Preparing ICT Skills for Digital Economy: Indonesia within the ASEAN context

The World Bank

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A Rapid Assessment

A study was carried out from December 2017 to February 2018, using desk research and qualitative study methods, to:

- Assess the current skills dimension of the digital economy in Indonesia within ASEAN context - as the main country of study
- Answer the following questions:

What are the ICT skills in demand?

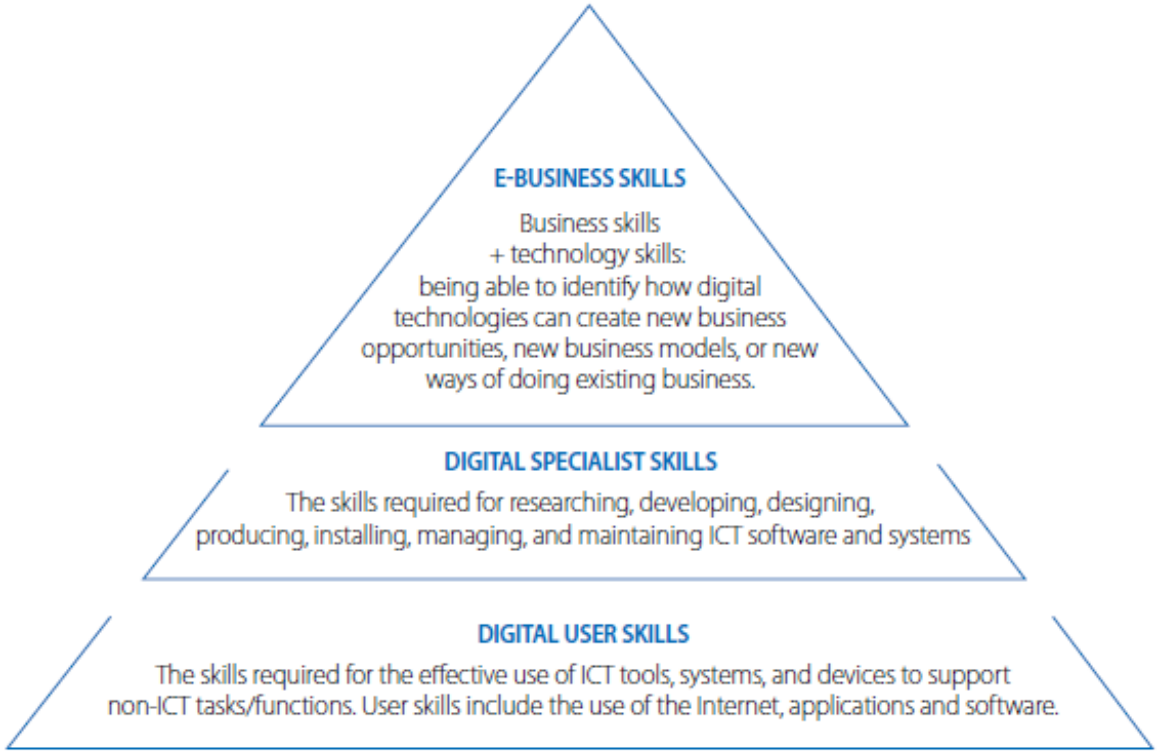
What are the different perspectives on ICT skills demand?

What has been done to meet the demand?

Frameworks for ICT Skills

Types	Purpose
ICT generic skills	To perform everyday work, such as work with word processors and access websites.
ICT specialist skills	To program, develop applications, and manage networks
ICT complementary skills	To perform multiple and aggregated tasks, such as processing complex information, communicate with others, solve problems, and manage a team.

Source: OECD, 2016



Notes: The bottom layer corresponds to users of digital/ICT tools; the next layer corresponds to producers of digital/ICT tools; the top layer corresponds to those who apply, create and invent innovative business models and applications of digital/ICT tools.

Source: Based on European Commission (2004), van Welsum and Lanvin (2012).

