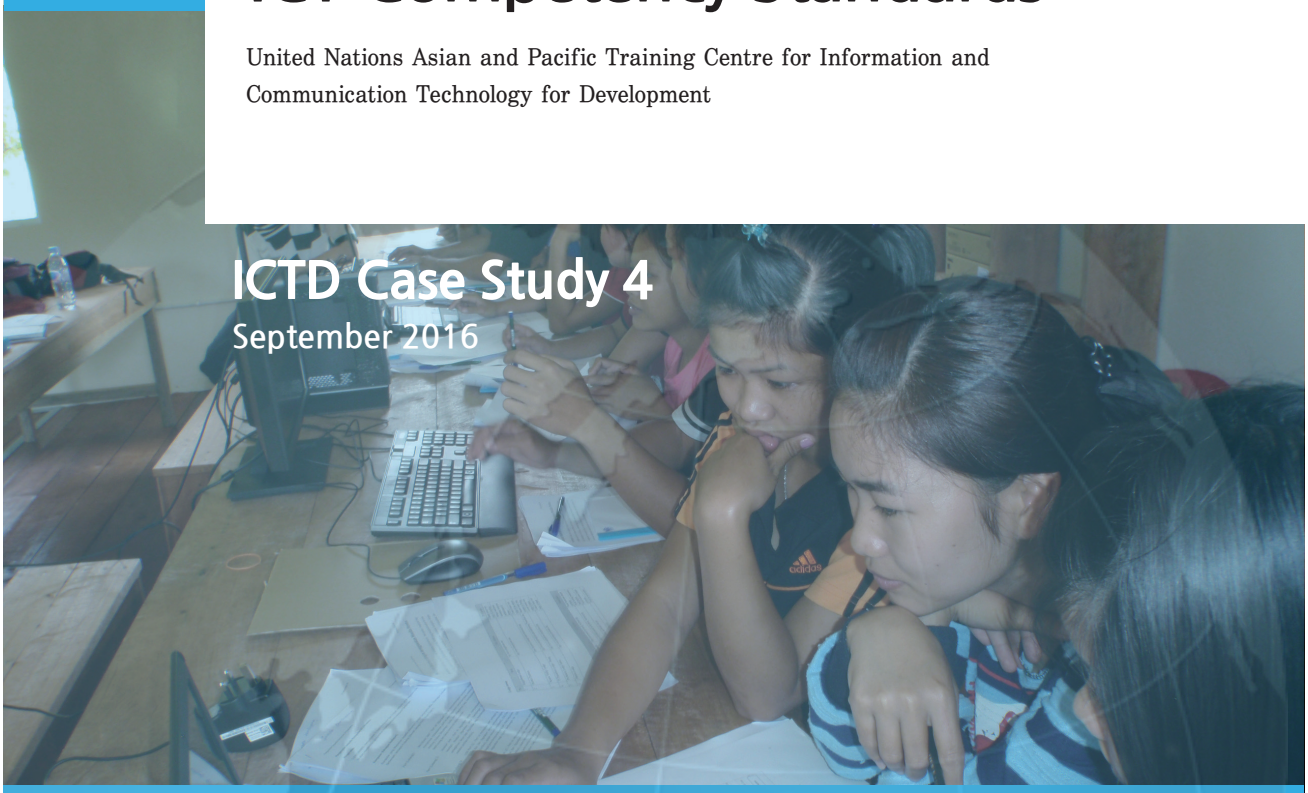
ICT Competency Standards

United Nations Asian and Pacific Training Centre for Information and Communication Technology for Development



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ICT Competency Standards

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Preface

Established in June 2006 as a regional institute of the Economic and Social Commission for Asia and the Pacific (ESCAP), the United Nations Asian and Pacific Training Centre for ICT for Development (UN-APCICT/ESCAP) has been strengthening the human and institutional capacities of countries in the region to use ICT for sustainable development.

UN-APCICT has developed and implements flagship capacity building programmes - the Academy of ICT Essentials for Government Leaders targeted to civil servants and the Primer Series on ICTD for Youth for society's future leaders - which have seen widespread adoption among government organizations and universities in Asia and the Pacific, and beyond. The Centre also launched in June 2016 its third programme - the Women and ICT Frontier Initiative (WIFI) - to strengthen the capacity of current and potential women entrepreneurs in Asia and Pacific on utilizing ICT in support of their businesses, as well as the capacity of policymakers to create an enabling environment for ICT-empowered women entrepreneurs.

As a regional hub on ICT capacity development, the Centre provides a platform for regional dialogue and exchange of experiences among national partners and ICTD stakeholders. It complements its flagship programmes through research and knowledge sharing on different aspects of ICTD through the development and dissemination of in-depth analyses, case studies and policy notes. It produces knowledge resources to deepen understanding on issues and practices in the field of ICT for sustainable development

The Case Study Series is APCICT's resource for compiling and disseminating good practices in ICT for development. It is aimed at a range of stakeholders including government agencies, international organizations, academia, non-governmental entities and the private sector. This is an important initiative with much potential to promote south-south cooperation for building a digitally inclusive society.

The fourth issue of the Case Study Series focuses on ICT competency standards. Competency standards have gained greater attention among ICT capacity development practitioners in recent years. Indeed, technology is not the sole factor that determines the success or failure of the ICT-enabled development; rather, it is the human element that is also driving success. By reviewing existing national competency standards and identifying their advantages and challenges, government policymakers can identify what key elements are critical in designing and developing ICT competency framework that will be fit their country context. In this publication, we review the ICT competency standards of five countries - Indonesia, Philippines, Singapore, Thailand and Republic of Korea. These countries have their unique experiences in ICT competency standards development that can offer valuable lessons for other countries planning to embark in this area.

We hope you find this publication an informative resource. I would like to express my appreciation to Prof. Ang Peng Hwa and the case study authors for their support to this publication. My sincere thanks go to our partners and the ICT experts who provided valuable feedback during the multiple rounds of reviews.

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Introduction

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There is one clear lesson from all the research done on the use of ICT for development: it is that technology alone never determines the success or failure of the development plan. This notion is called technological determinism and it is a difficult notion to shake off because of the tendency to be optimistic about innovations especially when they are supported by some initial success.

Instead, the lesson, which can be hard one to learn, is that it is always the human element that determines success. It is about how the technology is used (and not used) and that in turn depends on a range of factors such as the interest of the intended beneficiaries, how they are incentivized and their capacity.

It is against this backdrop that the first Case Study Series begun in 2010 started with "ICT Human Capacity Building". Human capacity in ICT lays the foundation that is essential for a successfully robust and self-sustaining ICT eco-system.

1. Background

This Case Study takes another step in ICT human capacity building by bringing together materials on the subject of measuring human capacity. In the language of the day, the method used is Competency Standards.

The broad idea is simple: in consultation with both ICT professionals and employers, set a range of standards so that everyone who meets one standard is competent to perform those tasks listed under that standard. To make it "motivating" the range of standards should be such that people can aspire to rise through them to reach the top. The range makes the attainment of competency standards a "game" in the sense that scores are kept, and those who attain certain scores are deemed competent to be promoted, and with that comes additional money and power (and responsibility).

To ensure a sound eco-system, have employers agree to hire those who meet those standards. Employers play a major role in this eco-system as they must recognise the competency standards as being useful in determining the capability of the person being hired.

In the ideal outcome, the standards work well, and are taken seriously by both employers in determining hiring and by ICT professional pursuing a career in the industry. Although the broad idea is simple, arriving at this ideal outcome is not.

Hence this Case Study has been developed to smoothen the process. It is a step-by-step guide detailing case studies with pitfalls to avoid and best practices to adopt.

3. Country Cases

If the process of developing competency standards sounds daunting, it is because it can be. To make it less so, detailed case studies from five countries are presented from Indonesia, Philippines, Singapore, South Korea and Thailand. These five countries offer interesting contrasts and a range of potential lessons for other countries that are drawing up ICT competency standards.

Both Singapore and South Korea have more developed ICT-intensive economies and their respective standards reflect as much. The advantage of being able to adapt, if possible, is the prospect that the standards can scale. That is, there is no need to re-design the standards as one's economy develops.

Philippines as a developing country has displayed a commitment to competency standards throughout the civil service to the very top of government. Indonesia is on a similar trajectory with a strong commitment by the government and the bonus of a vibrant ICT sector. At the time of this report, Thailand was drafting competency standards and so the Thai experience is particularly noteworthy in showing the thinking behind the process.

Because this is intended to be as close as one can get to a hand-holding guide, all the country case studies are quite detailed as to the process involved in creating competency standards and also quite blunt and critical about problem areas that the countries have faced. For example, a highly detailed series of standards has the prospect of giving ICT professionals the sense of leveling up. But finer-grained standards may be more challenging for employers to use. On the other hand, a smaller range of standards makes it easier for employers to understand but it also means larger jumps for ICT professionals when they want to move to a scale; the sense of attainment and therefore of motivation can be more challenging.

New to this area is ICT competency standards for disaster risk management. Developing countries are especially prone to the effects of disaster. ICT is increasingly proving itself useful for disaster risk management and with it is the need for competency standards in this area. Including standards in this area shines a spotlight on this critical need.

4. Conclusion

It is unlikely that an award-winning movie will be made about ICT competency standards. It is a dry subject, the process literally takes a year or two to do well and there is no drama when everything clicks.

But it is a critically important area for the success of ICT in development. And unlike many movies, this subject can make a significant difference in people's lives.

Country Case Study

Indonesia

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1. Introduction

The Association of Southeast Asian Nations (ASEAN) Economic Community (AEC) Blueprint[01] marked 2015 as an important year for ASEAN countries because it is the deadline for the Community to be a single market and production base. The concept of a single market and production base comprises the free flow of five core elements: goods, services, investment, capital and skilled labour.

As part of the activities to facilitate the free flow of skilled labour, ASEAN countries need to develop core competency standards and qualifications for job/occupational and trainer skills and complete mutual recognition agreements (MRA) for major professional services.

The importance of developing such competency standards is also noted in the ASEAN ICT Masterplan 2015[02] as one of six strategic thrusts of which Thrust 5 is human capital development. Initiative 5.2 in human capital development is to develop skills upgrading and certification in two ways:

1. First, establish mutual recognition agreement for skills certification by developing ICT skill standards for ASEAN to ensure quality of ICT talents and promote movement of ICT human capital within ASEAN.
2. Second, develop ICT certification and skills upgrading programme by adopting certification of ICT skill sets, promoting marketability of certified ICT experts, and developing a competitive ICT workforce through skills upgrading to meet the demand for ICT resources.

01 ASEAN Economic Community Blueprint, ASEAN SECRETARIAT, January 2008, ISBN: 978-979-3496-77-1, available at http://www.asean.org/archive/5187-10.pdf.
02 ASEAN ICT Masterplan 2015, ASEAN Secretariat, 2011, available at: http://www.asean.org/resources/publications/asean-publications/item/asean-ict-masterplan-2015.

In the ASEAN ICT Skill Standards (ASEAN ICTSS) Definition and Certification programme, five areas have been selected to be worked on: software development, ICT project management, enterprise architecture design, network and system administration, information system and network security.[03]

As the world's fourth most populous country and the eighth largest Internet subscriber base[04], Indonesia has the greatest potential market in South East Asia. ICT spending has been witnessing double-digit year-on-year growth, reaching US$16.5 billion in 2014[05]. The sustainable 6% economic growth has attracted many ICT professionals in the region. The Asian Economic Caucus initiative has heightened the interest to build the capacity of Indonesia ICT professionals so that they can actively participate in the ICT development in South East Asia.

2. Indonesia Competency Standard

Competency standards in Indonesia are under the authority of the Ministry of Manpower, which has developed 491 national competency standards across many sectors as at September 2015. The development of national competency standard in Indonesia[06] follows the RMCS (Regional Model Competency Standards) model[07] where each profession is described in its primary functions, unit competence, elements, performance criteria, and range of variable.

The national competency standard in Indonesia is known as the Standar Kompetensi Kerja Nasional Indonesia (SKKNI). It is well recognised that the SKKNI can help training and education institutions in preparing their program and curriculum and can be a reference in training assessment and certification. SKKNI will also help industry in recruitment, performance assessment, constructing job description, and to develop specific training program to fulfill industry needs. SKKNI also used by profession certification body to develop certification program according to qualification and level of the profession.

