ASEAN and APEC Perspectives of Philippine ICT Roadmaps

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Abstract

This paper presented the synthesis of various perspectives involving the Information and Communications Technology (ICT) environment in the Philippines. These perspectives are referenced from Association of Southeast Asian Nations (ASEAN) and Asia – Pacific Economic Cooperation (APEC) where the Philippines is a Member State and Member Economy respectively. First, various engineering disciplines were delineated based from its respective statutes in order to determine the scopes of the same that cover ICT practices. Second, both ICT and allied engineering disciplines (particularly the Electronics Engineering) were elaborated and compared with international definitions. Third, the Philippine ICT Roadmaps were compared with the ASEAN Digital Masterplan 2025 and APEC Internet and Digital Economy Roadmap in order to analyze possible opportunities as well as areas for improvements. Fourth, various ICT programs and projects in the Philippines as well as selected ICT Policy Instruments were also presented and compared with its ASEAN/APEC counterparts. Fifth, the roles of Electronics Engineering (ECE) profession were presented especially its contribution to the ICT industries in the Philippines. Finally, conclusions and/or recommendations were indicated for future reference.

Keywords— gender and development (GAD), globalisation, information and communications technology (ICT), technology management (TM).

INTRODUCTION

The Philippines is a Member State of the Association of Southeast Asian Nations (ASEAN) and also a Member Economy of Asia – Pacific Economic Cooperation (APEC). Specifically, the Philippines is one of the founding Member States of ASEAN (i.e. Indonesia, Malaysia, the Philippines, Singapore and Thailand) and one of the first twelve Member Economies of APEC joined on November 1989 (i.e. Australia, Brunei Darussalam, Canada, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand and United States).

Table 1ASEAN Member States [1]

Member State	Date of Accession
Indonesia	August 8, 1967
Malaysia	August 8, 1967
The Philippines	August 8, 1967
Singapore	August 8, 1967
Thailand	August 8, 1967
Brunei Darussalam	January 7, 1984
Viet Nam	July 28, 1995
Laos	July 23, 1997
Myanmar	July 23, 1997
Cambodia	April 30, 1999

Both ASEAN and APEC involve economic agenda toward prosperity while the former also include socio-cultural cooperation [2]. Moreover, these organizations exhibit challenges in various areas including the Information and Communications Technology (ICT). Furthermore, these challenges in ICT significantly increased during the Covid-19 Pandemic [3]. The Philippines was connected to the internet for the first time on March 1994 [4]. This event was cited as *history serves a reference for research and development as well as guide in formulation of policies* [3][5][6][7].

Table 2 APEC Member Economies [8]

Member Economy	Date of Accession
Australia	November 1989
Brunei Darussalam	November 1989
Canada	November 1989
Indonesia	November 1989
Japan	November 1989
Republic of Korea	November 1989
Malaysia	November 1989
Philippines	November 1989
Singapore	November 1989
Thailand	November 1989
The United States	November 1989
Chinese Taipei	November 1991
Hong Kong	November 1991
People's Republic of China	November 1991
Mexico	November 1993
Papua New Guinea	November 1993
Chile	November 1994
Peru	November 1998
Russia	November 1998
Viet Nam	November 1998

On the other hand, the Philippines being a member of both ASEAN and APEC had participated in Advanced Level Engineering benchmarking schemes through its respective registries namely ASEAN Engineering Register, APEC Engineer Register, and ASEAN Chartered Professional Engineer Register [9][10][11]. While both ASEAN Engineering Register and ASEAN Chartered Professional Engineer Register have same Member States entered its respective mutual recognition, not all APEC Member Economies participated in APEC Engineer Registry. APEC Member economies who participated in APEC Engineer Registry are Australia, Canada, Chinese Taipei, Hong Kong, Indonesia, Japan, Korea, Malaysia New Zealand, Philippines, Russia, Singapore, United States, and Peru while Thailand and Papua New Guinea are Conditional and Provisional Members respectively [12]. Consequently, Science Advisory No. 2020-02 of the National Academy of Science and Technology states that the Philippines is still below the UNESCO benchmark for the number of Research Scientists and Engineers (RSEs) [13].

