficacy of current ICT practices in classrooms, Holly Clark, an award-winning educator, said teachers, by "transliterating," need to develop their skills to be fluent in all mediums of information such as coding and social media if they are to teach their students more effectively.

Ms. Clark gave this advice in response to a study conducted by the Organisation for Economic Co-operation and Development (OECD), which found that the bottom five countries with the lowest average daily minutes of using the internet at school scored higher in mathematics, reading, and science than countries that used the internet the most in the classroom.

Using the cloud

While teacher training has been the main focus in improving the use of ICT in classrooms, new technologies are being introduced into the education space, reshaping the teaching-learning landscape.

One such technology is cloud computing, a technology that enables large amounts of data to be stored and readily accessible. This low-cost, high-security, and on-demand delivery service has modernized the pedagogy, empowering teachers to create and disseminate their own curricula, and giving them new roles as facilitators who only monitor and assess students.

Vincent Quah, Business Lead, Asia Pacific & Japan, Global Public Sector of Amazon Web Services, said cloud computing has transformed teaching and learning from the traditional teacher-centered structure into a student-centered one where education is through interactive participation and experiential learning. This method helps students learn independently, leading them to become responsible digital citizens.

Cloud platform technologies are set to have the largest growth in technological services, creating over 14 million jobs. Hence, schools need to equip students with the skills to adapt to the cloud.

Adopting the right policies

Adopting a more holistic approach to using ICT in classrooms has had positive results in many countries. But some countries have proven more successful after turning quality education into a national obsession.

One such example is the Republic of Korea. "The key to Korea's success is education," said Dr. Peck Cho, distinguished professor of the Sookmyung Women's University, Republic of Korea.

> "Introducing ICT in classrooms is not sufficient. Without a change in understanding what learning is all about, ICT will merely increase the quantity and speed of the wrong kind of education."
>
> — Dr. Pek Cho

From backwater in the 1950s when it was still "one of the poorest countries in the world," the country was able to leapfrog "within a single generation" into a flourishing economy that is globally recognized for its world-class education system and thriving innovation hub.

Dr. Cho shares Korea's recipe of success:

1. Make the importance of quality education a matter of national consensus. He said the Government of Korea put all its efforts into the education of children by investing in building schools and training thousands of teachers.

2. Invest in technology to prepare the education system for the Fourth Industrial Revolution. Using information communication technology, Korea now has the potential to enhance skills for anyone, anywhere, anytime, which Dr. Cho called "3A learning."

3. Nurture creativity and socio-emptional skills through ICT. Dr. Cho cautioned that "introducing ICT in classrooms is not sufficient." He said without a change in understanding what learning is all about, ICT will merely increase the quantity and speed of the wrong kind of education.

"We need to develop better, more intelligent education — one that is active, interactive, integrating and contextualized. In short, we need to focus on learning and not on teaching, to leave room for the creativity and the emotions of individuals," he added.

Dr. Cho advised countries against simply copying the formula for success, as well as the mistakes of other nations. "Leapfrog!" he added.

Beyond Books: Singapore and Nepal Experiences

"It has been said that the school of the future is not a building but a culture of competence development," Natalie Jorge, executive director of the Bato Balani Foundation, said at the start of the breakout session on "Beyond the Books: e-Learning Contents and Digital Technologies at Classrooms."

The breakout session discussed trends and current utilization of digital tools to facilitate more efficient and more engaging learning in the classroom.

Singapore: Shifting to Digital Learning

Singapore is one of the most digitally connected and advanced countries in the world. Despite this, using information and communications technology (ICT) to teach in schools is still a slow and careful process.

Dr. Shanti Divaharan, associate dean for Pedagogical Development and Innovations at the National Institute of Education (NIE), shared her experience in training and helping teachers adopt technology-integrated teaching practices in Singapore.

Skills that learners need for the future have changed. Technological advancements are helping create more effective and efficient ways of teaching and learning. However, teaching practices, curriculum, and school structures have not adapted as quickly and accordingly.

To truly reap the benefits of ICT as a tool for education, Dr. Divahan said teachers need to become change agents. The key is to engage and focus on teachers. Teachers can choose to change the way they teach and allow the participation and engagement of students. Armed with the right learning design, teachers can enhance the student's learning experience.

Based on the experience of the NIE, Dr. Divaharan shared this three-step "A3" process for teachers to engage students through ICT:

1. Awareness requires clarifying expectations, crystalizing the outcome, and changing the mindset. Faculty members need to be aware of the outcome of using technology for learning. To do this, NIE provided videos, support staff, and roadshows to raise awareness among the teachers, interact with them, and ask them what support they needed.