03 Thasawan Samorwong, ASEAN ICT Masterplan 2015, presented at ASEAN-ITU Seminar on ICT Accessibility and Assistive Technologies for Equity in Society, 25-26 August 2014, Bangkok, Thailand, available at: http://www.itu.int/en/ITU-D/Regional-Presence/AsiaPacific/Pages/Events/2014/August-Accessibility/index.aspx.

04 Internet World Stats, Top 20 Countries with the Highest Number of Internet Users, 2016, available at: http://www.internetworldstats.com/top20.htm

05 IDC Indonesia, Indonesia ICT Top 10: An Inflection Point Hit with the Deluge of Technology, 2014, available at: http://cdn.idc.asia/files/2481c053-f4a7-4a75-a8e7-56d0b3db4bc6.pdf.

06 Minister of Manpower and Transmigration Republic of Indonesia Decree No. 5 Year 2012 on National Competency Standardization System, available at: https://upload.wikimedia.org/wikipedia/commons/7/77/Permenakertrans_5-2012.pdf.

07 Guidelines for Development of Regional Model Competency Standards (RMCS), ILO, 2006, ISBN 92-2-119306-3 and 978-92-2-119306-7, available at: http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/publication/wcms_bk_pb_234_en.pdf.

In addition, the SKKNI initiative[08] also has several related objectives:

- Integrate and streamline the requirements of participating providers, employers and employees, individuals, and interested organizations.
- Encourage the provision of more and higher-quality vocational education and training through qualifications, clearly defining avenues for achievement, and generally contributing to lifelong learning.
- Promote national and international recognition of qualifications offered.

The process to develop a national competency standard for a profession, goes through seven steps, from Initiation to Review (see Figure 1). From Initiation to Establishment, it takes on average at least six months.

The detailed steps to develop a competency standard are as follows:

1. Initiation: Initiation of NCS can be by a citizen, industry association, professional association, professional certification agency, training agency, government and/or other stakeholders.
2. Formulation and Verification: Formulation of the competency standard by Competency Standard Committee is under the coordination of technical ministry and/or Ministry of Manpower.
3. Pre-Convention: The design of competency standard is discussed with selective stakeholders according to the profession sector.
4. Convention: The design of a competency standard is discussed with broader stakeholders to ensure national consensus.
5. Establishment: NCS is established by a Minister of Manpower Decree.
6. Implementation: Implementation of the NCS by related ministries.
7. Review: NCS is reviewed regularly to maintain its validity and reliability.

08 Emanuela di Gropello, Aurelien Kruse, Prateek Tandon, 'Skills for the Labor Market in Indonesia: Trends in Demand, Gaps and Supply', The World Bank, 2011, ISBN: 978-0-8213-8614-9, available at: http://datatopics.worldbank.org/hnp/files/edstats/IDNpub11.pdf.

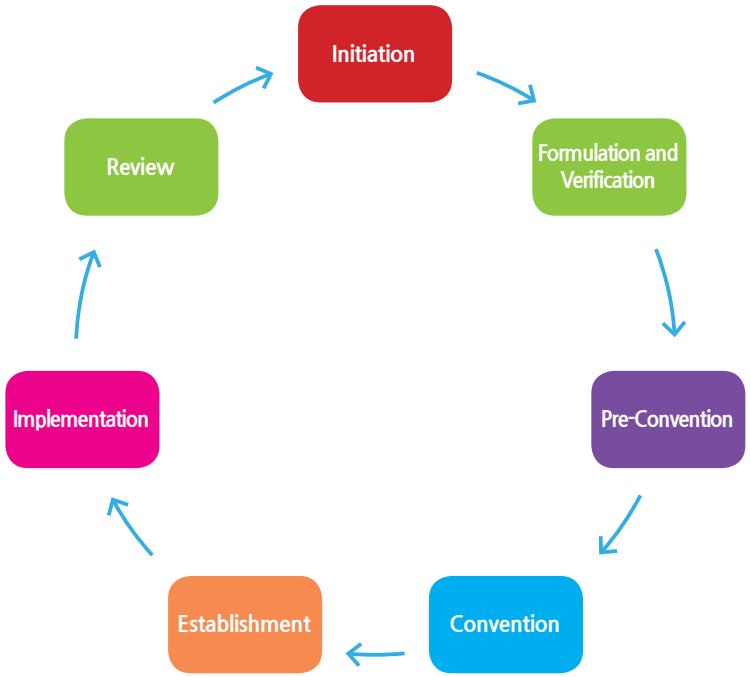

Figure 1. NCS Development Life Cycle

3. Indonesia ICT Professions

The first step to develop an NCS of ICT Professions is to identify professions in the ICT sector in Indonesia. In cooperation with the association of colleges and universities in Indonesia that offer educational programs in computing, information systems and technology (Asosiasi Pendidikan Tinggi Ilmu Komputer Indonesia—literally Association of Higher Education Computer Science Indonesia—APTIKOM) the Ministry of Communication and Information Technology (MCIT) has defined 201 ICT professions that can be divided into four levels:

1. Executive—comprises 10 professions. Examples of professions in this level are CIO, CKO, CSO, and CTO.
2. Managers—comprises 74 professions
3. Supervisors/Assistant Managers/Administrators—comprises 33 professions
4. Staffs/Coordinators/Operators/Specialists/Technicians/Clerks—comprises 84 professions.

Out of 201 ICT professions mentioned above, MCIT has developed NCS for 18 ICT professions since 2005 (see Table 1). At the national level, MCIT has said

that by 1 January 2016, NCS in ICT will be mandatory for industrial workforce, both for workforce from Indonesia and foreign countries[09]. At the regional level, NCS of all five professions mentioned in the ASEAN ICTSS requirements have also been developed.

No	Year	ICT Professions
1	2005	Operator
2		Programmer
3	2006	Systems Administrator and Computer Network*
4		Technical Support
5	2007	Multimedia
6	2008	Satellite Communication Technician
7	2009	Graphic Design
8	2011	IT Security*
9	2012	IT Service Management
10		Fiber Optic Technician
11		IT Auditor
12		Animation
13	2014	ICT Project Management*
14		Enterprise Architecture Design (EAD)*
15		Data Center Management
16	2015	Software Development*
17		Mobile Computing
18		Cloud Computing

Table 1. List of Indonesia ICT Competency Standard

* indicates recognised professions in MRA of AEC

09 Minister of ICT Decree No. 24 Year 2015 on Adoption of National Competency Standard in ICT Sector, available at: https://jdih.kominfo.go.id/produk_hukum/view/id/355/t/peraturan+menteri+komunikasi+dan+informatika+nomor+24+tahun+2015+tanggal+25+juni+2015

4. Certification Process

The profession certification process in Indonesia is established by the National Agency for Profession Certification (BNSP-Badan Nasional Sertifikasi Profesi, www.bnsp.go.id), which has the mission to develop a national system of competency certification covering all sectors of the economy. The BNSP has licensed the profession certification body (LSP-Lembaga Sertifikasi Profesi) to conduct the certification exam. An industry association could set up its own professional certification body to conduct the certification exam and such an arrangement would likely be supported by the relevant Government Agency.

As at December 2015, there were 260 LSP in Indonesia across many sectors. A person who wants to be certified, needs to register with an LSP and pass the exam. A certificate will be given as a proof of competency. Those taking such exams can be from a company, a training and education agency, or simply a private citizen (see Figure 2).

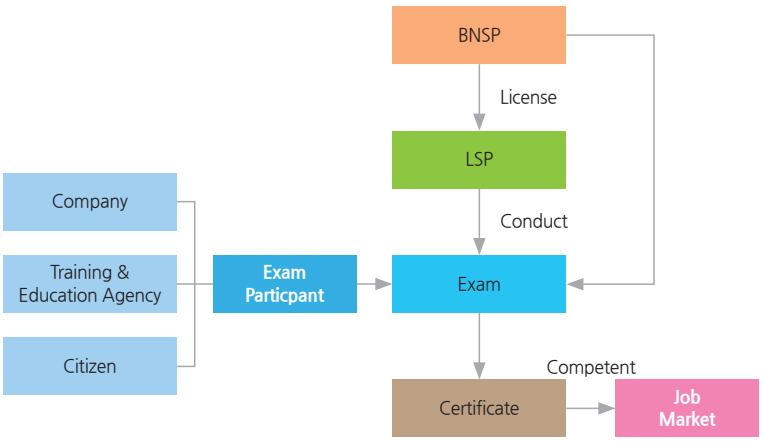

Figure 2. Competency Certification Process

5. National Qualification Framework

Indonesia has developed a national qualification framework (NQF) that is used to align and integrate formal education, job training and working experience. NQF divides qualification levels into nine levels where level 1 is the lowest and level 9 is the highest. Level 1 to 3 are for operator level, level 4 to 6 are for technician or analyst, and level 7 to 9 are for expert.

As shown in Figure 3, the left side of the diagram shows the formal education track, while the right side shows the track for non-formal education such as Job Training and Working Experience. Anyone who graduates from an Undergraduate program is considered Level 6 in the NQF. Similarly, levels 8 and 9 are for Master's and Doctorate degree programs accordingly.

In relation to NCS, a set of unit of competencies for each level in NQF needs to be defined in each profession. By doing so, someone without paper qualification but with working experience background and passes the certification exam can reach level 6, the same level as an undergraduate degree. The adoption of NQF in the national education curriculum is regulated by the Ministry of Education and Culture[10].

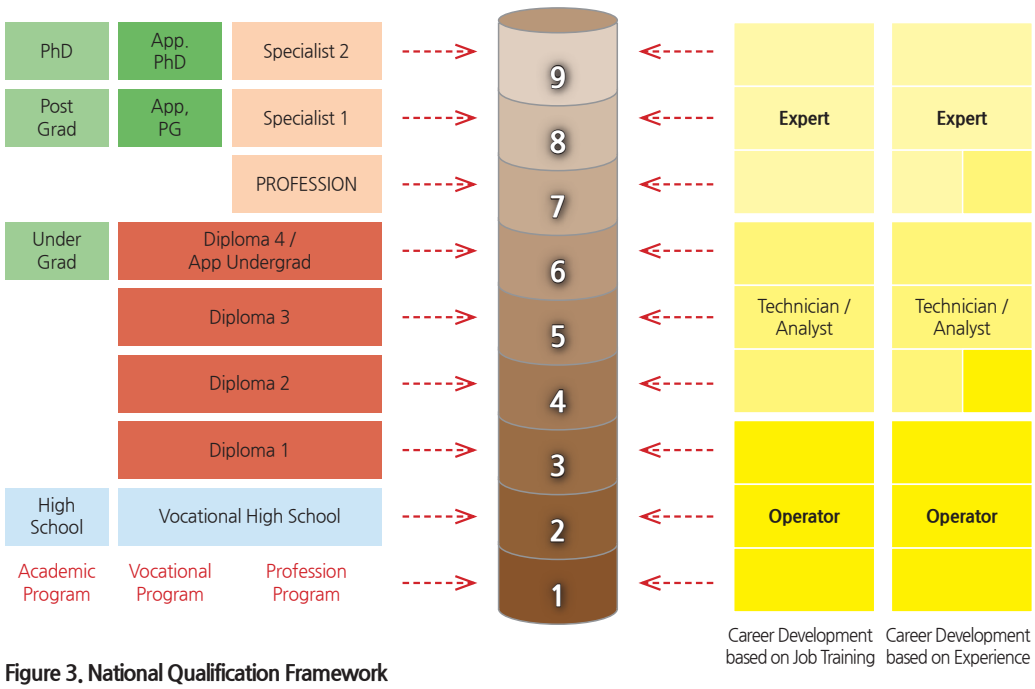

Figure 3. National Qualification Framework

10 Minister of Education and Culture Republic of Indonesia Decree No. 73 Year 2013 on Implementation of Indonesia National Qualification Framework for Higher Education, available at: http://sindiker.dikti.go.id/dok/permendikbud/Permendikbud73-2013JuklakKKNI.pdf

6. Issues

Looking back on the development of Indonesia ICT Competency Standard in the last decade, there are several issues that need to be considered for NCS implementation:

1. An NCS defined for a certain profession through the Minister Decree by the Ministry of Manpower will still not be effective unless it is adopted by the relevant sector. In the ICT sector, the MCIT has mandated the adoption of NCS for the industrial workforce.
2. The availability of and easy access to a Training Center and Competency Testing Center is another issue that needs to be solved for successful adoption of the NCS by industry. Such centres need to be easily accessible and any fees must be affordable.
3. Even though many countries have developed their NQF and NCS, still Mutual Recognition Agreement (MRA) among countries is an issue that needs to be discussed further on how exactly it will be adopted and implemented in each country. ASEAN ICT SS is expected to be a common platform for ASEAN countries to have MRA for ICT professions in the near future.