Methods

Data from both local and international references were gathered in order to synthesize the same in order to arrive in the intended assessment of the Philippine ICT Roadmap in the perspectives of ASEAN and APEC.

A. Definitions of ICT

Information and Communications Technology (ICT) in the Philippines is defined by the Republic Act No. 9292 (RA 9292) also known as the "Electronics Engineering Law of 2004". The definition of ICT based from Article I, Section 3(g) of RA 9292 is the following [14]:

"*the acquisition, production, transformation, storage and transmission/reception of data and information by electronic means in forms such as vocal, pictorial, textual, numeric or the like; also refers to the theoretical and practical applications and processes utilizing such data and information*"

Years hence, another Philippine law was enacted named Republic Act No. 10844 (RA 10844) also known as the "Department of Information And Communications Technology Act of 2015". The definition of ICT based from Section 3(a) of RA 9292 is the following: [15]:

"*...the totality of electronic means to access, create, collect, store, process, receive, transmit, present and disseminate information:*"

Referring to the two definitions of ICT, RA 10844 adopted the definition of ICT from RA 9292 including provisions of positions requiring Professional Electronics Engineers (PECE) in spite of having a span of more than ten years. Moreover, the International Telecommunications Union (ITU) emphasized clearly the coverage of ICT in its document entitled "ITU Council Contribution to the 2016 United Nations High – Level Political Forum on Sustainable Development"[16]. Furthermore, the United Nations Educational, Scientific and Cultural Organization (UNESCO) defines ICT as [17]:

"*...diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players, and storage devices) and telephony (fixed or mobile, satellite, visio/video-conferencing, etc.)*"

RA 10844 is also the law that created the Department of Information and Communications Technology (DICT)

in 2016. DICT is the National Government Agency (NGA) that implements ICT programs, projects and services; formulate ICT policies; and foster strategic collaboration among ICT stakeholders. Table 3 summarizes references defining ICT.

Table 3 References Defining ICT

Reference	Category / Remarks
Philippine Republic Act No. 9292 (Electronics Engineering Law of 2004) [14]	Philippine Definition / Electronics Engineering (ECE) is a different discipline from Electrical Engineer (EE)
Philippine Republic Act No. 10844 (Department of Information And Communications Technology Act of 2015) [15]	Philippine Definition / The Department of Information and Communications Technology (DICT) was formed when the following agencies were abolished: - Information and Communications Technology Office (ICTO); - National Computer Center (NCC); - National Computer Institute (NCI); - Telecommunications Office (TELOF): - National Telecommunications Training Institute (NTTT) - All operating units of the Department of Transportation and Communications (DOTC) with functions and responsibilities dealing with communications Abolished agencies have its powers and functions, budget, records, properties, and personnel transferred to DICT
UNESCO Learning Portal [16]	International Definition
ITU Report [17]	International Definition

B. The Philippine Technological Council (PTC) and its Foreign Counterparts

The Philippine Technological Council (PTC) is non-stock and non-profit corporation incorporated under the Securities and Exchange Commission (SEC) that aims to foster engineering mobility of Filipino engineering practitioners around the globe and encompasses thirteen (13) professional engineering organizations in the Philippines each representing specific engineering field of practice [18]. It is emphasized in this paper that the Philippine Government regulates engineering practices (except for Industrial Engineering) by virtue of respective statutes but the Accredited Professional Organizations (APOs) of respective engineering disciplines are actually non-profit corporation incorporated under the Securities and Exchange Commission (SEC).

Table 4 Accredited Professional Organizations (APOs) of Various Professional Engineering Disciplines in the Philippines Which Are Members of the Philippine Technological Council (PTC) [19][20]

Engineering Disciplines	Name of APO
Electronics Engineering (ECE)	Institute of Electronics Engineers of the Philippines (IECEP)
Geodetic Engineering (GE)	Geodetic Engineers of the Philippines (GEP)
Mechanical Engineer (ME)	Philippine Society of Mechanical Engineers (PSME)
Metallurgical Engineer	Society of Metallurgical Engineers of the Philippines (SMEP)
Mining Engineer	Philippine Society of Mining Engineers (PSEM)
Naval Architect / Marine Engineer (Marine Engineering is included in the Naval Architecture)	Society of Naval Architects and Marine Engineers (SONAME)