2. Acceptance involves providing a conducive environment where teachers can learn to use ICTs for learning. NIE provided a champion group of faculties, technical support, and learning designers who worked with the faculty members in transforming the way they teach their lessons in class. A lot of focus was given to training teachers on learning design, the thinking behind the designs of lessons to make them more engaging for students. In the end, the successful use of digital tools depends not on the technology available or on knowing how to use the technology, but on teachers creating the opportunities for learning.

3. Actualizing is about teachers answering the "why," "how," and "what" in the design of their lessons. Why am I integrating technology? Using technology in the classroom could be for many reasons: to entertain the kids, monitor the children's learning, personalize learning, gather information about learning, opportunities for self-paced learning, receiving and giving immediate feedback. What is the purpose of using technology? "How am I designing the integration?

Shifting from face-to-face to technology-mediated learning should be a seamless, continuous process. In the end, it's the change in the teachers' mindset and attitude towards technology that leads the way, said Dr. Divaharan.

Nepal: Bridging the Education Gap Digitally

Nepal is known for its mountains and hills, which make it a trekker's paradise. However, it is also one of the remotest places on Earth. As such, access to basic services, like education, can be a huge challenge.

Open Learning Exchange (OLE) Nepal has initiated efforts to work with the Ministry of Education to improve the quality of education and promote better access to learning opportunities through the effective use of technology.

Rabi Karmacharya, OLE founder and executive director, believes that technology allows for a more active learning environment, and makes learning fun, relevant, and meaningful for the students. It also helps provide more equitable access to quality education.

In Nepal, when you talk about digital tools, a lot of people think it is about digitizing books. OLE helps raise awareness and promote the different types of digital resources that are available. These include interactive games and activities, which have animation and a feedback mechanism for students; educational videos, such as Khan academy, YouTube, and online courses like massive open online courses; teacher-created lessons, where teachers share their courses and lessons online; online reference materials, such as Wiki, Almanac, Atlas maps, which are more updated than the print encyclopedia; and e-books and texts.

What makes a successful ICT in education program? Mr. Karmacharya identified four factors based on OLE's experience:

1. Digital content. There is a saying that "content is king." However, in Nepal, there was not much content aligned with the school curricula, and that matched the context and the language of the country. OLE is producing digital content that are appropriate to the levels and types of learners. The content is in English, Nepali and one indigenous language. OLE built a digital library, essentially a packaged free online content consisting of 7,000 e-books, Khan academy courses, maps, and the like.

Open Learning Exchange (OLE) Nepal has initiated efforts to improve the quality of education and promote better access to learning opportunities through the effective use of technology in Nepal.

2. Teacher training and support. In Nepal, about 70-80% of the teachers have little or no exposure to technology. The country also does not have a good centralized institution that trains teachers. Thus, efforts must focus on teaching and training the teachers about the use of technology.

3. Technology infrastructure. In promoting digital tools in a country like Nepal, the appropriate technology needs to be identified, especially for remote schools. It also has to be low maintenance, durable, and works in a remote rural-area setting. In remote, rural areas, the cost of Internet access in Nepal is often prohibitive. In Kathmandu, for example, a subscriber has to pay $200 per month for a 4-Mbps service. OLE's solution is to build local intranet in schools.

4. Capacity building and community support. It is important to build the capacity of the locals on the ground. OLE works with the government and develops the content together with the concerned agency within the Ministry of Education, and the local school districts.

The impact of using digital resources in Nepal schools has so far been mixed. Although there was no significant improvement in students' performance in math and science subjects, confidence among students in using technology has risen. Students are also more excited about coming to school and about learning using computers. This, in itself, is already a huge benefit.

The Smart Move:
Making Urban Transport Future-Ready

To efficiently provide public services like transportation, cities must integrate new technologies, which are based on practical data gathered from their intended users.

More efficient uses of information and communications technology (ICT) will pave the way for creating new smart cities, experts say.

Emboldened by Singapore's campaign to become the world's first Smart Nation, other cities have started using technology as a way to improve their public services such as transportation.

Technology provides a sound solution to pressing social problems in urban cities such as congested roads and aging populations. For urban planning and public transport services, it is seen as the key driver to boost efficiency.

Smart City is all about data

"For smart cities in general, it is all about the data" and how it can be captured and put in one place in order to develop smart solutions, said Bryan Wong, public sector lead of Amazon Web Services (AWS) for the ASEAN region.