Country Case Study

Republic of Korea

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1. Background and Rationale

As a key enabler for economic and social development, ICT is no longer an option but an imperative that is integral to a nation's development. With the rising popularity of the Internet, the widespread mobile access and the take-up of social media tools, ICT may never find a better opportunity to speed-up its growth, meaning that ICT can contribute significantly to increasing public administration efficiency and transparency and the delivery of public services to the citizen. This in turn requires public officials to build ICT competency and enhance competitiveness.

Against such a backdrop, the Korean government has conducted the ICT Competency Assessment for Public Officials since the early 2000s and implemented policies to improve their ICT competency through tailored ICT education based on the assessment result.

The ICT Competency Assessment is organised by Korea Local Information Research and Development Institute (KLID), which is an affiliated organisation of the Ministry of Government Administration and Home Affairs (MOGAHA), the supervising body of the assessment. ICT education is provided by Central Officials Training Institute under supervision of Ministry of Personnel Management (MPM). The assessment and education activities are both targeted toward public officials in central government ministries, local government offices and educational offices. This report focuses on the ICT competency assessment and excludes contents regarding ICT education for public officials.

As Table 1 below shows, the ICT Competency Assessment for Public Officials has evolved from IT skills assessment from 2005 to 2009, to the establishment of the ICT competency assessment framework, with its pilot implementation in 2010 and the full implementation of the framework in 2011.

2005 ~ 2009	IT skills assessment (similar to private sector's computer skills test)	• A manager is sent to the organisation wishing to have the assessment, which consisted of theoretical and practical tests. • 7,928 persons in 83 organisations took the assessment tests from 2005~2009.
2010	Establishment of ICT Competency Assessment framework and its pilot implementation	• A competency assessment framework was established, using the online computer-based testing (CBT) method. • ICT competency assessment model, assessment indicators, and intensive guide for competency-building were developed. • 521 persons in 29 organisations, including MOGAHA and public offices in Gangwon Province, took the pilot assessment tests.
2011 ~ 2014	Full-scale implementation of the ICT Competency Assessment	• The ICT competency assessment model has been continually improved. • In 2012, a dedicated server was installed and the system was transferred (from Central Officials Training Institute to KLID) • Assessment scale and method (BARS) were changed in 2013.

Table 1. Evolution of ICT Competency Assessment

Source: KLID, 2015 ICT Manpower Capacity Improvement Project Guide

2. Public Officials' ICT Competency Assessment Model

ICT competency can be defined as the ability to solve problems and enhance the organisational performance by using ICT in the work process. The ICT Competency Assessment model used for public officials in Korea largely consists of the common ICT competency and job-based ICT competency as shown in Table 2 below.

<table>
<tr><th colspan="2">Definition of ICT Competency</th><th colspan="4">ICT Competency Assessment Model</th></tr>
<tr><td rowspan="5">ICT competency</td><td rowspan="5">Ability to solve problems and enhance the organisational performance by using ICT in the work process</td><td rowspan="3">Common ICT competency (10)</td><td rowspan="3">ICT competency that is commonly required in all public officials regardless of their jobs (except for ICT Leadership, which is for management-level officials)</td><td colspan="2">Understanding of ICT (4)</td></tr>
<tr><td colspan="2">ICT Leadership (3)</td></tr>
<tr><td colspan="2">ICT Use (3)</td></tr>
<tr><td rowspan="5">Job-based ICT competency (61)</td><td rowspan="5">ICT competency specifically required in public officials who have ICT-related jobs (16 jobs)</td><td>OS (8)</td><td>Middleware (1)</td></tr>
<tr><td>DB (6)</td><td>Network (6)</td></tr>
<tr><td>Security (15)</td><td>Program Language (4)</td></tr>
<tr><td>Project Management (6)</td><td>Web (2)</td></tr>
<tr><td>ERP (2)</td><td>IT Strategy (11)</td></tr>
</table>

Table 2. ICT Competency Assessment Model

Source: KLID, 2015 ICT Manpower Capacity Improvement Project Guide

The assessment is conducted in form of the Internet-based test on the website (http:// i-cap.e-academy.go.kr) for four weeks around July or August every year.

The behaviorally-anchored rating scale (BARS) is used for assessment and it takes around 15 minutes for public officials in general and 30 minutes for public officials who have ICT-related jobs. One of the distinguishing characteristics of BARS is that it focuses on the behavior shown while working as the standard, or anchor for assessment; therefore, it removes the uncertainties that graphic rating scales have.

The ICT Competency Assessment is targeted toward public officials in the central and local governments and nation-wide educational offices. About 4~25% of public officials in the central government offices are assigned for assessment from each of the 14 segments that are defined based on the organisational size and characteristics, while 20% of the public officials in local government offices are assigned regardless of the segments they belong to. The number of assigned officials for each organisation is measured by multiplying the above share to the number of currently working public officials.

Table 3 shows the case in 2014, when 67,780 public officials out of 538,076 in 303 organisations were

assigned as the assessment target but it turned out that 77,958 officials actually took the assessment, yielding a participation rate of 115%.

Organisation	Assigned No. of Officials		No. of Officials Participated	Participation Rate (%)	No. of Officials Participated in 2013	Growth Rate (%)
	No. of organisations	No. of persons				
Total	303	67,780	77,958	115.02	76,743	1.6
Central Government	43	13,285	13,632	102.61	15,336	-11.1
Local Government	243	49,418	55,430	112.17	54,254	2.2
Educational Offices	17	5,077	8,896	175.22	7,153	24.4

Table 3. Assigned Number of ICT Competency Assessment Targets and Participation Rate in 2014

Source: KLID, 2014 Final Report on "ICT Manpower Capacity Improvement Project"

At the same time, different assessment categories are applied to each job position or level of public officials, as shown in Table 4.

Type		Questionnaire Type	No. of Questions	Remarks
Job Type	Level			
General Positions	Managers	Common competency	40	• 'Competency for ICT leadership' (3 competency types and 9 elements/questions) • Only for managerial-level officials
	Middle managers or working-level	Common competency	31	
Computing or ICT-related Positions	Managers	Common competency (40 questions) and specialised competency (3~32 questions)	Min 43~ Max 72	• No. of questions are different for each of selected 16 jobs • Positions other than computing-related must also select one of the 16 jobs for assessment. • Computing-related positions whose work is not currently related to ICT select one of the 18 jobs, which they wish to have.
	Middle managers or working-level	Common competency (31 questions) and specialised competency (3~32 questions)	Min 34~ Max 63	

Table 4. Assessment Categories by Job Type or Level

Source: KLID, 2014 Final Report on "ICT Manpower Capacity Improvement Project"

2.1 Common ICT Competency

All public officials, regardless of their job positions, are required to have common ICT competency. This consists of three competency groups - understanding of ICT, ICT use, and ICT leadership, which can be further broken down into 10 competency types and 40 assessment elements as shown in Table 5.

Understanding of ICT (3 types and 15 elements)		ICT Use (4 types and 15 elements)		ICT Leadership (3 types and 9 elements)	
Understanding ICT Policies (8)	Gov3.0 Master Plan	PC Management (3)	Executing Security Functions of PC	Diffusion (3)	Exploring Opportunities
	Smart Government Action Plan		Setting OS Environment in PC		Propagating the Need
	Local Informatisation Master Plan		Setting Internet Environment in PC		Promoting Policies
	Work Efficiency	OA Use (6)	Hangul Programs (Korean Word Processor)	Practice (3)	Making Efforts to Adopt Information Technologies
	Impact of G4C Services		Excel		Encouraging Use of Information Technologies
	Smart Work		Power Point		Finding Solutions to Problems
	Open Data and Data Sharing		Image Editing Programs	Competency Development Support (3)	Finding Out Needed Competency
	Copyright Infringement		Video Editing Programs		Providing Opportunities for Competency Development
	Cloud Computing		Mobile Applications		Providing Support for Adaptation
Understanding Latest Technologies (3)	Big Data	Internet Use (3)	Information Search		
	IoT		Social Network Services		
Understanding Personal Information Protection Act (4)	Personal Information Processing Standards and Procedures		Information Systems		
	Personal Information Management Standards and Procedures	Mobile Device Management (3)	Executing Mobile Security Functions		
	Standards and Procedures for Ensuring Information Holder's Rights		Setting Mobile OS Environment		
	Personal Information Infringement				

Table 5. Common ICT Competency Groups and Assessment Elements

Source: KLID, 2014 Final Report on "ICT Manpower Capacity Improvement Project"

Note: Four assessment elements - understanding of smart work, open data and data sharing, copyright infringement, and Internet of Thing (IOT) - were newly added in 2014.

2.2 Job-based ICT Competency

Job-based ICT competency is specifically required in public officials handling ICT-related jobs. It defines 10 competency types and 61 assessment elements for 16 jobs as shown in Table 6.

OS (8)	Server Platform Cluster Management	Understanding of System Management Software	UNIX System Management	LINUX System Management	Windows System Management	Cloud System Management	Understanding of Integrated Servers and Virtualisation Technology	System Compatibility Management
DB (6)	Database Tuning	Database Operation and Management	Database Backup and Recovery	Database Architecturing	Understanding of SQL and PL/SQL	Data Quality Management		
Security (15)	Understanding of Information System Security	Response to Security Incidents and Framework Building	Understanding of Network Security Methods	Computer Forensics	Reverse Engineering	Understanding of Information Security Management System	Secure OS Use	Understanding of Database Encryption
	Understanding of DLP	Web Server Security Review	Understanding of DDoS	Understanding of Mobile Security	Establishment of Security Architecture	Understanding of Secure Coding	Understanding of Network Access Control	
Project Management (6)	Project Planning	Software Test	Configuration Management	Project Performance Evaluation	E-Government Project Management Office (PMO)	Information System Audit		
ERP (2)	SAP ERP Management	Oracle ERP Management						
Middleware (1)	Use of TP-Monitor							
Network (6)	Understanding of Wireless Facilities	Understanding of Network Types	Network Planning and Design	Network Equipment Operation and Management	Understanding of VOIP/IPT	Use of Applications		
Program Language (4)	Basic Understanding of Programming Language	Use of Shell Programming	Use of Tools for Integrated Management	Understanding of Smart Phone Applications				
Web (2)	Use of Web Servers	Use of Web Application Servers						
IT Strategy (11)	IT Governance Establishment	Understanding of ITSM	Establishment of IT Architecture	Understanding of Information System Audit	Business innovation	Understanding of SOA	Understanding of Domestic and International Standards	Understanding of IT Terms and Concepts
	Understanding of IT Educational Trend	IT Education Planning	Evaluation of IT Education					

Table 6. Job-based ICT Competency Types and Assessment Elements

Source: KLID, 2014 Final Report on "ICT Manpower Capacity Improvement Project"

Note: Two assessment elements, PMO and information system audit, were added in 2014.

3. Procedures of Developing ICT Competency Assessment Model

The ICT Competency Assessment model and indicators were developed in 2010 and have been revised and improved each year through analyses of the latest IT trends, national informatisation policies and issues, interviews with specialists and HRD experts. The procedures for developing the ICT Competency Assessment model are illustrated in Figure 1.

Figure 1. Procedures for Developing ICT Competency Assessment Model

Source: KLID, 2014 Final Report on "ICT Manpower Capacity Improvement Project"

The first step in developing the model is to analyse ICT trends in the public and private sectors as well as major policies of the government, and determining which set of IT competency needs to be developed to achieve the national vision and strategy. In 2014, for example, four assessment elements - understanding of smart work, open data and data sharing, copyright infringement, and IoT - were added after considering the latest ICT trends and national issues on informatisation policies. Further, considering the need in the field, two more elements, PMO and information system audit, were also added.

The second step is to interview job specialists to gather inputs to revise and improve the model. The 2014 interviews were conducted with 58 specialists in 21 organisations - 6 central government ministries including Ministry of Government Administration and Home Affairs and Ministry of Employment and Labor, 12 local government offices including Gangwon Province and Daegu Metropolitan City, and 3 educational offices - over four weeks from August to September to review the feasibility of the ICT Competency Assessment model and questionnaire as shown in Table 7.