Sanitary Engineer	Philippine Society of Sanitary Engineers (PSSE)
Industrial Engineer (IE)	Philippine Institute of Industrial Engineers (PIIE)
Aeronautical Engineer	Society of Aerospace Engineers of the Philippines (SAEP)
Agricultural Engineer	Philippine Society of Agricultural Engineers (PSAE)
Civil Engineer (CE)	Philippine Institute of Civil Engineers (PICE)
Chemical Engineer (ChE)	Philippine Institute of Chemical Engineers (PIChE)
Electrical Engineer (EE)	Institute of Integrated Electrical Engineers (IIEE)

The engineering disciplines indicated in Table 4 are associated with its respective APOs. These APOs are members of the Philippine Technological Council (PTC). At the ASEAN level, PTC is a member of ASEAN Federation of Engineering Organisations (AFEO). Table 5 indicates the members of AFEO.

Table 5 Members of ASEAN Federation of Engineering Organisations (AFEO) [21]

ASEAN Engineering Organisation	Member State
Pertubuhan Ukur, Jurutera & Arkitek (PUJA)	Brunei Darussalam
Board of Engineers, Cambodia (BEC)	Kingdom of Cambodia
Persatuan Insinyur Indonesia (PII)	Republic of Indonesia
Laos Union of Scientist and Engineers Associations (LUSEA)	Laos People's Democratic Republic
The Institution of Engineers, Malaysia (IEM)	Malaysia
Federation of Myanmar Engineering Societies (Fed. MES)	Myanmar
Philippine Technological Council (PTC)	Philippines

The Institution of Engineers, Singapore (IES)	Singapore
The Engineering Institution of Thailand (EIT)	Thailand
Vietnam Union of Science & Technology Association (VUSTA)	Viet Nam

On the other hand, Table 6 indicates APEC Member Economies participating in the APEC Engineer Registry. Notice that among ASEAN, only Indonesia, Malaysia, Philippines, and Singapore fully participated APEC Engineer Registry.

Table 6 APEC Member Economies Having Full Rights of Participation in APEC Engineer Registry [12]

APEC Engineering Organisation	Member Economy
Persatuan Insinyur Indonesia (PII, 2001)	Indonesia
The Institution of Engineers, Malaysia (IEM, 2000)	Malaysia
Philippine Technological Council (PTC, 2003)	Philippines
The Institution of Engineers, Singapore (IES, 2005)	Singapore
Engineers Australia (EA, 2000)	Australia
Engineers Canada (EC, 2000)	Canada
Chinese Institute of Engineers (CIE, 2005)	Chinese Taipei
Hong Kong Institution of Engineers (HKIE, 2000)	Hong Kong China
Institution of Professional Engineers Japan (IPEJ, 2000)	Japan
Korean Professional Engineers Association (KPEA, 2000)	Korea
Engineering New Zealand (EngNZ, 2000)	New Zealand
Association for Engineering Education of Russia (AEER, 2010)	Russia
National Council of Examiners for Engineering and Surveying (NCEES, 2001)	United States
Peruvian Engineers Association / Colegio de Ingenioros del Peru (PEA/CIP, 2008)	Peru

C. The Electronics Engineering (ECE) Profession in the Philippines

The law governing the Electronics Engineering (ECE) Profession in the Philippines is Republic Act No. 9292 and this features *information and communications technology (ICT)* as one of its scope of practice.

Table 7 Engineering Disciplines Together With Its Respective Statute / Legal Basis

Engineering Disciplines	Statute
Electronics Engineering (ECE)	Republic Act No. 9292
Geodetic Engineering (GE)	Republic Act No. 8560
Mechanical Engineer (ME)	Republic Act No. 8495
Metallurgical Engineer	Republic Act No. 10688
Mining Engineer	Republic Act No. 4274 as amended by Republic Act. No. 5677
Naval Architect / Marine Engineer (Marine Engineering is included in the Naval Architecture)	Republic Act No. 4565
Sanitary Engineer	Republic Act No. 1364
Industrial Engineer (IE)	Non – Government Organisation but recognized by the Philippine Technological Council (PTC) and IEs are accepted in ASEAN Engineer Register (AER) and ASEAN Chartered Professional Engineer Registry (ACPER)
Aeronautical Engineer	Presidential Decree No. 1570
Agricultural Engineer	Republic Act No. 10915
Civil Engineer (CE)	Republic Act No. 544 as amended by Republic Act No. 1582
Chemical Engineer (ChE)	Republic Act No. 9297
Electrical Engineer (EE)	Republic Act No. 7920