ICT Skills Demand and Development Program in ASEAN Countries

Context:

The definition of ICT skills are not uniformed across ASEAN countries;

Qualification frameworks of ICT occupations also differ in each country (e.g.: Indonesia: KKNI; Malaysia: Malaysia Skill Competency Matrix, Singapore: NICS)

What ICT skills are in demand? Case studies of ICT Skills in ASEAN-5

Country	Skill Challenges	Skill Shortage
Indonesia	ICT graduates' skill sets often fall short of what the industry requires.	Projected shortage of 9 million skilled and semi-skilled ICT workers 2015-2030.
Malaysia	Lack of industry-ready graduates.	• 10% of the new entrants to the ICT industry are employable, 90% requiring substantial training before they are work-ready. (PIKOM, 2014). • The demand for ICT graduates (such as computer science, information technology, and software engineering) 7,121 in 2010 to 13,300 in 2014, the supply of graduates had decreased from 8,237 to 8,000 during the same period. (MDEC, 2015). • There would be a shortage of close to 10,000 ICT professionals at various levels in 2016.
Philippines	ICT graduates lacking relevant IT skills, soft skills, English proficiency, numerical competence, verbal and report writing skills, familiarity with different business models and terms, industry specific knowledge and processes codes and terms.	• Needs IT workers at least 200,000 graduates every year. • Shortfall of 150,000 every year. • High attrition rate of up to 60-70%.

What ICT skills are in demand? Case studies of ICT Skills in ASEAN-5 [2]

Country	Skill Challenges	Skill Shortage
Singapore	The shortage of skilled workers for cyber security at the middle and senior tiers due to insufficient training programs and entry routes for mid-career professionals.	• In 2012, only 0.8% of Singapore's 144,300 ICT workers were considered IT security specialists. • It is projected that by 2017, the ICT industry would require an additional 15,000 workers particularly in the areas of cyber security, data analytics, development and network infrastructure – a number set to rise to 30,000 by 2020.
Thailand	ICT graduates lack basic skills like coding or a strong foundation in core subjects such as advanced mathematics.	• 90% of the 20,000 ICT graduates each year are unable to meet the basic qualifications for companies. • The industry needs 6,000 to 7,000 workers annually, which translates to a skills shortage of 4,000 to 5,000 a year.