Goal	• Analyze the suitability of the "2014 Public Officials ICT Competency Assessment Model" • Collect overall opinions on ICT competency assessment • Collect opinions on the mid and long-term development plans for the ICT Manpower Capacity Improvement Project
Period	• 25 August 2014 ~ 22 September 2014
Interviewee	• Persons from organisations which showed high participation rates and good results in competency assessment • 58 interviewees from 21 organisations
Method	• Face-to-face interview
Contents	• Review on jobs in the assessment model • Review on definitions of ICT competency • Review on the assessment model and questions (common/ leadership/ job) • Opinions regarding the competency assessment system, Information Knowledge Competition, and ICT Manpower Capacity Improvement Project

Table 7. Interviews with Job Specialists in 2014

Source: KLID, 2014 Final Report on "ICT Manpower Capacity Improvement Project"

The third step is to gather the overall opinions from interviews with HRD and informatisation experts to revise and improve the common ICT competency. In 2014, as shown in tables 8 and 9 below, a total of ten informatisation and HRD experts joined the interview to contribute their opinions to improve the ICT Competency Assessment model. Also, research on case studies of new competency models is carried out through websites and literature analyses at this stage.

Goal	• Analyze the suitability of the '2014 Public Officials' ICT Competency Assessment Model' • Collect opinions on the mid and long-term development plans for the ICT Manpower Capacity Improvement Project
Period	• 10 October 2014 ~ 21 November 2014
Interviewee	• Informatisation and HRD experts • 10 interviewees
Method	• Face-to-face interview
Contents	• Review on definitions of ICT competency • Review on the assessment model and questions (common/ leadership/ job) • Opinions regarding the competency assessment system, Information Knowledge Competition, and ICT Manpower Capacity Improvement Project

Table 8. Interviews with HRD and Informatisation Experts in 2014

	Type	Number
Informatisation Expert	E-Government Expert	2
	IT Expert	3
HRD Expert	IT Competency Expert	2
	Competency Expert	3
Total		10

Table 9. Types and Number of Interviewees

Goal	• Research on case studies of new competency models based on analyses of competency frameworks that many governments, organisations, and institutions have developed and used
Target	• Clinger-Cohen Core Competencies of the United States • UK's Competence Framework • EU's e-Competence Framework • IBM IT University • Oracle's Competency Assessment Service (CAS) • National Information Society Agency's Digital Competency/ Big Data Competency Assessment Model
Research Method	• Website and literature analyses
Research Content	• Analysis of foundation for informatisation • Analysis of ICT competency model • Analysis of ICT competency assessment model • Analysis of implications for ICT education and training

Table 10. International Benchmarking

The fourth step is to tease out the implications from the analyses of the IT trends and feedback from job specialists and informatisation and HRD experts and to revise the competency assessment model based on such implications.

The final step is to ascertain the feasibility level of the model through Delphi analysis of the competency assessment model and improved questions that had been revised based on the implications drawn throughout the process. Delphi analysis is a method that surveys the same group of experts with several rounds of questions to aggregate their answers and opinions. In each new round, the experts are given the answers and feedback of others in the group. The technique integrates, mediates, and converges the opinions of the group. In 2014, seven organisations, including Korean Intellectual Property Office and Ministry of Foreign Affairs, participated in the Delphi survey. The final ICT competency assessment model that has gone through the five steps of revisions is illustrated in Table 2 above.

4. Use of the Assessment Results

Once the assessment results are gathered, they are provided in the form of reports to individual public officials, managers, and heads of organisations so they can use them for betterment of their ICT competency. The reports help individuals determine which set of competency they need to develop, check guidelines for developing individual ICT competency, and prioritise areas for education. Individual public officials can use the reports to establish their ICT education plans. As for manager-level officials, the reports help them find out the competency they need to develop in their working staff, check guidelines for coaching and encouraging the staff, and prioritise areas for education. The reports serve as useful tools for them to coach and encourage their team workers. For heads of organisations, the reports help them find out the competency their organisations need to develop, check guidelines for ICT competency development at the organisational level, and prioritise areas for education. Using the reports, they can make better plans for ICT education for workers in their organisations.

5. Future Development and Usage of the ICT Competency Assessment Model

5.1 Improvement of ICT Competency Model

The definition of ICT competency and its components must adapt to keep pace with the acceleration of IT development. In this context, the Korean model was compared with the EU's Framework for Developing and Understanding Digital Competence in Europe (DIGCOMP) to gain new insights to improve the ICT Competency Model.

DIGCOMP categorises digital competence into five areas - information, communication, content creation, safety, and problem solving - and defines the level of skills for each area. In comparison, the Digital Literacy Framework of Korea Education and Research Information Service (KERIS) categorises digital literacy into technological, critical, and social literacy, which are further analyzed into indices of understanding, usage, application, and integration.

Both approaches demonstrate that a broader upper-level competency should be defined as the common ICT competency. Classification of the areas and level structure should be redefined so as to accommodate the changes brought by informatisation while at the same time accommodating ICT competency changes in the longer term. For instance, as security or digital device addiction issues is becoming more important, competency in this area needs to be specially addressed. Second, the concept of digital literacy should be enhanced, with a more mature understanding that not only incorporates technological elements into the ICT competency, but also includes interpreting, utilising, and creating information based on technologies. Third, the ICT competency should not only portray knowledge and technological elements but also include attitudinal elements such as open mindedness towards changes, as well as towards management and growth.

5.2 Consistency of ICT Competency Model with National Competency Standards (NCS)

The Korean government has selected "establishing the competency-based society" as its key agenda for some years now. In this regard, the government came up with the National Competency Standards (NCS), which identifies and standardises competencies that are required for successful job performance. It is a comprehensive concept including ability such as knowledge, skill and attitude necessary to perform a job, and assessment of the ability.

In the 1960s and 1970s, when economic development was driven by the government, Korea's Vocational Education Training (VET) and qualification systems played a major role in training industrial workers. But from the late 1990s, there was criticism that these systems do not reflect the real world needs of industry, thus questioning the utility of the VET as well as the credibility of the qualifications.

Realising that advanced countries including the United Kingdom and Australia introduced occupational standards at a national level and continuously make efforts to produce competent workers, Korea began to develop occupational standards by the Ministry of Labor and Human Resource Development Services of Korea (HRD Korea) in 2002.

Competency Unit		Individual competency constituting the whole competency required in relevant occupation
Competency Unit	**Competency Unit Description**	Describes environment, purpose, and range of tasks in one sentence.
	Competency Unit Element	Describes important key sub-competencies constituting a competency unit.
	Competency Unit criteria	Presents results and levels individual should achieve by unit element for evaluation.
	Application Range	Describes scope of utilisation of competency unit, and physical and environmental conditions for performing the unit.
	Assessment Guidance	Describes environment and situation where the described results can be found and used

Table 11. Composition of Competency Unit

Meanwhile, the competency standards on IT-related jobs were revised in 2014 with news standards continually being developed as of 2016. The NCS on IT-related jobs that have been developed so far are listed in Table 12.

Level-1 Classification	Level-2 Classification	Level-3 Classification	Level-4 Classification
Information and Communication	Information Technology (IT)	1. IT strategy and planning	1. IT strategy (revised 2014) 2. IT consulting (revised 2014) 3. IT planning (revised 2014) 4. Software product planning (revised 2014) 5. Big data planning and analysis (new 2015)
		2. IT development	1. Software architecture 2. Application software engineering 3. System engineering 4. Database engineering (revised 2014) 5. Network engineering (revised 2014) 6. Security engineering (revised 2014) 7. UI/UX engineering (new 2015)
		3. IT operation	1. IT system management (revised 2014) 2. IT education (revised 2014) 3. IT support (revised 2014)
		4. IT management	1. IT project management (revised 2014) 2. IT quality assurance (revised 2014) 3. IT test (revised 2014) 4. IT audit (developed 2013)
		5. IT marketing	1. IT sales (revised 2014) 2. IT marketing (revised 2014)

Table 12. National Competency Standards for IT-related Jobs

In the future, the elements for job-based competency assessment of the ICT Competency Assessment model will need to be improved based on the National Competency Standards. Personnel management like competency assessment of public officials in charge of ICT-related jobs, education and training or promotion, and mid and long-term career development support based on NCS will lead to a more practical and systematic assessment framework.

5.3 Utilisation of the Result of Public Officials' ICT Competency Assessment

The result of competency assessment must be used in recruiting and allocating competent talents as well as in contributing to their competency improvement through customised educational and training programs. Even educational and training programs developed based on competency assessment would not improve competency unless public officials' participate in such programs. To improve competency therefore, the guidelines for competency building should be made explicit or it should be compulsory to attend the training program.

The Korean system of ICT Competency Assessment allows public officials to build their own individualised ICT competency development roadmap for their long-term career development. The assessment result at different levels (e.g. introductory/ intermediate/ advanced/ innovative) would require provision of detailed learning methods and contents for competency development, along with the recommended curriculums for each ICT competency level, so as to help public officials come up with specific action plans for their competency improvement.

5.4 Capacity Assessment at the Organisational Level

ICT competency needs to be assessed and improved not only in terms of individuals but also at organisational or institutional levels. Assessment of individual competency may provide the opportunity to check and look back on one's own ICT competency level but will hardly cause direct influence to improving the culture and ICT competency of the organisation.

As it can be more important to go beyond the individual work competency and build the organisational competency, which includes the learning culture for constant promotion of informatisation and the innovative culture for pursuing changes based on informatisation, it is necessary to provide continuous support to define and improve the ICT competency level of individuals as well as organisations.

Country Case Study

Philippines

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1. Introduction

The Information and Communications Technology Office (ICTO) under the Department of Science and Technology aims to produce a nation of competent ICT users for sustainable human development. Executive Order No. 47 mandated it to build the capacities of public sector institutions and their personnel in the use of ICT to improve planning, management, delivery of mission-critical functions and monitoring and evaluation.

Through its National ICT Competency Management Service, the ICTO manages the identification of government personnel qualification and other standards essential to the integrated and effective development, and operation of government ICT services and infrastructure. Further, the ICTO is mandated to professionalise ICT human resource through the development of the National ICT Competency Standards (NICS).

2. The National ICT Competency Standards

As part of its mandate, the National ICT Competency Management (NCM) Service of the ICTO developed several NICS for different ICT job roles in the government. The NICS defines the basic set of knowledge and skills that all Filipino ICT practitioners, non-professional or professional, across various agencies, industries and sectors, can and should be able to demonstrate at given levels of proficiency. It is intended as a baseline to measure the ICT literacy of high school students, civil servants, and the vast workforce that can benefit from the development of ICT in the Philippines.

The skills and knowledge defined in the NICS are the building blocks of ICT competencies. They attest to, and prescribe the levels of fundamental skills that the ICT-enabled human resource in the Philippines can contribute to the global economy.

Knowledge and skills in competency areas are presented generally with specifics on essential areas of learning and performance indicators, but avoid reference to specific vendors, versions or equipment. Thus, it allows flexibility in the adoption of the standard while preserving the general requirements for competence.

3. Purpose

The ICT competency standards are used for performance management, professional development and professionalisation of human capital in government, industry and academe. Each competency standard provides a common framework of expectations among government, business, educators, workers and students, such that:

- Government & business are assured of manpower with the guaranteed ability to perform;
- Educators can discern the competencies on which curriculum is based;
- Workers understand what is expected to be performed and be more efficient & productive; and
- Students know what they need to be able to do.

Effectively, the NICS serves as a snapshot of existing industry standards and as a blueprint for ICT capability building for forward-looking agencies, institutions and organisations. Through the creative and productive use of the standards to their own operations, organisations can use it as a benchmark by which the competencies of their ICT workforce can be assessed.

4. Competency Framework

The NICS Competency Framework outlines the competency levels and domains, with the corresponding performance progression stages, that constitute an ICT competency standard developed by the ICT Office. Each level provides the technical, management, and personal attributes that an individual needs to perform effectively based on his/her job role. Hence, the framework allows for flexibility, adoptability and scalability that may be needed in the future.