Prior to the implementation of RA 9292, there was an old law named Republic Act No. 5734 known as the "Electronics and Communications Engineering Law of the Philippines". While both RA 5734 and RA 9292 uses the initials "ECE", the former refers to "Electronics and Communications Engineering" while the former refers to "Electronics Engineering". There are misconceptions that truncating the word "Communications" from "Electronics and Communications Engineering" that led to "Electronics Engineering" narrowed down the scope of practice of ECE. On the contrary, the Electronics Engineering (ECE) scope of practice pursuant to RA 9292 significantly broadened. As a matter of fact, prior to the implementation of RA 9292, the Board Examination subjects were only Mathematics (30%), Electronics Engineering (30%) and Communications Engineering+ (30%). Moreover, during the implementation of RA 9292, there are four subjects namely Mathematics (20%), General Engineering and Applied Sciences (20%), Electronics Engineering (30%), and Electronics Systems Technologies (30%). Furthermore, RA 5734 as compared with RA 9292, the latter had already repealed the former and RA 9292 actually has three levels of *Electronics Practitioners* namely: Professional Electronics Engineer (PECE), Electronics Engineer (ECE), and Electronics Technician (ECT).

Table 8 Comparisons of RA 5734 and RA 9292

	RA 5734	RA 9292
Name of Profession	Electronics and Communications Engineering (ECE)	Electronics Engineering (ECE)
Categories of Practice	One (Electronics and Communications Engineer or ECE)	Three (Professional Electronics Engineer or PECE, Electronics Engineer or ECE, and Electronics Technician or ECT)
Board Exam Scope (for ECE)	Mathematics, Electronics Engineering, and Communications Engineering	Mathematics, General Engineering and Applied Sciences,

		Electronics Engineering, Electronics Systems Technologies
Effectivity	Repealed by RA 9292	Still in effect

Electronics Engineering (ECE) is distinct from Electrical Engineering (EE) per regulation of the Professional Regulation Commission of the Philippines while both professions are recognized by the Philippine Technological Council (PTC) and accepted both in ASEAN and APEC Engineer Register.

D.   The   Department   of   Information   and Communications Technology (DICT)[15][22]

The Department of Information and Communications Technology (DICT) is the National Government Agency (NGA) in the Philippines that executes ICT policies, plans and agenda. It is also the NGA championing ICT drives and partnerships among stakeholders. DICT was created in 2016 when agencies such as Information and Communications Technology Office (ICTO), National Computer Center (NCC), National Computer Institute (NCI), Telecommunications Office (TELOF), National Telecommunications Training Institute (NTTT), and all operating units of the Department of Transportation and Communications (DOTC) with functions and responsibilities dealing with communications were abolished. These abolished agencies have its powers and functions, budget, records, properties, and personnel transferred to DICT. The names of these abolished agencies are reiterated in this paper in order to provide references to the ICT Roadmaps discussed (offices were reorganized together with the workforce in the organization). The scope and limitation discussed about DICT are its roles in perspectives of ASEAN and APEC. Specifically, one of the Mission of DICT is:

"Be the enabler, innovator, achiever and leader in pushing the country's development and transition towards a world-class digital economy."

   It is clearly defined in its Mission that Philippine ICT Roadmap is gearing towards globalization. Referring to Fig. 1, Venn Diagram is used to represent the interrelationships of RA 9292, RA 10844, and International Benchmark (ASEAN/APEC). However, not all DICT programs and projects involve Electronics Engineering Profession. One example is the APEC Accountability Agent by the National Privacy Commission (NPC)[23]. Pursuant to RA 10844, NPC together with the National Telecommunications Commission (NTC), and Cybercrime Investigation and Coordinating Center (CICC) are attached agencies of DICT. Moreover, there are ECE practitioners employed in DICT but do not undergo ASEAN/APEC Benchmarking. Plantilla positions in DICT requiring ECE license are Engineers and IT Officers. Furthermore, there are ECE practitioners who undergone ASEAN/APEC Benchmark but neither employed or associated with ICT.