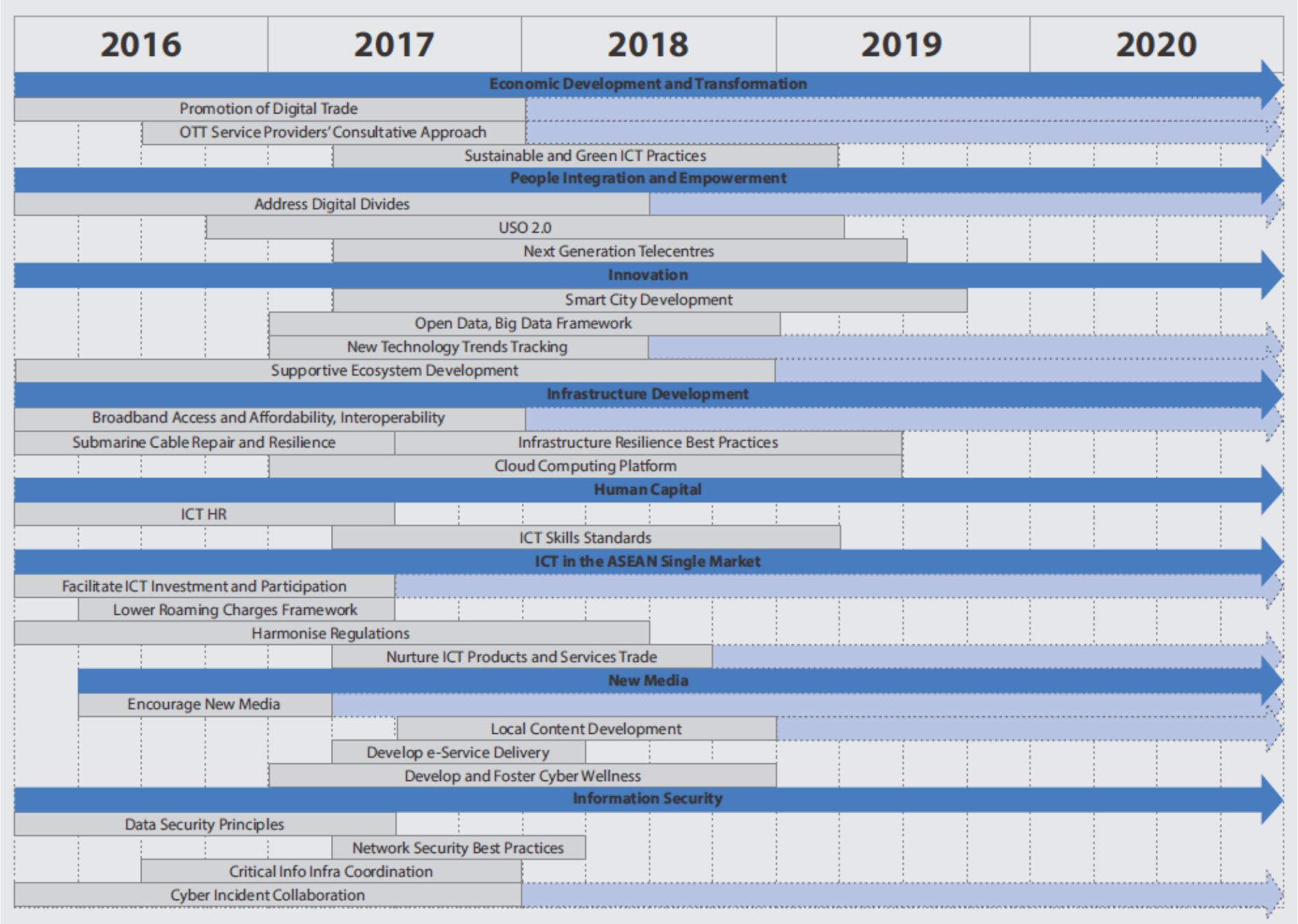
(Source: Tan, K. S. and Tang, J. 2016. *Managing Skills Challenge in ASEAN-5.* Retrieved from: http://ink.library.smu.edu.sg/cgi/viewcontent.cgi?article=2891&context=soe_research)

Meeting ICT Skills Demand: Completion of ASEAN ICT Masterplan 2015

- The ASEAN ICT skill upgrading development project → addressing the Strategy 5.2 of ASEAN ICT Masterplan 2015: "Develop skills upgrading and certification."
- Through this project, ASEAN focused on ICT Specialist Skills development as framework, qualification standards, and training roadmaps were developed.
- The skills involve 5 main ICT occupational domains: Software Development, ICT Project Management, Enterprise Architecture Design, Network and System Administration and Information System and Network Security.

Meeting ICT Skills demand: ASEAN ICT Masterplan 2016-2020

Continue to develop human capital through ICT HR and skill standards



Indonesia’s Strategy for Meeting ICT Skills Demand

Indonesia Case Study

Contexts

- With over 257 million people, Indonesia requires large-scale interventions and varied approaches for diverse topography.
- GoI (Government of Indonesia) has started programs to address digital infrastructure requirements, human resources capability, and to bridge regulation and incentive gaps.
  - Digital infrastructure to improve access: Palapa Ring Project, *Pipa Bersama*, BTS Provision for Telecommunication Blankspot Area Project, and Wireless Connectivity Pilot Project for Rural Areas
  - Digital government (e.g. for more online services—mainly in the planning stage)
  - Human resources capability gap: Nongsa Digital Park program in Batam, improving skills of workers, creating jobs in technology-based entrepreneurship and revamping of vocational education institutions,
  - Regulation and incentive: Presidential Decree No. 74/2017 on e-Commerce Road Map in which skills development is included and Tax incentives for start-ups and venture capital (KMK No. 1251 Year 1988 and KMK No. 250 Year 1995).
- E-readiness level: In 2017, over 143.26 million people (54.68%) from 262 million population are using Internet (APJII, 2017).