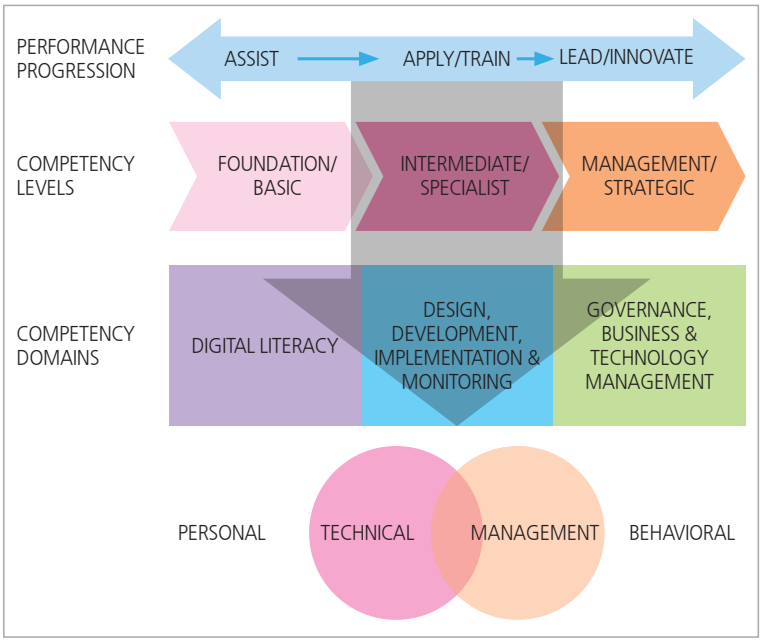

Figure 1. NICS Competency Framework

5. Development Methodology

All NICS are developed through the conduct of several activities such as: comparative research on current industry best practices in the Philippines and in other countries, focused group discussions or consultation with various government and private agencies, institutions, academe, and stakeholders, validation workshops, etc. Figure 2 below shows the phases of NICS development.

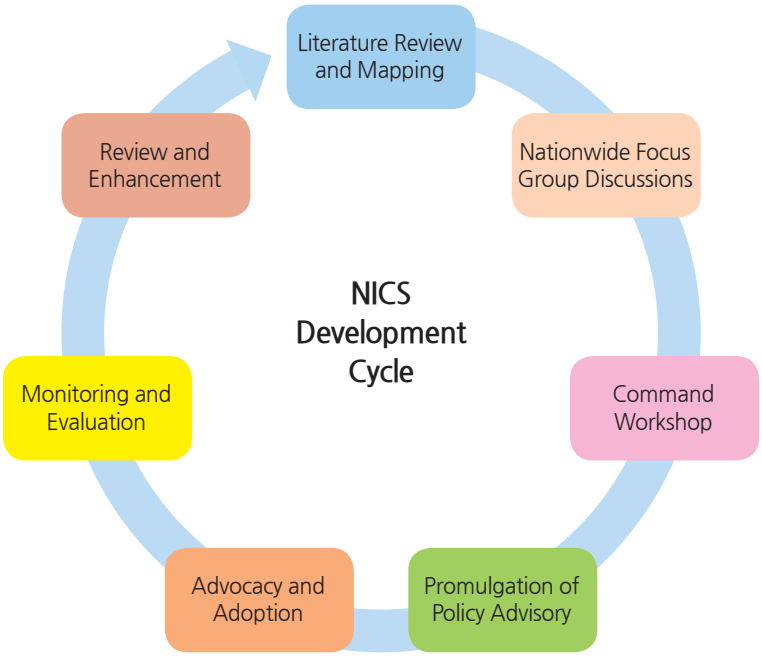

Figure 2: NICS Development Cycle

The NICS is developed in seven phases:

1. Literature Review and Mapping
This phase involves a comparative research on current industry best practices in the Philippines and in other countries. It also includes developing the first draft of NICS customised to the Philippine setting.

2. Conduct of Focus Group Discussions
The first draft of the NICS is validated through a series of Focus Group Discussions (FGDs). Opinions, suggestions, recommendations, and additional information are gathered from subject matter experts from the academe, local government units, ICT Councils, and government and private sectors. These FGDs are conducted in different parts of the country. The output of this phase is the second draft of the NICS.

3. Conduct of Workshop
The second draft of the NICS is now enhanced through the conduct of a workshop. Participants to this workshop are subject matter experts from different sectors facilitated by a resource person who is also an expert on the field. The output of this phase is the final NICS for approval by the ICTO Executive Director.

4. Formulation of Policy Advisory
A Memorandum Circular/Policy Advisory is released by ICTO to all national government agencies, state universities and colleges, local government units, and other stakeholders promulgating the adoption and implementation of NICS.

5. Advocacy and Adoption
In order to ensure understanding and adoption of the developed NICS, several forums are conducted with different industry sectors.

6. Monitoring and Evaluation
Monitoring and evaluation activities are conducted to assess relevance, effectiveness, and impact of the developed NICS to stakeholders. The output of this phase serves as inputs to the next phase.

7. Review and Enhancement
The NICS is reviewed on an ongoing basis through FGDs and workshops with subject matter experts and stakeholders. Updates and revisions are applied to conform to current progress in the development of knowledge, technology, or skill.

6. NICS STRUCTURE

The NICS is a wealth of information presented in a compact form with the following elements:

- Skill Set: this is the key area of competency.
- Sub Area: this is a more specific area of competency within the skill set.
- Competency Descriptor: this is a brief description of the competencies covered by the Sub Area.
- Competency Level: this defines the level of proficiency a person must demonstrate to fulfill a specific job role.
- Performance Indicators: these identify the actions an individual would normally take to perform the area of competence detailed in the relevant statement. These are specific evidence of the achievement of a defined skill or knowledge level or the competent completion of a task.
- Underpinning Knowledge: these are the essential areas of learning and understanding that underpin the area of competence described in the standard. They also indicate broad areas of learning and development that an individual might consider to strengthen the specific area of competence.

Skill Set	**TECHNICAL:**	
Sub-Area	Networking and Communications Planning, implementation, and management of the interaction between two or more networking systems	
Competency Level [Apply / Train]	Performance Indicators	Underpinning Knowledge
3	a. Ensure the effective operational management and delivery of technical infrastructure services	• Topological design • Load balancing
2	a. Lead the research, testing, and evaluation of network and communications services	
1	a. Participate in the research, testing and evaluation of existing and new network and communications service improvements	

Figure 3: Sample Snapshot of a NICS

7. ICTO-Developed NICS

The development of NICS commenced last 2005 and to date the following are available:

- NICS Basic
- NICS Advanced
- NICS Civil Servant
- NICS Teacher
- NICS Career Executive Service Officer
- NICS CeC Knowledge Workers (with two positions)
- NICS Application Developers (with three positions)
- NICS Network Professionals (with three positions)
- NICS Webmaster
- NICS Project Manager
- NICS Enterprise Architect
- NICS Information Security Manager
- NICS Information System Auditor
- NICS Chief Information Officer

The review and enhancement of the NICS are on-going, especially aligning these to the ASEAN ICT Skills Standards (ISS). Alignment of the five priority key positions identified by the ASEAN ISS Technical Working Group has been completed. These five positions are: Software Development, ICT Project Management, Enterprise Architecture Design, Network and System Administration, and Information System and Network Security have been completed.

8. Specialist Certification

Pursuant to Presidential Decree 1408, the ICTO and the Civil Service Commission (CSC) are mandated to assess the proficiency of individuals and certify those who qualify for the ICT Specialist Eligibility. The ICTO issues a Certificate of Proficiency, which serves as basis for the granting of the special ICT eligibility by the CSC. There are two ways of acquiring the proficiency certificate: either passing a technical course or an examination, both administered by the ICTO. To date, a total of 4,620 individuals have been certified as ICT proficient.

In an effort to expand the certification process and certify more individuals, the ICTO partners with state universities and colleges (SUCs) nationwide. These SUCs promote and provide the facilities for the exams. As an incentive, faculty and graduating students of the partner SUCs get a subsidised examination fee. And more importantly, the exams serve as a means for the SUCs to evaluate their ICT curriculum vis-à-vis the NICS, as well as the competence

of their faculty. Graduating students who pass the exam will automatically get proficiency and eligibility certificates facilitating their employment upon graduation.

Moreover, the ICTO is an accredited testing center (ATC) of the International Computer Driving License (ICDL). Hence, basic ICT competencies of the citizens as well as the workforce are assessed vis-à-vis the NICS using the ICDL.

9. Issues and Concerns

It has been a decade since ICT competency standards through the NICS have been introduced. However, there are several issues that surround it and which need to be addressed.

- Its acceptance, and more importantly, the awareness and understanding of the significance and impact of competencies and certification is still lacking. There is a need to adopt a multi-stakeholder approach in its promotion and advocacy. ICT competencies cut-across sectors and their role as a strategic tool for human capacity development and management should be underscored.
- Recognition of the ICT competency certification as one of the elements of the Qualification Standards of the CSC, especially for regular ICT positions. This is another factor that can accelerate its implementation across government.
- Standardisation of ICT curriculum across education sector (both public and private institutions). This will lead to compliance to the ASEAN ISS and ultimately ensure manpower mobility and efficiency.
- Availability of competency certification exams that address the array of NICS, including accessibility and subsidised costs. A “system of equivalency” or a competency-certification matrix where certification exams (vendor-specific or generic) may be mapped vis-à-vis the NICS.

Country Case Study

Singapore

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1. Introduction

1.1 Singapore's ICT Development

Singapore's rapid development since its independence in 1965 from a back-water island to the First World country of today is well-documented. Its rhetoric of pragmatism permeated through all aspects in its government planning and policy, and is one that is relentlessly focused on delivering practical results in the island-state.[01]

The Singapore government recognised early in the 1980s that information and communication technologies (ICT) play a catalytic role as the nation-state mature its manufacturing base towards a knowledge economy.[02, 03] National ICT masterplans have been formulated and implemented since the 1980s, with the latest culminating in 2015 (termed iN2015 plans[04]) towards its target of becoming an intelligent nation.

The focus of Singapore's ICT masterplans evolved from its initial focus on building infrastructure and enabling access, then driving adoption and usage of key ICT technologies, while ensuring that a critical mass of skilled ICT professionals are developed to lead the ICT competitive advantage across sectors and industries.

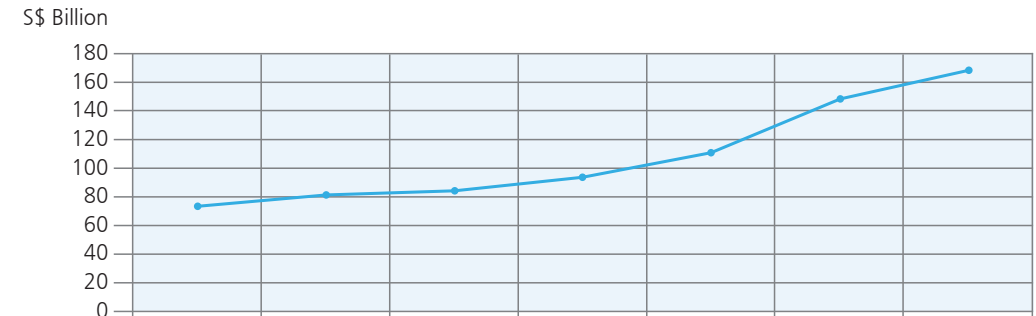
01 Tan, K. P. (2012). The ideology of pragmatism: Neo-liberal globalisation and political authoritarianism in Singapore. Journal of Contemporary Asia, 42(1), 67-92.
02 Wong, P. K. (2001). The contribution of IT to the rapid economic development of Singapore. In Matti Pohjola (Ed.) Information Technology, Productivity, and Economic Growth: International Evidence and Implications for Economic Development, Oxford University Press, 221-41.
03 Yue, C. S., & Lim, J. J. (2003). Singapore: a regional hub in ICT. Towards a Knowledge-based Economy: East Asia's Changing Industrial Geography. Nomura Research Institute: Institute of Southeast Asian Studies. 29, 259.
04 http://www.mci.gov.sg/web/department/infocomm/developing-infocomm/infocomm-masterplans/intelligent-nation-2015-in2015

In doing so, it has engaged the spectrum of governmental ministries and agencies, as well as the private sector as it moves up the value-chain of ICT implementation. Many scholars have written about Singapore's master planning for ICT development. For example, Tan, Pan & Cha[05] included a comprehensive overview of case studies conducted on specific Singapore ICT projects, adoption studies and macro-level strategic ICT plans and focused on the models of governance and ICT engagement, and the transformational processes used. This paper focuses on the country's development of its ICT human capacity, by way of education and training, and the ICT Competency Standards developed.