Mr. Wong presented cloud web services and the components of a successful smart city deployment. He cited AWS projects such as PetaJakarta for disaster preparedness in Jakarta, Indonesia, which brings mobile mapping and flood information; and Chicago's Open Grid for open data, a real-time situational awareness platform that lets citizens explore what is happening around them using 600 public data sets.

For the Peterborough City Council in the United Kingdom, the AWS deployment acts as a hub for all legacy applications, integration to Smart City Internet of Things (IoT) devices, analytics, and SaaS applications for city planning, utility monitoring, and sensor monitoring. Data collected can be used for building a whole suite of solutions to address needs, and in formulating government policies to better manage these needs.

Mr. Wong also discussed New York's "Vision Zero" for public safety and sensor monitoring which uses crowd sourcing to collect traffic safety data and then used to redesign streets and traffic patterns. The goal is to reduce traffic fatalities to zero in New York City.

From Peterborough to Jakarta, Mr. Wong said citizens can use crowdsourcing platforms in their mobile devices to relay data that can help manage and address the needs of society. This highly valuable information can then be used to direct government officials in implementing more appropriate policies and better city planning, guide startups in creating smart solutions for current problems, and assist citizens in their everyday life.

Commuters in Singapore are now able to pay for their public transport fares with just a tap of their mobile phones, thanks to its newly piloted cloud-based ticketing system.

Smart sensors in Singapore

Singapore's bid to become the world's first true Smart City got another boost with the deployment of its cloud-based ticketing (CBT) system in public transport. This is in line with Singapore's vision for a completely cashless public transport system by 2020.

Silvester Prakasam, director of Fare System in Singapore's Land Transport Authority (LTA) said the CBT system enables commuters to use contactless credit and debit cards for fare payments, removing the hassle of carrying and topping up a separate fare card, among many other benefits.

The LTA is also able to reduce its operation costs by eliminating cash top-up points while giving customers the option of using their mobile devices for transport payments.

Since it piloted CBT in March 2017, more than 100,000 commuters have already signed up and an average of over 60,000 transactions daily has been recorded.

Public acceptance grew as commuters are able to enjoy a hassle-free public transport ticketing experience with their contactless credit and debit cards by simply tapping their card on the bus or MRT (Mass Rapid Transit which forms the major component of the railway system in Singapore) fare readers. Commuters are charged for their public transport rides in their credit or debit card bill.

Outsmarting traffic in Japan

Japan is making a big push in intelligent transportation systems (ITS) to solve the country's increasing traffic congestion. Shigetoshi Tamoto, senior vice president of ITS Japan, said Japan is currently expanding its electric toll collection by having a dynamic toll charging and freight operation support (real-time location management and safe driving management) to reduce traffic congestion by 50%.

To cope with its rapidly growing aging population, Japan is also piloting Automated Driving Systems for Universal Service (ALDUS), and has allocated a budget of ¥2.7 billion in 2016 alone, said Mr. Tamoto. Using ALDUS, Japan will be able to enhance mobility for the aged, as well as greatly reduces traffic congestion and driving workload.

Despite all the vast benefits that technology bring to the transportation sector, societal challenges still remain. As technology advances at an ever-rapid rate, elderly populations are forced to change their mindset to enable more learning and interaction with new technologies. And as more cities shift to cashless transactions, those without bank cards and less tech-savvy will be left out.

There is thus a need to veer away from creating smart cities and instead move towards using technology to enhance the quality of life, solving societal challenges from the ground up, the experts said.

The Long and Winding Road: Challenges for E-Vehicles and Charging

It seems eons ago when Elon Musk, the brains behind Tesla, started talking about the glittering future of electric vehicles (EV). Now, almost every economic powerhouse and major carmaker in the world are jumping into the EV bandwagon.

The EV population has been doubling each year since 2013 and has already breached the two-million mark in 2016, said Terence Siew, regional manager in Asia of California-based Greenlots, developer of intelligent solutions for EV charging. Worldwide, EV sales are projected to hit 70 million by 2040, comprising 54% of all new cars by then.

While EV makers are riding on this bullish trend, industry experts agree there are still many stumbling blocks. One of the biggest obstacles to why EVs still have not caught on is the significant lack of effective EV charging stations.

Meralco plans to put up charging stations and electric vehicles as well as provide EV public shuttles. It also announced that it is setting up a subsidiary to engage in the business of owning, maintaining and operating transport service networks of charging stations, batteries and vehicles utilizing electric energy and other alternative energy sources.