NOTA KESEPAHAMAN
ANTARA
KEMENTERIAN PERINDUSTRIAN,
KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN,
KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI,
KEMENTERIAN KETENAGAKERJAAN, DAN
KEMENTERIAN BADAN USAHA MILIK NEGARA

Nomor : 668/M-IND/11/2016
Nomor : 125/XI/NK/2016
Nomor : 17/M/NK/2016
Nomor : 5/NK/MCN/XI/2016
Nomor : MOU-04/MBU/11/2016

TENTANG

PENGEMBANGAN PENDIDIKAN KEJURUAN DAN VOKASI
BERBASIS KOMPETENSI YANG *LINK AND MATCH* DENGAN INDUSTRI

Pada hari ini, Selasa, tanggal dua puluh sembilan bulan November tahun dua ribu

Regulation and program contexts

- The Indonesia **e-Commerce road map** does have a solid component of skill development. The e-Commerce road map was issued through Presidential Decree No. 74/2017.
- An **MoU on vocational education development** was signed on November, 29 2016 among relevant 5 ministries (Ministry of Industry, Ministry of State-owned Enterprises/BUMN, Ministry on Manpower, Ministry of Education and Culture, and Ministry of Research, Technology and Higher Education).
- The Ministry of Industry is working on **Industrial 4.0 roadmap** focusing on four technologies: IoT, E-smart SMEs, start-up incubation, and the use of digital digital technology for industries (big data, AR, Cloud, cybersecurity)

National ICT Occupational Qualification Map

- Relevant ministries and National Professional Certification Body (BNSP) are preparing job competency standards based on SKKNI and KKNI.
- The Ministry of Communications and ICT – also supported by industrial and professional associations – has completed the national ICT occupation map to be launched in the near future with 9 levels of competencies and 16 occupation areas (e.g. Data Management System, Program & Software Development, Network and Infrastructure, etc).

What they say: Regulatory Contexts

Focus group respondents acknowledge the worth of the digital economy policy as Indonesia's strong political commitment. (World Bank, December 13, 2017)

E-commerce policy and road map is perceived as a demand driven regulation, an attempt from the government to keep up with the technology development and the private sector's trend.

GoI is very open, fostering opportunities for start-up companies and ease of doing business. This is particularly true in finance sector.

> *"They* (OJK – *Otoritas Jasa Keuangan*) *create space for application developers to tryout financial technologies under close supervision. Such openness needs to be replicated in the education sector"* – Singgih, KodePolitan (FGD participant)

What they say: ICT Skills in Demand

ICT Specialist and Complementary Skills: The industrial demand emphasizes the need of a more complex skills of technical ICT, and the soft skills of leadership, communication, and business/marketing skills.

> *"It is the 'all-rounders' that we are looking for. People with advance technical skills and communication skills. …. On the technical side, the company values skills in computing artificial intelligence and resolution architect for customization."* – Obert Hoseanto, Microsoft Indonesia.

> *"We need people with deep understanding of education, technology and business."* – Mohammad Rinaldi, Extramarks.

What they say: ICT Skills in Demand [2]

ICT Specialist skills:

- People with the right ICT specialist skills with the right attitude to implement programming good practices
- Specialists who can create high quality and scalable applications
- Good talents are hard to find and expensive – some start-up companies are tapping onto international human resources
- Start-up companies: Formal degree is really not required!

ICT generic skills:

- Consumers' skills needs to be nourished:
  - Not all young people are digital natives
  - Indonesian costumers do not read FAQs – continuous support are frequently needed
  - Search skills – information literacy – needs to be enhanced
- Educators mentioned that ICTs are integrated into everyday lives and considered a critical aspect in teaching and learning:
  - Tourism SMK 27 in Jakarta already integrates its use for their teaching and learning process (digitalization of teaching in beauty classes, mobile devices to develop student e-portfolios, etc);
  - At different rate, PNJ (Jakarta State Polytechnic) is adopting various new technology for machinery engineering, and other program studies.