1.2 Singapore's ICT Development Indicators

After more than three decades of ICT development, Singapore's ICT achievements include being ranked first in World Economic Forum's GITR (Global Information Technology Reports Ranking) in 2015, first in e-Government Rankings by Accenture (in 2007) and Waseda University (in 2015) and the third most competitive IT Industry by EIU (Economist Intelligence Unit) in 2011.[06]

The rising importance of ICT as a competitive differentiator to Singapore is also seen through the increasing revenues generated by the sector. Figure 1.2.1 below shows the doubling of total ICT Revenues in the seven-year period from 2008 to 2014, while Figure 1.2.2 provides a breakdown of these revenues by key ICT segments in the same period.[07]



	2008	2009	2010	2011	2012	2013	2014
Revenue	74.17	80.69	82.84	94.52	113.29	148.11	167.05

Figure 1.2.1. Singapore's Yearly ICT Industry Revenue, from 2008 to 2014

05 Tan, B. C., Pan, S. L., & Cha, V. (2008). The Evolution of Singapore's Government Infocomm Plans: Singapore's E-Government Journey from 1980 to 2007. Singapore E-Government Leadership Centre Report, National University of Singapore.
06 https://www.ida.gov.sg/Tech-Scene-News/Facts-and-Figures/Singapores-Ranking-in-Infocomm#infocomm1
07 https://www.ida.gov.sg/Tech-Scene-News/Facts-and-Figures/Infocomm-Industry

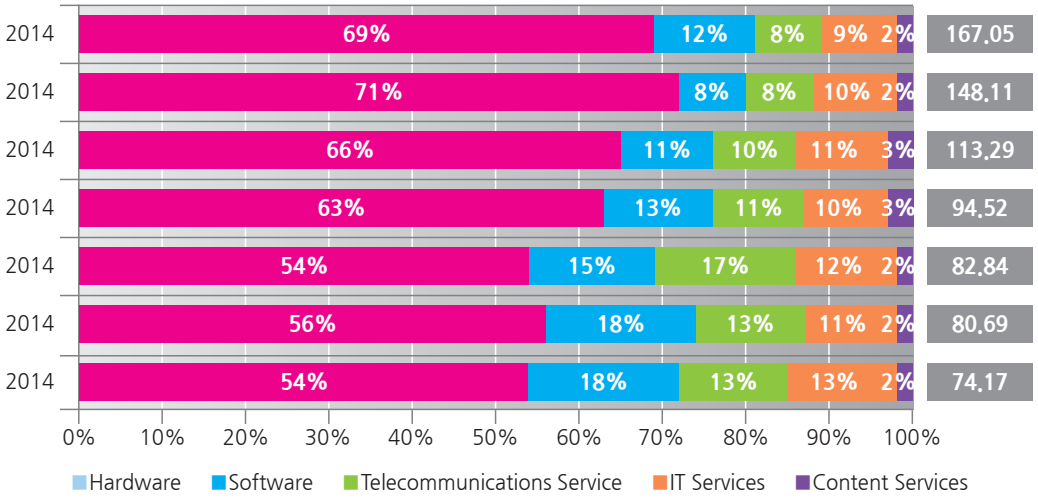


Figure 1.2.2. Revenue breakdown by key ICT Segments

1.3 Singapore's ICT Human Capacity Indicators

The rapid development of Singapore's ICT industry would not have been possible without the parallel effort to upgrade and skill its national workforce. Singapore's ICT journey began in the 1980s as a three-pronged approach including e-government, industry integration and national education. The National Infocomm Plans (Figure 1.3.1 below) concentrated on enabling e-government (through Government Infocomm Plans), whilst integrating the national data infrastructure with key economic sectors such as trade, law and medicine etc. This in turn dovetailed with a series of ICT in Education Masterplans that looked to expose and equip its workforce with the increasing levels of skills as the country kept pace with technological changes and mature its ICT capabilities. These are encapsulated in Figure 1.3.1.

Figure 1.3.1. Overview of Singapore's historical ICT Masterplans

The doggedness with which Singapore developed its human capacity has been a key pillar of the country's success in ICT development. This is evidenced through the high 71% of its ICT workforce who possessed a degree or post-graduate qualification, as shown in Figure 1.3.2.

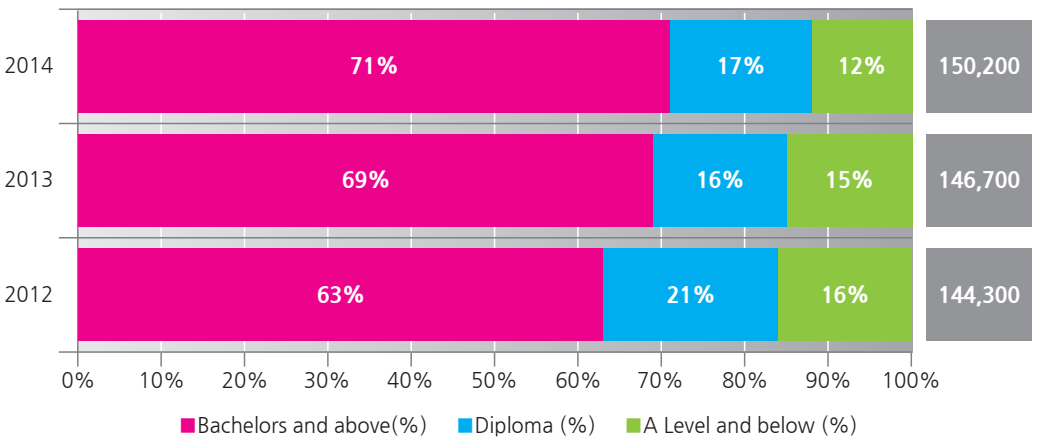


Figure 1.3.2. Employed ICT Manpower, by educational qualifications.

2. Singapore's ICT Competency Standards: the National Infocomm Competency Framework (NICF)

2.1 Background on NICF

The NICF was jointly developed by the Infocomm Development Authority of Singapore (iDA) and the Singapore Workforce Development Agency (WDA). While iDA is the national ICT regulatory and development agency, WDA oversees the WSQ (Workforce Skills Qualification) system that defines and funds the skills and standards across key sectors of the economy as it trains, assess and certify its workforce across industries. Key skills and competencies are developed collaboratively with the industry, and curriculum developed in tandem with accredited WSQ training providers for delivery and certification.

The NICF was developed specifically to define ICT skills and competencies, and was launched in 2008 with 31 job roles. This has since been expanded to 314 job roles across 587 "competency units" at the end of 2014.[08]

As a "manpower planning tool", the NICF details both current and forward-looking competencies as the country looks to continue to grow the ICT industry. The country is unique internationally where its ICT Competency Standards include new and emerging areas such as Cloud Computing, Business Analytics, Green ICT and Next Generation Networks (fibre-optic networks). By specifying competency skills against hierarchical job roles, NICF also serves as a tool for the individual ICT professional in planning his skill development and career progression. At the same time, this provides clear assessment and confidence to business employers in the hiring and training of their ICT professionals at the workplace. NICF's objectives, therefore, are multi-layered as it synergises the requirements of the ICT industry and the individual workforce through a scheme of certified training programs. This is crucial in the small nation of Singapore, where tight labour conditions are often an impediment to business growth. The framework thus, seeks to attract and retain ICT talent in the effort to sustain growth in its ICT capabilities. As at the end of 2014, more than 9,400 individuals have completed the NICF training.

2.2 NICF - Overview

Singapore's ICT competency framework is the largest one internationally, as no other region or country frameworks number close to its 587 "competency units" across 314 job roles. NICF sought to be as comprehensive as possible. Where it is broad beyond the core ICT and telecommunication industries to include ICT

08 https://www.ida.gov.sg/Tech-Scene-News/iN2015-Masterplan/Realising-The-Vision/Manpower-Development

requirements across sectors and business domains, it is also deep in the segmentation of job scopes within each one. Figure 2.2.1 gives an overview.

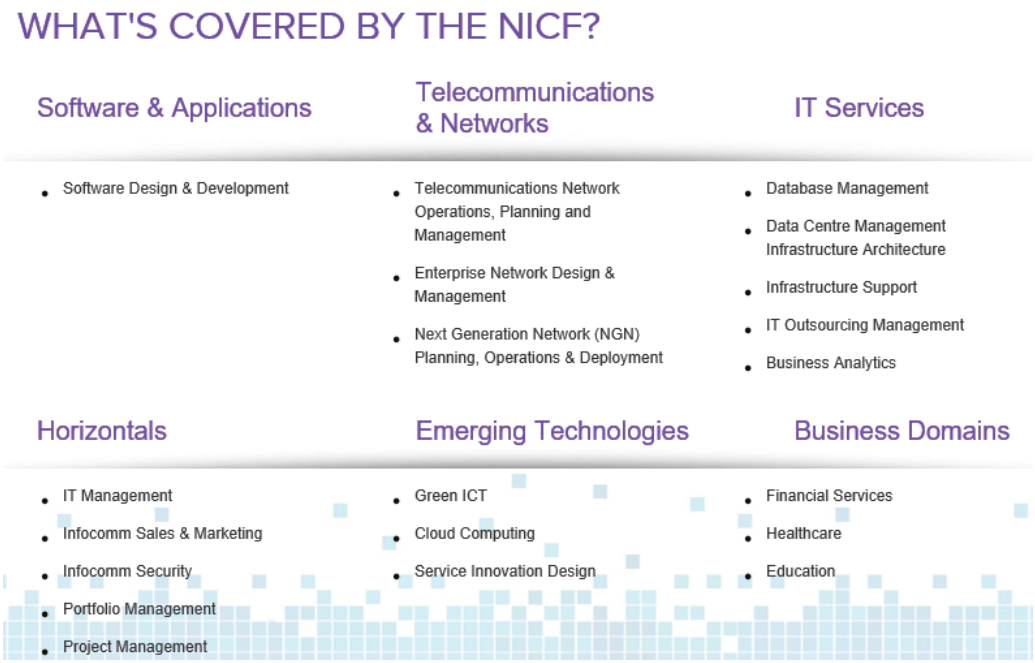


Figure 2.2.1. Coverage of NICF - an overview[09]

2.3 Breadth of NICF - Beyond ICT & Telecommunications

NICF attempts to cover all ICT capabilities required in its national economy, and this pertains beyond the core ICT and telecommunication industries themselves. The first row in Figure 2.2.1 above, with the three sectors, "Software & Applications", "Telecommunications & Network", and "IT Services", are specific to the core ICT and telecommunications industries in the country.

"Emerging Technologies" in the second row, bottom centre, of Figure 2.2.1, looks at seeding capabilities and interest as Singapore looks forward to pioneer these new ICT segments in green and cloud computing, as well as new service innovations enabled through ICT technologies. "Horizontals" in the bottom left extends ICT skills across industries, with particular focus on the three key sectors under "Business Domains" (bottom right) where ICT technologies could be specifically leveraged for competitive advantage. Each of the 587 competency units, therefore, is specific to scope and seniority of a job role in the different areas covered.

09 https://www.nicf.sg/home.aspx

2.4 Depth of NICF - Hierarchical Job Roles

Within each of the six sectors listed in Figure 2.2.1 above, NICF drills down further into sub-sectors (featured in Figure 2.2.1 under each sector heading), before expanding into sub-categories within each with hierarchical job roles. Figure 2.4.1 shows an example of the first sector of "Software & Applications". This sector only has one sub-sector in "Software Design & Development" that is further expanded into six sub-categories of skills with respective job hierarchy from "Entrant" to "Senior Management".

Sub-Sector		SOFTWARE AND APPLICATIONS					
Functional Group		Software Design and Development Involves planning, sourcing and creating the components of a system					
	Job Family	Requirement Gathering & Process Redesign	Design	Development & Deployment	Testing	Quality Assurance	Application Support
Career Progression Pathways based on Job Roles	Senior Management		• Chief Architect ΔXΘ				
	Expert / Management	• Business Process Consultant ∑ΔX	• Information / Database Architect • Application / Solution Architect • Integration Architect ΔXΘ	• Application Development Manager ◊ΔX	• Test Manager ◊ΔX	• QA Manager • Release Manager • Configuration & Change Manager ΔX	• Application Support Manager ΔΘ
	Specialist (Tech)/ (Mgt)	• Business Analyst ΔXΘ	• System Analyst ΔXΘ	• Software Engineer ◊XΘ	• Test Specialist ◊	• QA Analyst • Configuration & Change Engineer	• Application Support Lead Θ
	Entrant			• Application Programmer • Rich Internet Application (RIA) Developer ◊XΘ	• Test Engineer		• Application Support Analyst** ◊XΘ

Figure 2.4.1. Example of Job Roles under Software & Applications

This provides an indication as to how the 314 job roles in NICF were propagated. In larger ICT-specific sectors such as "IT Services", the five sub-sectors are branched out further into 10 sub-categories across the four layers of seniority, and in turn mapped with a specific competency unit for each job role.