When it comes to EV charging stations, experts agree there have been a plethora of possibilities but it is still currently a tangled mess. Stakeholders must, therefore, work together towards the common goal of moving EVs into the mass market. Before consumers and manufacturers can plug into their EV future, here are the hurdles they have to overcome first:

1. Lack of access to EV charging stations.
Tonichi Agoncillo, EV project manager at the Manila Electric Company (Meralco), said the main driver of EV adoption is customers' desire for cost savings and environmental advocacy. However, he said customers are still hesitant to buy EVs due to concerns regarding access to charging, price, and driving range.

Interestingly, unlike in many developed countries, EV adoption in the Philippines is driven by jeeps and trikes, among the country's biggest polluters and whose user demographic is from the low-income classes who have less education and limited formal driving experience.

These obstacles prompted Meralco, the Philippines' dominant power distributor, to result to ingenious solutions such as supporting eTrikes and eJeeps through the energization of depots and charging stations. Meralco also built proof-of-concept EV charging racks and stations in several strategic locations in Metro Manila. It also offers EV consultancy services and work with its customers for cost-efficient sites, potential designs, and alternative revenue models. In addition, it developed two charging pods in the market and is also studying fast charging.

2. Lack of incentives for EV and charging stations.

Edmund Araga, vice president of the Electric Vehicle Association of the Philippines (EVAP), said EVs remain heavily taxed in the Philippines despite the continuous promotion of e-jeepneys and e-trikes. This is why EVAP is pushing for the approval of legislation that will give fiscal and non-fiscal incentives incentives to electric and hybrid vehicles.

EVAP is also urging the government to fully implement the eTrike Program of the Department of Energy and Asian Development Bank (ADB) or offer an alternative program that extends the same financial support. Mr. Araga also stressed the importance of developing the export market for EVs that would make the Philippines a manufacturing hub, and for pursuing the public utility jeepney modernization program that would convert high-polluting jeepneys into e-jeeps.

3. Lack of universal access and stable electricity.

Energy is a key ingredient in the electrification of the transport sector and without it, EVs would remain a pipe dream for many.

Yongoing Zhai, technical advisor for energy at ADB, said as much as 400 million people in Asia still do not have electricity and over a billion with low quality and unreliable supply of power. Environmental issues such as severe pollution and growing CO2 emission are also major challenges that should be addressed. Hence, to promote electrification of the transport sector, it is necessary to ensure that reliable and affordable electricity is available at all times in the country, he added. ADB's energy sector support energy investments to increase energy access and promote low-carbon power generation.

When developing EVs, Mr. Zhai said the country must consider relying on the private sector and market forces instead of government policy instructions or government subsidies.

He further noted that for a pilot project to avoid causing issues with other stakeholders in the sector, it is important to solicit feedback from the rest of the sector.

Making EV charging simple and accessible

So you are now a proud owner of an electric vehicle (EV). But do you have to drive miles to find a charging station that would cost you an arm and a leg?

Greenlots, an open standard charging network operator, has come up with low-cost networked solutions that enable car park owners, employers, municipalities, utilities, automotive and other businesses to own and operate their own EV charging network.

Terence Siew, regional manager in Asia, said privately held Greenlots has sold its Smart Energy System in 13 countries since 2008.

How does it work? Currently, the e-mobility ecosystem is comprised of the EV drivers, automakers, the building owners, the charging hardware suppliers, and the utility and grid operators. Greenlots puts itself at the center of the ecosystem as it provides charging solutions for EVs and serves as a facilitator to coordinate between each of these major stakeholders.

Originally established in Singapore in 2008, Greenlots has since scaled up into a global EV charging network operator, with operations in 13 countries and offices in North America. Its partnership with BMW Group Asia in Singapore in 2014 has led to the setting up of Singapore's first-ever   home and public charging network as part of BMW's 360° electric program. The partnership has enabled BMW customers in Singapore to access its vast and expansive network of AC charging units by using the BMW i ChargeNow card and Greenlots' mobile app.

Mr. Siew said Greenlots is looking to expand beyond its current operations in Singapore, Hong Kong, Malaysia, and Thailand into new countries in parallel to establishing relationships with new partners. He has big plans to bring together public EV charging stations and battery storage with the power of its network and cloud technologies in order to level up EV charging infrastructure in Southeast Asia and North America.