What they say: ICT Skills in Demand [3]

Male or Female?

Focus group respondents agree that in the ICT companies, programmers are mainly male with the ratio around 1 female to 9 males (also confirmed by hackerranks' data)

- *Although female programmers are quite rare, these programmers are usually looked for because their attention to details and a touch of 'art' in their work.* – Novistiar Rustandi, HarukaEdu.

Which Country Has the Largest Proportion of Female Developers?

Share of HackerRank Tests

Rank	Country	Female	Rank	Country	Female
1	India	22.9%	26	France	9.4%
2	United Arab Emirates	21.0%	27	Switzerland	9.0%
3	Romania	20.6%	28	Egypt	8.9%
4	China	19.6%	29	Netherlands	8.3%
5	Sri Lanka	19.0%	30	Greece	8.3%
6	Italy	16.7%	31	Belarus	7.8%
7	Bulgaria	16.5%	32	Russia	7.8%
8	Singapore	15.2%	33	Spain	7.4%
9	Philippines	15.1%	34	Germany	7.4%
10	Indonesia	15.0%	35	Portugal	7.2%
11	United States	14.8%	36	Turkey	6.7%
12	New Zealand	14.6%	37	Colombia	6.5%
13	Malaysia	14.4%	38	Pakistan	6.5%
14	Hong Kong	13.8%	39	Mexico	6.3%
15	South Korea	13.6%	40	Venezuela	6.3%
16	Israel	12.9%	41	Belgium	6.0%
17	Japan	12.8%	42	South Africa	5.9%
18	Ukraine	12.6%	43	Brazil	5.8%
19	Bangladesh	11.9%	44	Sweden	5.7%
20	Canada	11.4%	45	Austria	5.4%
21	Vietnam	11.3%	46	Hungary	5.0%
22	Australia	10.7%	47	Argentina	4.5%
23	United Kingdom	10.3%	48	Czech Republic	4.5%
24	Poland	10.2%	49	Denmark	3.3%
25	Ireland	9.7%	50	Chile	2.9%

HackerRank

ICT Skill Supply by Education System

	MoEC	MoRTHE	MoM	Kemenkominfo
Mandate	Management of Vocational High Schools & Non-formal Education programs	Management of Polytechnic Higher Education Institutions	Manage Job Training Programs and Institutions	Research and human resource development in ICT
Responsible Unit	• Directorate of Vocational • Directorate of Work Upskilling Courses and Training	Directorate General of Academic and Student Affairs	• Directorate General of Job Training and Productivity	BP3TI Human Resource
Priority Programs	• Vocational High School Revitalization • Equivalency education • Preparation of non-formal education and training certification standards	Revitalization of polytechnics through: retooling of polytechnic higher education institution lecturers through training and internship programs.	BLK revitalization: Reorientation, Rebranding, and Revitalization	Certified training provision of ICT skills ICT Governance Training for Local Governments

Revitalization of SMKs

At senior secondary education level, revitalization of SMK (*Sekolah Menengah Kejuruan)* or senior secondary vocational schools has been initiated to:

- Compose SMK development road map
- Align curricula with industrial demand
- Strengthen collaboration with the industries
- Strengthen collaboration with local governments
- Accelerate skill supply from higher education vocational institutions
- Develop projection of job classifications and industrial locations.

In 2017, a new four-year program has been introduced.

Polytechnics Revitalization

- At higher education level, revitalization of 43 state polytechnics are also underway: supporting the 14 corridors of economic development and polytechnic lecturers professional development.
- GoI digital economy program also involves a number of Polytechnics – such as the State Polytechnic of Jakarta or *Politeknik Negeri Jakarta* (PNJ) and State Polytechnic of Surabaya or *Politeknik Negeri Surabaya* (PENS) – to be committed to relevant flagships.
  - PNJ's: Financial Technology development
  - PENS (Surabaya) IOT

What they say: ICT Skills in Demand [3]

- PNJ is preparing skills for different target of potential market, the industries and independent technopreneurs
- The need of mixture of ICT hard and soft-skills is acknowledged to increase employability. It’s getting difficult to work in isolation – all study programs and departments must collaborate to fulfil the multiple skill sets demand
- Multimedia study program curriculum focus on IOT, Mobile application development, computer programming, and computer network.
- Electric engineering – regards ICT skills are pervasive abilities and very important aspect in the professional field as all work domains are now digitalized and computerized.