On the other hand, Section 10 of RA 10844 clearly states that at least one of the Assistant Secretaries shall be a licensed Professional Electronics Engineer (PECE). The Assistant Secretary is the third in-line of DICT hierarchy (Secretary being the highest position, followed by Undersecretary then by Assistant Secretary).
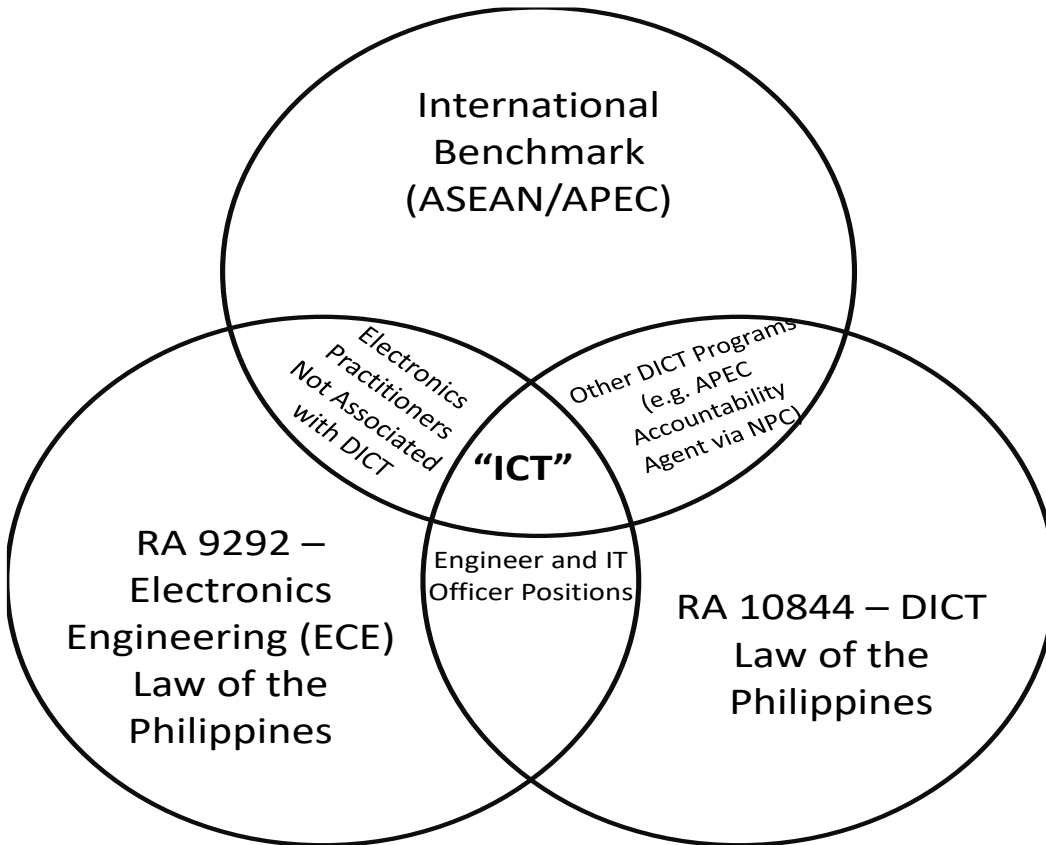
Fig. 1*Venn Diagram Representation of Interrelationships of Philippine Electronics Engineering (ECE) Law, Philippine DICT Law and International Benchmark (ASEAN/APEC Engineer Registry)*
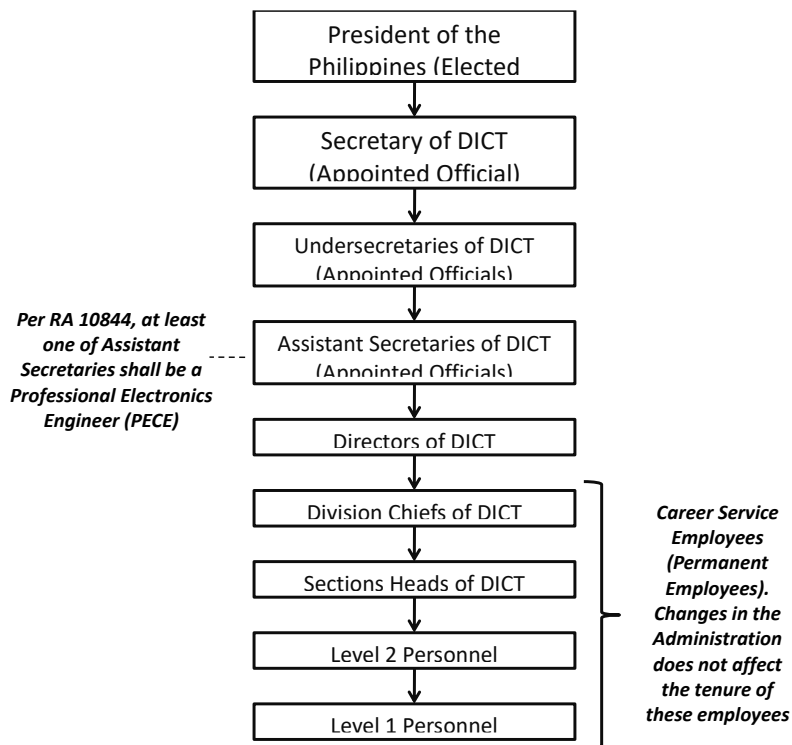