2.5 Target Audience Groups

2.5.1 Workforce Individuals

The population is one of the key target segment for which NICF was formulated, with the intention to attract, retain and up-skill ICT professionals as Singapore tries to develop its ICT competencies to compete in the global marketplace. The breadth and depth of the framework meant that any individual who is currently in, or looking to join, the ICT industry or an ICT-related role in the economy could leverage on the scheme to find suitable levels of training for forward career progression.

The extensive spread of ICT sectors, sub-sectors, sub-categories and job hierarchy would have been mind-boggling, however. NICF circumvents this through the interactivity on its website, as individuals can search by job roles or functional groupings, or the competencies sought for. The individual can even search and compare between his current versus a target job role, and see the required competencies necessary for the next career move. This is illustrated through the screen grabs below in Figure 2.5.1.

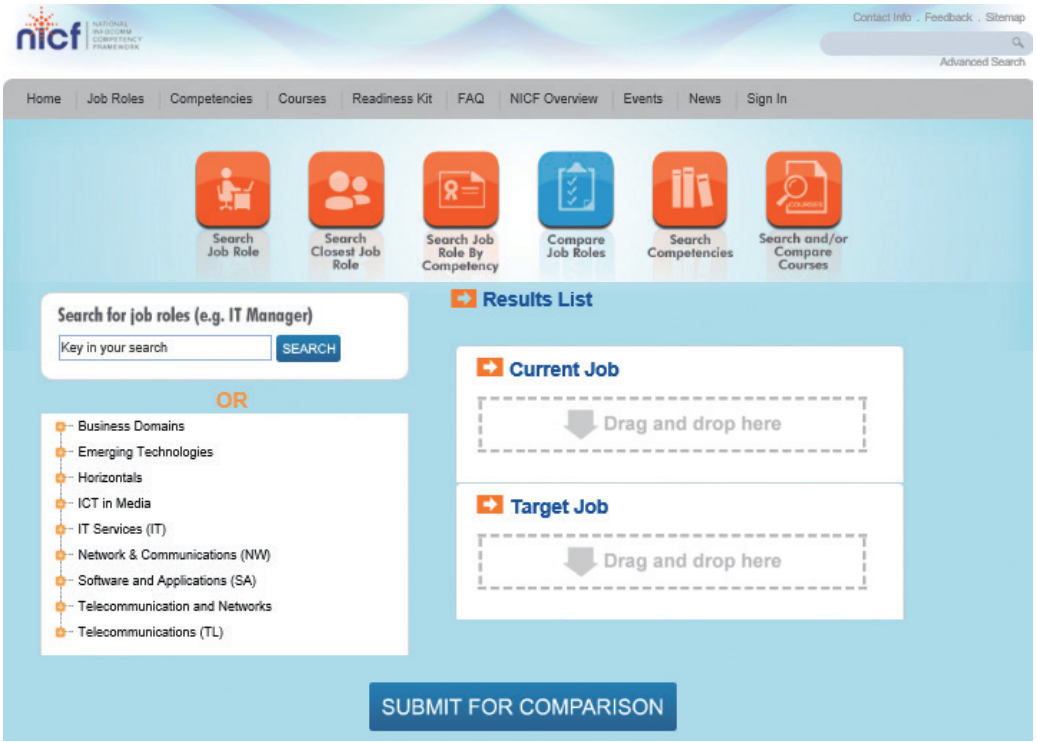


Figure 2.5.1. Interactive Search for Individuals on NICF website[10]

10 http://www.nicf.sg/JobRoles/SearchAndCompareJobRoles.aspx

2.5.2 Industry & Employers

Another key target segment for NICF is the industry employers. The framework was conceptualised based on close collaboration with the industry, and has progressively added scope and depth in response to employers' requirements.

By defining the ICT skills and competencies against job roles, NICF aims to guide employers in their hiring, assessment and training of ICT professionals. In order to accelerate the adoption of NICF, iDA launched the NICF Readiness Kit in March 2013 to help employers plan and manage their ICT human resources amidst the tight labour market conditions in Singapore. Figure 2.5.2 provides an overview of the benefits of NICF targeted towards the industry employers.

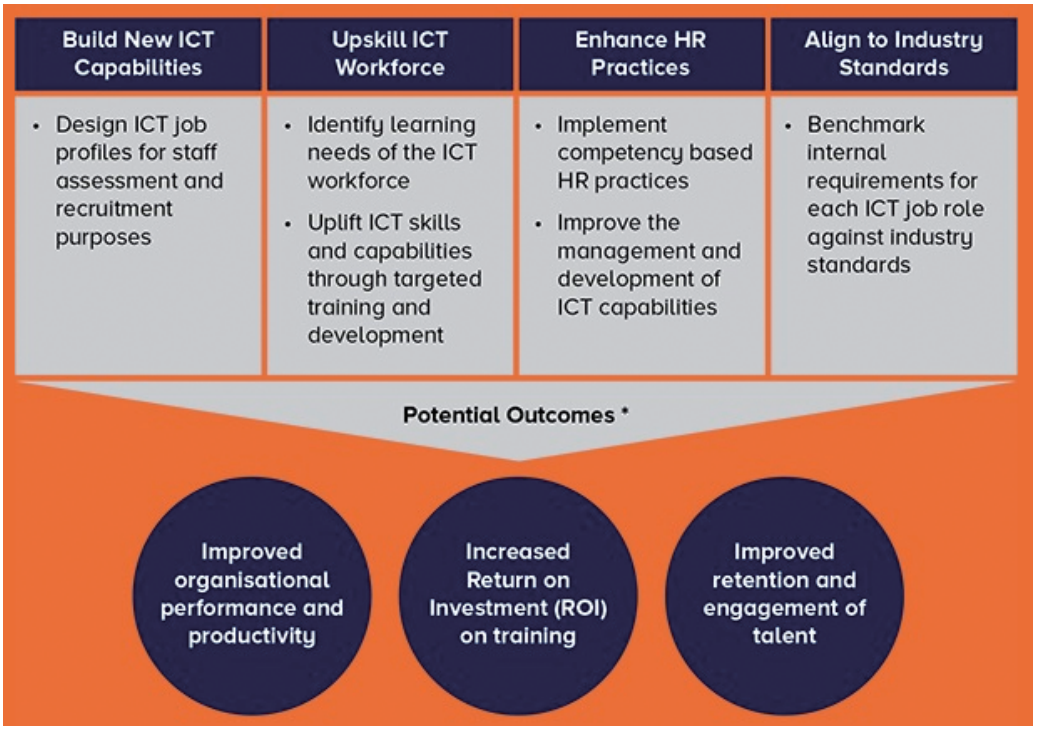


Figure 2.5.2 Overview of Benefits of NICF for Industry Employers
Source: NICF (http://www.nicf.sg/ReadinessKit.aspx)

2.5.3 Public Funding of WSQ Training

Being a part of the national WSQ (Workforce Skills Qualification) system means that all NICF courses offered by accredited training providers enjoy a high level of public funding from the state.
Whether an individual looking to acquire further ICT skills as part of his career planning, or an employer looking to upskill and retain key ICT talents in his organisation can enjoy up to 90% of course fee subsidy under the WSQ system.

The subsidy is higher for individuals or employees who are in lower-bracket income categories. For those earning below S$1,900 monthly, up to 95% of the course fees would be subsidised under the scheme coupled with an additional daily allowance (for the individual) or payroll funding (for the employer) for the duration of the training.

The blanket funding makes NICF training appealing to individuals or companies alike, who are looking to upskill their ICT capabilities. The additional boost to the lower-bracket workforce also exemplifies Singapore's continued drive to value-add its workforce to higher levels of ICT capabilities.

3. Assessment of Singapore's ICT Competency Standards, the NICF

3.1 Strengths

3.1.1 Comprehensive ICT competency coverage across industries & sectors

A key strength of NICF is the breadth and depth of the ICT competencies covered. As Singapore has matured its ICT capabilities, the scope of NICF reflects the spread of skills beyond the core ICT and telecommunication industries, and includes clear "horizontal" ICT skills across the rest of the economy. At the same time, NICF is also forward-looking; by grooming competencies in targeted "business domains" where ICT can be specifically developed as competitive differentiator, as well as new emerging technologies from which Singapore can continue to strengthen its ICT standing internationally.

3.1.2 Industry Relevant

Having been developed collaboratively with the industry also makes NICF relevant. The continuing inputs and endorsement from the industry across the myriad of key sectors and sub-sectors are critical to its credibility and adoption. The increasing breadth and depth of competency units under NICF is an indirect testimony to the continuing engagement with the private sectors and industry.

3.1.3 Granularity in Job Roles & Career Planning

The spread of 314 ICT job roles, mapped hierarchically, across industries is a valuable planning resource for both individuals and companies. Individuals can plan for vertical or horizontal progression in the ICT areas of their interest. Companies, on the other hand, can leverage on NICF's comprehensive list of competency standards and qualifications as they look to hire, train or retain their ICT staff.

3.1.4 Strong Government Support & Funding

The generous amount of public funding testify to Singapore's deliberate effort to grow and mature the ICT competencies of its people. Coupled with qualified and accredited training providers under the WSQ system also lends credibility and confidence to the NICF competency standards and assessment.

3.2 Weaknesses

3.2.1 Adoption Measures

The success of NICF is not transparent, as neither iDA nor WDA have announced any projected levels of take-up or targets. Thus far, the only published statistic is that 9,400 individuals had completed NICF training under WSQ as at the end of 2014. This comprises about 6% of the total ICT workforce.
There were no other available measures to the efficacy of NICF, such as, for example, a listing of companies who have adopted the NICF in their hiring and assessment processes.

3.2.2 Communication & Awareness

Related to the issue of adoption measures is the relative lack of awareness of NICF. Online searches for related news to NICF yield little, and illustrated a need for greater communication and public relation efforts in order to sustain awareness and adoption of the competency framework.

3.2.3 Hard to Understand

While the granularity of NICF is advantageous to the individual or organization looking to a specific task or job role, the spread of 587 competency units across 314 job roles makes it incomprehensible.

Singapore is the only nation observed thus far, whose ICT competency is grouped by specific sectors and sub-sectors. While this is specific to its industry needs in terms of job roles, the manner in which the competency units are developed, and the combination of different domain skills are not transparent. This makes it hard for external parties to understand or relate to the competency framework. For example, in the APCICT's Stocktaking Report of ICT Competency Standards, Singapore's NICF was rarely quoted across the spectrum of competency areas in spite of its extensive spread across industries and job roles.

In comparison, international frameworks such as EU's e-CF (European e-Competence Framework) are classified by the five broad ICT business areas of Plan-Build-Run-Enable-Manage, and UK's SFIA (Skills Framework for Information Age) by six core ICT competence areas (Change & Transformation, Development & Implementation, Delivery & Operations, Skills & Quality, Relationship & Engagement). The NICF's pedagogical framework could be made clearer to be better understood and more widely adopted. This would make the combination of skills and proficiency levels that goes into each job role less opaque and more legible across the breadth and depth of the ICT competency framework.

4. Moving Forward: Opportunities

Singapore's ICT competency standards, the NICF, stood out as one with an extensive range of job roles, industries and ICT areas. Coupled with interactivity, this makes it directly relevant to the individual or organization who is looking at a specific job role (and therefore, the training or certification levels required). This is unlike most international ICT frameworks that list between 20 to 100 competencies grouped by ICT areas or business functions. There is, therefore, an opportunity to reinforce the value of NICF by streamlining its broad range of 587 competencies and 314 job roles by integrating with accepted international benchmarks of ICT areas or business functions. This would make the vast array of competency units easier to understand and further scale as ICT requirements continue to evolve and increase with technological change.

On another note, NICF also exemplifies the need for clearer communication and measures. Efficacy measures beyond the number of enrolled individuals and courses attained under the program could be boosted with the listing of companies who have adopted or endorsed the framework as part of their human resource and talent management practices. This would widen the appeal of the competency framework towards individuals in the workforce as well as synergise ICT hiring and retention efforts across industries. In order to stay relevant and engaged in this manner would also require that NICF continually build on its awareness and media presence. Regular reviews to these measures, therefore, are important to NICF and arguably, for any other regional or international competency framework as well.