A need to strengthen relationship between SMKs and Polytechnics

- Now, more and more SMK students are pursuing higher education:
  - The share of those that applied to Higher Education ranges from 2,2% to 85,4%*
  - Those who get jobs go from 13,2% to 81,4 %*
- But, in most cases, alignment between jobs and studies is low.
- Vocational education revamping needs to provide streams to connect – or reconnect – vocational senior secondary and higher education (e.g. specific program to absorb SMK students

*from Luque and Scmidt, 2017

"Before, most SMK students came from a poorer family, but now some are more well-off. Some students attend SMKs by choice because it concerns their interests and many go to universities" – Kuwat, SMK 1 Vice Principal

"Most SMK students do not pass the enrolment/selection test to PNJ's Electric Engineering Department. They are not qualified." – Damaraji, PNJ Vice Director for Academic Affairs

BLK Revitalization

- Job Training Centers or BLKs are under the coordination of MoM and under the management of local governments
- The 3R (Reorientation, Rebranding and Revitalization) has been started and piloted in 3 BLKs/BBPLKs in West Java (Bekasi, Serang, and Bandung)
- Relevant to ICT skill enhancement program, other BLKs continue to offer ICT technical courses.

BLK Name	ICT Training Program
BLK NTB Province	Course: Business Administration; sub-Course: Computer, Computer Network, Office Tools
BLK DIY Province	Computer: Lotus, Base Interactive 8, Basic MS Office, Advance MS Office, Accounting Computer, Technician and Computer Installation
BLK Surakarta City	▪ Computer Operator (Basic Office) ▪ Web Programmer ▪ Technical Support ▪ Graphic Design ▪ Digital Animator 3D
BLK Wonosobo District	Business & Information Technology
BLK Purworejo District	▪ Technical Support ▪ Graphic Design ▪ Audio Video Editing
PPKD Central Jakarta City	▪ Computer Technique ▪ Computer Operator
PPKD South Jakarta City	▪ Computer Technique ▪ Computer Operator ▪ Graphic Design

Challenges and Opportunities

Good talents are expensive and difficult to keep

- Bigger companies use formal approach such as talent scouting in top ranking universities and provide them with training and internship programs.
- One of the edutech companies also recruits teachers who are ICT savvy as they need people who has are knowledgeable in instructions and technology.
- ICT start-ups do:
  - Recruit international company or freelancers to help them with coding their applications.
  - Train and use SMK graduates' skills. Two companies found this approach is economical, however they are not easy to be mobilized.
- ICT start-up companies use existing professional network to recruit good talents with reduced fee/salary and access potential employees from giant ICT companies job events.

Challenges and Opportunities [2]

Challenges in provision of skills lie on education curriculum and infrastructure/facilities.

- Curriculum. Education curriculum on technology vocational skills are outdated and need to adjusted with most current development. This is being addressed - as part of the SMK revitalization, by local governments and schools obtaining support from industries/private companies to review their teaching process and equipment standards.
- Infrastructure and access to technology. SMK respondents reported that the infrastructure and facilities – such as computer network, internet bandwidth, laboratory facilities – need to be updated.

Challenges and Opportunities [3]

Access to technology is an urgent issue. By not taking prompt actions to technology access, the skills gap will be widened. PISA results suggest that limited use of computers at school may be better than not using computers at all (OECD, 2015)

The systemic limitation of education institutions' access to technology includes:

- Around 51 thousand schools (23.95%) are still to be connected to the Internet. Some because these schools are still not electrified.
- The upgrade of ICT infrastructure need to ensure a good quality of teaching factories to meet industrial needs, sound delivery of e-learning, uninterrupted connection during online national examination.
- A high probability that polytechnics also in need of bigger capacity of connectivity infrastructure. (e.g. PNJ has 60 Mbps bandwidth internet - insufficient for parallel video conferencing)

The need to focus on educators' skills.