(Seated, L-R): Plenary moderator Bambang Susantono, VP for Knowledge Management of ADB; Sandeep Aneja, managing partner of Kaizen Private Equity; Ramanathan Ramanan, SVP of TATA Consultancy Services; Holly Clark, educational Strategist, EdTechTeam; Vincent Quah, Business Lead, Asia Pacific & Japan, Global Public Sector, Amazon Web Services; and Jeffrey Tung Head of R&D, Singapore & Southeast Asia, 3M

Impact of High-Level Technology

The adoption of high-level technology (HLT) is expected to produce profound effects on developing economies. But in order to reap these benefits, nations must know how to leverage the HLT in development activities and tackle the challenges and opportunities.

During the plenary session on the impact of HLT on development, the panelists said the Fourth Industrial Revolution (4IR) has a potential to raise global income levels and improve the quality of life around the world. On the other hand, this revolution could also lead to greater inequality, particularly in the job markets, as routinary human tasks across entire sectors may be replaced with machines and automation.

However, the panelists agreed that the benefits of the digital revolution could be massive if people know how to use new technologies better.

Panelists talked about the continuing development and use of artificial intelligence, big data, and cloud computing in different aspects of business and development. They also pointed out, however, that these HLTs may only be the tip of the iceberg.

As in many development areas, both the public and the private sectors must work hand in hand to preparate for the 4IR.

Ramanathan Ramanan, senior vice president of TATA Consultancy Services, said governments have a key role to play in creating an enabling environment for an innovation infrastructure. This includes, among others, building an information infrastructure and a regulatory environment for innovation.

He cited the case of India, where a culture of innovation and entrepreneurship is getting massive support from the government through its flagship project, Atal Innovation Mission (AIM). The AIM serves as a platform for promoting world-class Atal Tinkering Labs, which builds a support ecosystem for start-up businesses and other self-employment activities, particularly in technology-driven areas.

While it is important to invest on the development of a platform for innovation, Dr. Jeffrey Tung, head of R&D, Singapore & Southeast Asia Region, of 3M, said there are also two things that must be considered: the innovation platform should be "borderless and consistent in foundational principle," and that the investor should be patient enough to wait for the results.

Such is the case at 3M, whose heavy investment in research and development helps produce more than 3,000 patents each year. "3M has successfully transformed such diverse ideas into business assets and innovative products," he added.

New opportunities
Technologies and innovations have also created opportunities, not only to enhance productivity, but also in creating a whole new set of categories of products, markets and services. Services such as cloud computing, fintech, big data analysis, voice/video calls via mobile devices, and the sharing economy have tremendously improved daily lives.

Vincent Quah, Business Lead, Asia Pacific & Japan, Global Public Sector of Amazon Web Services (AWS), a global leader in cloud computing, agrees that,

"innovation does not come out of blue, but from accumulated knowledge and trials." This is especially so when development contexts get more complex and the demands of people become higher and diverse, he added. There is no longer a cure-all solution for any development mission.

In the case of cloud computing, Mr. Quah said this can provide a flexible, agile, scalable platform for digital technology-based innovations. Since intriducing cloud computing solutions in 2006, he said AWS has helped reduce prices 62 times. " "Don't overthink innovation. You can create innovation today because you have access to technology today. Think of innovating your process; it can be highly productive and efficient. Innovation in the end must turn out to be an outcome that benefit a broader and wider community."

Preparing for the next wave
Given the increasing demands on digital technologies for development in developing countries, a lot of preparation must be done to maximize the benefits in the Digital Economy Era.

"Just like a knife, technology can create and destroy," said Mr. Ramanan. So a lot of factors have to be considered for technology to be a great enabler, he stressed. He cited the case of the young inventor of the prosthetic arms made possible through 3D printing technology. "It's no longer a game of 'survival of the fittest.' There's an opportunity for us for the first time to bring more quality to life with the aid of technology," he added.

Another is sparking innovation. "Value failure and experimentation in schools. Teach kids what they have to be ready for," Ms. Clark said. One is equipping future learners with the skill to discern information. "Most of the digital citizenship (initiatives) I know is not about validating fake information, but more on how to protect yourself from hackers. It's critical to teach kids how to find information on Google and how to validate it," she added.

Even as 4IR technologies are rapidly changing the way people live and work, the panelists agreed that the most important but difficult task is the transformation of people themselves. Without a massive shift in people's mindset and culture, nothing meaningful will happen. In the face of 4IR, people must "learn, relearn, and unlearn," they said.