Fig. 2 *DICT Hierarchy indicating the level of the Assistant Secretary (in which at least one of position shall be a Professional Electronics Engineer*
)

discussion

Referring to previous sections, Electronics Engineering (ECE) profession has vital roles in the ICT roadmap

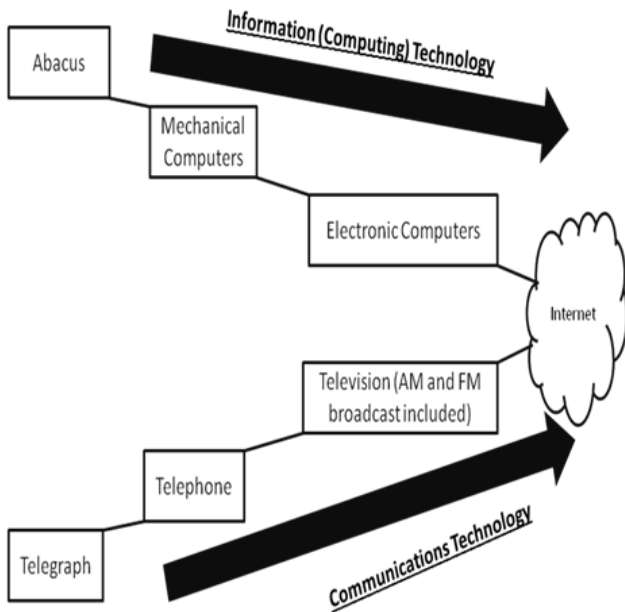before, during and after Covid-19 pandemic as well as disaster risk reduction management [3][24][25].

Fig. 3 "Digital Convergence" indicating the how information technology and communications technology converge each other with respect to time.

Likewise, government offices in-charge with Computers and Communications undergone convergence. This clearly indicated that ICT is neither limited with computer (information) technology alone nor communications technology alone. This convergence of government offices coincides with historical digital convergence as well as APEC and OECD studies [26].
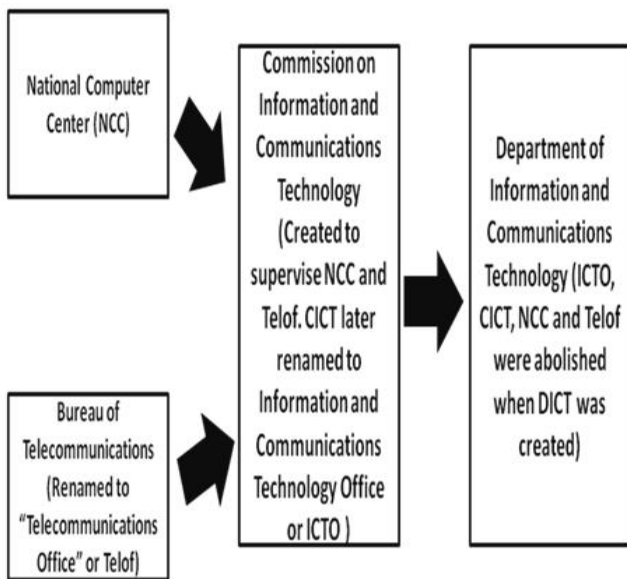