Many teachers will need to work on leveraging their basic ICT literacy skills. This limitation hampers them from effective usage of ICT in teaching their taught subjects as required by the curriculum.

Challenges and Opportunities [4]

A stronger connection between the education system and industries is a significant opportunity: in the development of KKNI and teaching factories. But his collaboration will still need to be strengthened, underlining the need of SMKs.

> *"..If you could help us in connecting us with the industries, and ask more industries to build teaching factories in our SMKs, that would be very helpful."* (Suharno, DKI Jakarta Education Office)

Opportunities in more advance technology use. Continuous technology development offers vast ranging of possibilities allowing. (e.g. the use of cloud-based servers as seen more efficient and secure)

Possible Solutions and Recommendations: ASEAN Countries

- **Develop or adapt a more comprehensive ICT skill framework** (e.g. OECD and EU – refer to Slide 3) to layout a stronger foundation of ICT skill development roadmap – encompassing ICT complementary/e-business skills and ICT generic/user skills – aside from ICT specialist skills.
- **To further strengthen vocational skill development through sharing of common programs among vocational schools in ASEAN and encourage its replication in vocational schools in Indonesia** (e.g. through SEAMOLEC TVET Initiatives). The revamp of ASEAN vocational education would refer to ASEAN Qualification Reference Framework (AQRF).

Possible Solutions and Recommendations: Indonesia

- **The need for GoI to revisit the innovation policy to be ready for the 4th industrial revolution.** There is a need for a more holistic solution (of education and e-commerce) that bridges the demand, supply and opportunities.
- **The adoption of ICT competency frameworks also need to be reconsidered and expanded.**

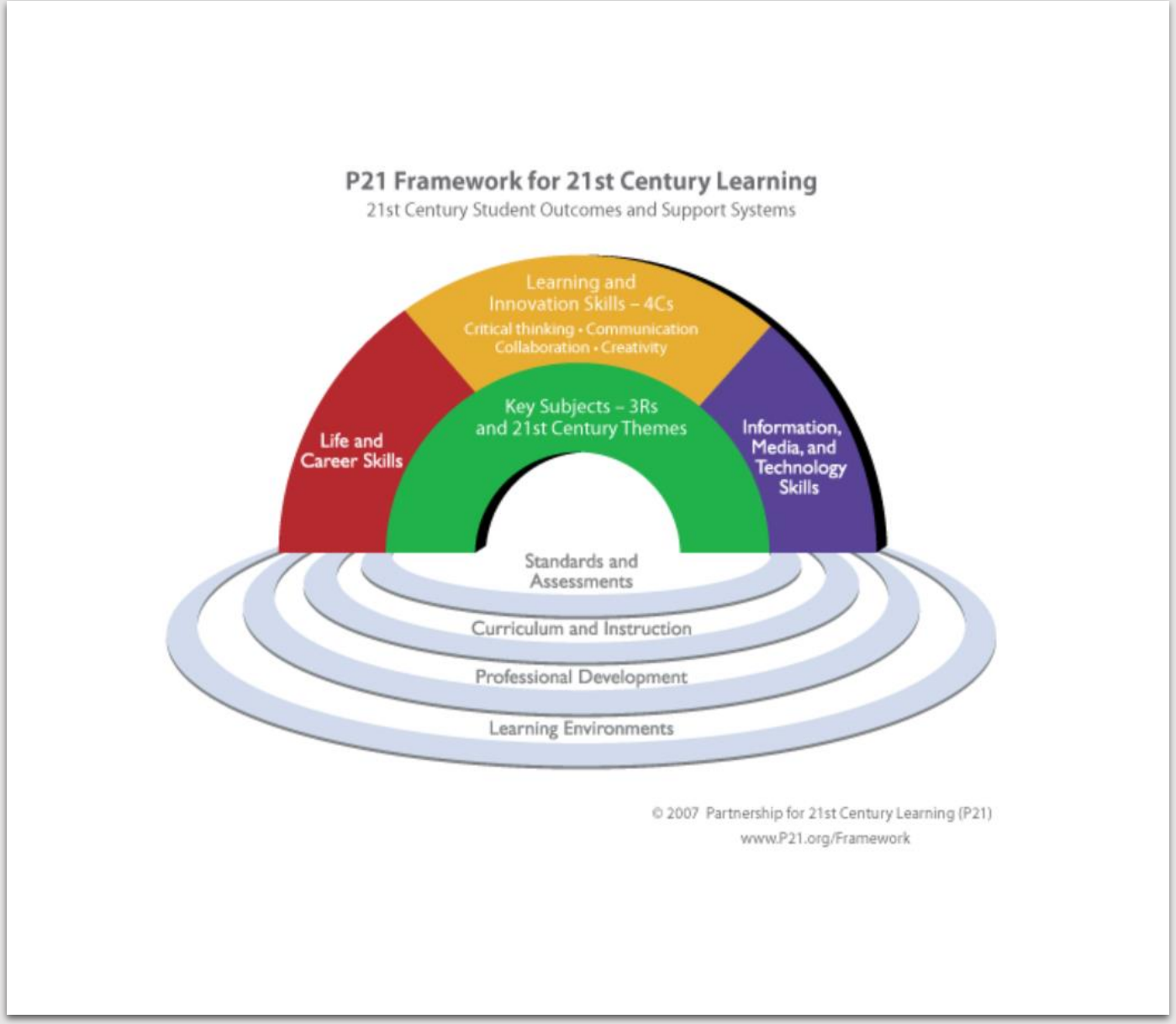
	ICT Literacy	Knowledge Deepening	Knowledge Creation	Knowledge Sharing
POLICY	1	1	1	1
CURRICULUM & ASSESSMENT	2	2	2	2
PEDAGOGY	3	3	3	3
ICT	4	4	4	4
ORGANIZATION AND ADMINISTRATION	5	5	5	5
PROFESSIONAL DEVELOPMENT	6	6	6	6

MoEC has adapted UNESCO's ICT-CFT framework to be further endorsed.

Possible Solutions and Recommendations: Indonesia [2]

A framework will also needed to be engaged in the curriculum and translated for ICT skills upgrade of K-12 students, particularly focusing on improving student thinking skills.

This will help to ensure that ‘all-rounder’ skills or ICT complementary/e-business skills are more available in the future market.



Possible Solutions and Recommendations: Indonesia [3]

1. **Another round of round table discussion on vocational skills development policy** to ensure smooth implementation of vocational skills development pilot program and its buy-in from relevant ministries and stakeholders.
2. **Strengthen government-industry collaboration to define digital skill needs** focusing on short term and long term program (e.g.: by extending the e-commerce roadmap 2017-2019).
3. **Improving access to technology by**:
   - Establishing industry-schools-government collaboration framework to further strengthen the expected collaborations (through a long-term cooperation)
   - Revisit BOS unit cost for SMKs, based on different program studies.
   - Reconsider the policy for software procurement
   - Connect all schools in Indonesia and enhance student-computer/technology device ratio.

Possible Solutions and Recommendations: Indonesia [5]

4. **Enhance/optimize the use of ICT** in vocational education should be enhanced through the optimal use of internet (with minimum specification of bandwidth) and use of technology based on industrial demand (e.g. Augmented Reality).
5. **A technology pool**, linked with Teaching Factory that can be used together by SMKs, Polytechnics, and Industry is needed.
6. **Seamless program between levels of vocational education (**between SMKs and Polytechnics).
7. **Enhance women's participation**. Possible approach include: a) adapt Coding for Moms as a globally popular program, to help with gender equity campaign; b) encourage ICT companies to encourage female candidates to apply.

Terimakasih!

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