Fig. 4 Convergence of Philippine Government Offices In-Charge with Computers and Communications

Upon discussion of both ASEAN and APEC perspectives of ICT together with the roles of Electronics Engineering (ECE). Likewise, government offices in-charge with Computers and Communications undergone convergence. This clearly indicated that ICT is neither limited with computer (information) technology alone nor communications technology alone. This convergence of government offices coincides with historical digital convergence as well as APEC and OECD studies [26].

The 2006-2010 ICT Roadmap of the Philippines focused on Community e-Centers (CeCs) that aimed to reach out the marginalized sectors and other stakeholders down to grassroots levels while globalization was also pronounced [27]. Reaching out various sectors fulfills the Gender and Development (GAD) agenda. Empowering these sectors through digital literacy and capacity building enables them to be an economic contributor. This roadmap also aimed to create laws to strengthen ICT drives as well as updating old laws (including the abolition of NCC and Telof when DICT was created in 2016). However, there was no provision for Electronics Engineering profession despite of existence of RA 9292 and ASEAN / APEC Engineer Register. Moreover, there are many experienced Electronics Engineers in the old agency named Telecommunications Office (Telof) and considered permanent employees. Furthermore, even the National Broadband Plan was pronounced, the provision for backbone infrastructure was not included. In 2011, the Commission on Information and Communications Technology was renamed "Information and Communications Technology Office (ICTO)" Consequently, ICTO became an attached agency of the Department of Science and Technology (DOST). With ICTO being attached to DOST, research and development (R&D) agenda can be in future ICT roadmaps.

The 2011-2015 ICT Roadmap of the Philippines had included Institute of Electronics Engineers of the Philippines (IECEP) as one of its stakeholders [28]. In addition, the roles of Philippine ICT in ASEAN was pronounced and elaborated while APEC was also mentioned. Under this roadmap, CICT is now transforming into DICT in order to obtain its own statute/charter. On the other hand, when CICT became ICTO, another roadmap was created entitled "The Philippine Roadmap for Digital Startups, 2015 and Beyond". In this 2015 roadmap, engineering disciplines were now emphasized as these are essential in creating startups.

ICTO, CICT, NCC and Telof were abolished when DICT was created in 2016. However, the functions and

personnel of these abolished agencies were just transferred to DICT. The Philippines finally launched the Strategic Engagement and Collaboration to Undertake a Reliable and Efficient Government Internet (SECURE GovNet) project on November 2017[29]. The author of this paper is the Focal Person of SECURE GovNet project and collaborated with expatriates as well as other government stakeholders. Once the infrastructure commenced operation, appropriate technology management is necessary. Moreover, *Technology Management (TM)* is one of the skills stipulated in the competency standards for ASEAN Engineers [30].

Table 9 Number of Registrants in the ASEAN Engineering Register per Country (subject to changes) [9]

Member States	Number of Registrants
Brunei	45
Cambodia	475
Indonesia	525
Laos	12
Malaysia	2182
Myanmar	362
Philippines	1214
Singapore	38
Thailand	39
Viet Nam	261

Referring to Table 9, if there are one thousand two hundred fourteen (1214) registered engineering practitioners from the Philippines and there are thirteen (13) engineering disciplines representing the Philippine Technological Council, there are only around ninety-three (93) Electronics Engineering practitioners with the assumption of equal distribution of disciplines in the roster. This date indicate that even Filipino ECEs are vital in ASEAN ICT perspectives, the number is smaller compared with Malaysia. However, relative other ASEAN Member States, Philippines ranked second highest in the number of registrants. On the other hand, Table 10 indicates the number of registrants in the APEC Engineer Registry per participating Member Economies.

Table 11 PTC Report on APEC Engineer Registry as of January 2020 (subject to changes) [20]

Member Economy	Number of Registrants
Indonesia	26
Malaysia	341
Philippines	133
Singapore	12
Australia	10000+
Canada	16
Chinese Taipei	80
Hong Kong China	54
Japan	2589
Korea	562
New Zealand	1472
Russia	30
United States	334
Thailand	244

Conclusion

The ICT Roadmaps of the Philippines continue to evolve in order to keep abreast with technological changes and disruptions. The are many laws in the Philippines pertaining with ICT which are aligned with ASEAN and APEC benchmarks while there are some laws needed to be updated. However, updating, amending, and / or repealing laws might be strenuous as this requires time, resources and efforts. In order to mitigate these issues, some non-government organizations spearhead engineering mobility (e.g. ASEAN Federation of Engineering Organisations and APEC – International Engineering Alliance). However, *engineering* is still a broad profession consisting of various disciplines in which ICT is under the scope of practice of Electronics Engineering (ECE). Moreover, ECE has still various scopes of practice aside from ICT. Furthermore this paper focused on ASEAN/APEC perspectives of Philippine ICT Roadmap in order to gauge the benchmark of engineering practices. ICT roadmaps of the Philippines also encompass the following but not limited to: *digital literacy*, *capacity building*, and *providing equitable access*. These functions of DICT are indeed associated with Electronics Engineering (ECE) profession. Specifically, the ICT sector not directly associated with ECE is called ICT-Enabled Sectors. Both ICT-Enabled Sectors and ICT Sectors were defined by RA 10844. Table 12 indicates some examples of both ICT Enabled Sectors and ICT Sectors.

Table 12 Examples of ICT Enabled Sectors and ICT Sectors

ICT Enabled Sectors	ICT Sectors
HR Tasks	Telecommunications
Finance	Broadcasting
Education Sectors *EXCEPT* to those having Technical Disciplines such as Engineering	Programming / Networking / Computer Hardware and Software

It was stated in this paper that Philippine ICT Roadmaps focus also community connectivity and digitalization. These ICT enabled skills help the participants to be globally competitive in their respective fields of expertise in the ICT Enabled Sectors. Table 13 indicates the number of people obtained ICT enabled skills upon completing DICT program named Rural Impact Sourcing (RIS, later rebranded to Digital Jobs). It is notable that in year 2020, online workers increased significantly due to *WFH* schemes implemented when pandemic struck (year 2020*). Moreover, data in Table 13 covers only Regions 3 and 4A of the Philippines [24].

Table 13 Number of DICT Trainees Who Obtained Online Jobs After Undergoing Digital Jobs Training Program

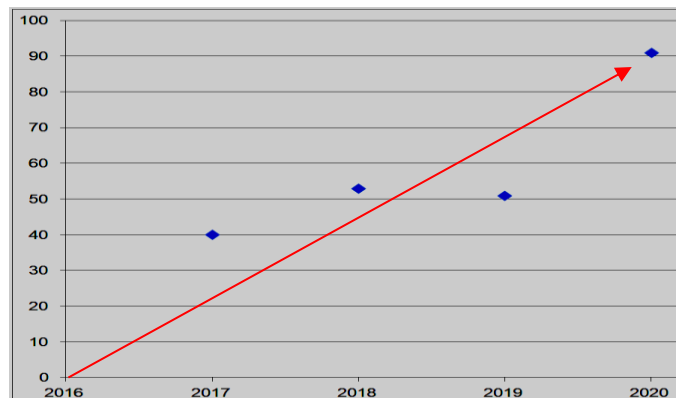| Year	Number of Trainees Who Obtained Online Jobs
2017	40
2018	53
2019	51

2020*	91

Fig. 5 Plot of Number of Trainees versus Year Time Lapse

The correlation coefficient is 0.876 which seemed a positive correlation of trainees who got online jobs (either *freelancing* or in *IT-BPM* companies) and the progression of year especially during the pandemic. The data for 2021 is not yet available as the training is still in progress. With this positive correlation, online workers both *ICT Sectors* and *ICT Enabled Sectors* may significantly increase. With this expansion, improvement of ICT infrastructures is necessary creating challenges and opportunities for the *electronics engineering* practitioners [24].

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