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Country Case Study

Thailand

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1. Introduction and Background

In Thailand, a system of academic degrees has been used for evaluating an individual's competencies for employment in both public and private sectors. Companies have found, however, that fresh graduates with academic knowledge still require additional training on some professional competencies, which costs money and time. As market competition has intensified, employers aim to reduce cost and increase work efficiency by improving the capability of existing staff and at the same time recruiting competent new staff. Therefore, a system of professional qualification standards is required in various professions to ensure better standardisation of employment and strengthen Thailand's competitiveness in national and international markets.

The ICT industry, which has been emphasized as an important sector in the Thai economy, has addressed these concerns through ICT competency standards in recent policy papers. Thailand has had three ICT policy frameworks thus far: IT2000, IT2010, and ICT2020, respectively. The first ICT policy framework, known as IT2000, was introduced in 1996 and aimed to develop information technology in the country in the areas of infrastructure, human resources, and government services. The second phase of the policy framework, IT2010, was implemented in 2001-2010, and intended to guide the development and application of ICT for enhancing Thailand's economy and fostering a "wisdom-based" and knowledge-based society. The IT2010 framework outlined five development strategies: e-Government, e-Commerce, e-Industry, e-Education, and e-Society.

The current ICT framework, ICT2020, was developed and enacted during 2011-2020. Under this latest policy framework, Thailand envisions a "Smart Thailand 2020" strategy, with ICT as a key factor to improve the economy and quality of life. It should lead the country towards greater social equality, a stronger economy, and more environment sustainability, as shown in Figure 1. The main objectives of the ICT2020 framework are to broaden ICT accessibility through ongoing improvement of infrastructures and rising penetration of

mobile broadband and through developing information literacy among Thais. In addition, the framework aims for Thailand to rank in a top quartile of the Networked Readiness Index (NRI) and to increase the proportion of ICT-based industries to not less than 15% of the GDP. One of the framework strategies focuses on ICT human resources and competent ICT workforce, aiming to establish a framework for developing ICT personnel and personnel in general fields with knowledge and skills that are in tune with the changing economy, society and technology in the 21st century.

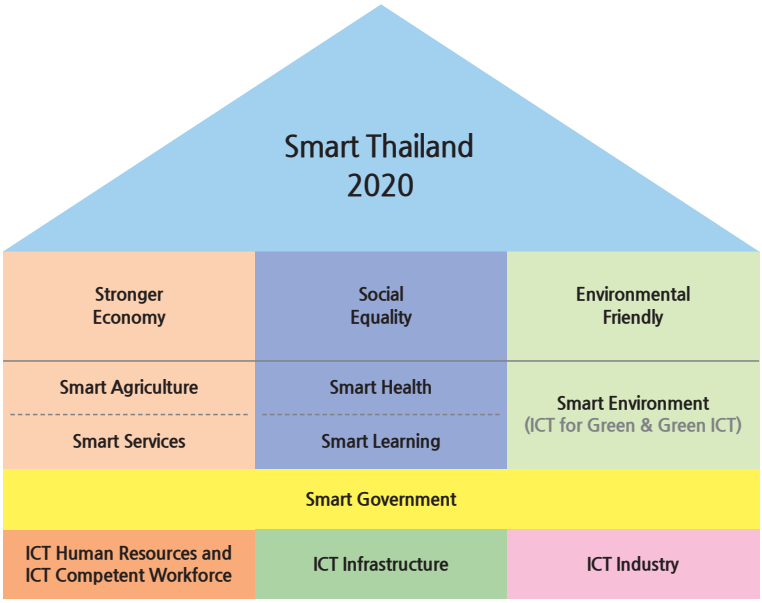

Figure 1: ICT 2020 Framework

Source: http://www.mict.go.th/view/10/All%20News/e-Publication/25

Along with the establishment of IT2010 and ICT2020 policy frameworks, the Thai government launched a five-year National ICT Master Plan (2002-2006), which led to the establishment of the Ministry of Information and Communication Technology (MICT). Building on this first Master Plan, the second National ICT Master Plan addressed existing weakness, built up existing strength, and sharpened a focus on particular areas in response to the technological, economic, and social changes. Some of the strategies concerned developing ICT professionals and creating an information literate society in the populace.

Before the end of the second master plan, the MICT drafted the third National ICT Master Plan and proposed it to the Cabinet. A coup took place on May 22, 2014, however, and the junta cabinet, which has governed the country since, launched a new policy of digital economy. Although this latest policy still positioned ICT as an important driving force, it suspended the third ICT Master Plan and paved the way for a new Digital Economy Master Plan.

Under the new Digital Economy Master Plan are five themes: 1) hard infrastructure, 2) soft infrastructure, 3) service infrastructure, 4) promotion and innovation, and 5) society and knowledge. At the time of writing this report, the MICT was drafting the details of the Digital Economy Master Plan, which will replace the third National ICT Master Plan and serve as a blueprint for the new digital economy. During this drafting, and in the absence of a Master Plan, the second ICT Master Plan is still used as a guide for government agencies at the operational level.

This second Master Plan was the first to addresses the development of ICT personnel competencies, especially in the strategy that focuses on ICT human resources and competent ICT workforce (see Figure 1). Some strategic actions of the strategy include setting up a database of ICT personnel and labor force and making an ICT professional development plan with the National ICT Competency Framework and the National ICT Skill Certification Center to systematically increase high-quality manpower that is capable of developing and using ICT efficiently. In response to the ICT2020 policy framework, the second ICT Master Plan focuses on developing ICT professionals and information literate population; more specifically, the population should have the knowledge and skills to create, produce, and use ICT in effective, ethical, and considerate ways.

2. Thailand's ICT Development Indicators

Thailand ranks 67 out of 143 countries in Network Readiness in the Global Information Technology Report 2015[01] ; mobile network coverage in Thailand was ubiquitous, with mobile penetration of 127.5% and 150 mobile subscribers per 100 inhabitants, which is above the global average of 95.5%. Broadband penetration per household in 2015 also increased 8.9%, according to the NBTC website, with fixed broadband internet subscription and mobile broadband subscription per 100 people marking the 73rd and the 42nd of the 2015 NRI rankings, respectively.

In ICT device possession and use, 7.1 million Thai households connect to the Internet, 6.9 million possess computer devices (personal computers, notebooks, PDAs, and tablets), and 2.9 million have fixed line phones. The top three activities on computers of Thai people were entertainment, surfing the Internet, and playing games; the Internet was used mostly for downloading movies and games, listening to radio/music, and social networking (National Statistic Organisation, 2014a).

3. Thailand ICT Competency Standards

ICT competency standards in Thailand were set by the Thailand Professional Qualification Institute (TPQI), a public organisation that established a system of competency standards for various professions and approves organisations as certified bodies. The MICT and TPQI signed a memorandum of understanding (MOU) in 2012, which assigned TPQI to formulate ICT and digital content professional standards.

The standards cover six ICT professional sectors: 1) hardware, 2) network and security, 3) software and applications, 4) animation, 5) telecommunication, and 6) project management, with 64 ICT professions in total as depicted in Table 1 below.

01 Dutta, S., Geiger, T. & Lanvin, B. (2015). The global information technology report 2015. In World Economic Forum.

Category	ICT Professions	Number of Levels
1. Hardware (11 professions)	ICT product design and development	3
	ICT sourcing and procurement	2
	ICT production and quality assurance	3
	Computer and computer system service provider	3
2. Network and security (10 professions)	Technical supporter	4
	Network and computer security system manager	3
	Computer network system manager	3
3. Software and application (11 professions)	Software tester	2
	Software developer	3
	ERP software	2
	Software architect	3
	Software quality control	4
4. Animation (14 professions)	Animation editor	2
	Animation sound designer	2
	Animation artist	2
	Animation project management	2
	Animation modeler	2
	Animator	4
	Animation scriptwriter	3
	Animation storyboard artist	2
5. Telecommunication (15 professions)	Radio Base Station (RBS) technician	4
	Microwave link technician	3
	Optical Distribution Network (ODN) technician	2
	RBS technology officer	2
	Microwave link technology officer	2
6. Project management (5 professions)	IT project management	5

Table 1: Job-based ICT professions covered in TPQI's ICT and digital content professional standards

Source: http://www.tpqi.go.th/standard.php

The TPQI's ICT competency assessment is optional for public officers and private employees in the ICT and digital content industries. In 2015, about 500 persons participated in ICT competency assessments organised by certified assessment centers.

Other competency standards initiated by vendors or private companies include ICDL, Microsoft Certified Professional (MCP), Java Certification, Cisco Certification, and CompTia Certification. These are professional certifications with special ICT competence that have been employed by some corporations in Thailand in acquiring job applicants in order to get certifications from those vendors.[02]

Also, the National Science and Technology Development Agency (NSTDA), a state entity that is Thailand's representative as a member of the Information Technology Professional Examination Council (ITPEC) among other six countries including Japan, Malaysia, Vietnam, Myanmar, and Mongolia, has adopted the Information Technology Professional Examination (ITPE) and organised the examination for IT and non-IT professions in both public and private sectors. Some state agencies have employed ITPE, including the Thailand Board of Investment, the E-Government Agency, and Department of Medical Sciences of the Ministry of Public Health, while True Corporation is an example of a private sector using this examination. The ITPE covers six professions: 1) Fundamental Information Technology Engineer Examination (FE), starting in 2006, 2) IT Passport Examination (IP), starting in 2010, 3) Applied Information Technology Engineers Examination (AP), starting in 2012, 4) Software Design & Development Engineer Examination (SW), 5) Network Specialist Examination (NW), and 6) Database Specialist Examination (DB), which have started recently. Some 20,000 persons have taken the examination thus far, as shown in Table 2.

Status	FE	IP	AP	SW	NW	DB	Total
Applicants	7,746	13,072	80	111	261	174	21,445
Examinees	6,893	11,843	66	105	214	149	19,270
Passes	567	3,504	8	3	0	1	4,083

Table 2: Number of participants of ITPE in Thailand
Source: www.nstdaacademy.com/webnas/index.php/itpe-statistic

02 Manoo Ordeedolches, personal interview, October 16, 2015.

4. Development of ICT Competency Standards

Prior to the establishment of TPQI's ICT competency standards, the MICT appointed a committee comprising representatives from government agencies, private sectors, and academics to develop ICT competency standards during 2010-2012. The committee was to study and outline core standards of ICT competencies for ICT professions in five subsectors: project managers, system analysts, security specialists, system architects, and programmers. The standards were designed in accordance with ASEAN ICT skill standards, which had been originally proposed by Thailand. In its report, the committee recommended a certifying body to handle certification services for related agencies in both private and public sectors. Two organisations were nominated — TPQI and the Ministry of Labor. While he study has been completed, the proposals have yet to be approved and implemented.[03] The tardy response to implement the planned standards and appoint certifying bodies could stem from a lack of appropriate agencies to put the plan into practice.[04]

After the MOU between the MICT and TPQI in 2012, TPQI finished the first phase (2013-2014) of formulating six categories of ICT and digital content professional standards, as mentioned in Table 1. TPQI developed the standards by consulting with multi-stakeholders, including relevant state agencies, ICT industry members, and academic sectors; these stakeholders were involved in different stages of the standards development. First, TPQI invited universities and ICT-related industry associations to be the project's consultants in studying relevant standards. Under the terms of reference (TOR), the project consultants had to conduct document analysis regarding best practices of ICT competency standards of three other countries, the selection of which would be left to the consultants, and other relevant information in Thailand. The TOR specified that one country in the study had to be one of ASEAN members and the study should take the ASEAN qualifications reference frameworks into account. Next, the project consultants invited a working committee, which consisted of representatives from the MICT, Ministry of Labor, operators and associations in the ICT industries i.e. the Thai Federation of ICT Technology Association (TFIT) and the Association of Thai Software Industry (ATSI) to collaboratively define ICT competency standards and job roles of each profession, including key purposes, key functions, key roles, units of competency, and levels. Also, the working committee outlined a draft of assessment tools, which varied from examination, interview, portfolio, and 360 degree approach, etc. Then, the project consultants invited all relevant stakeholders to the public consultation. After that, the project consultants proposed the standards to a standard

03 Manoo Ordeedolches, personal interview, October 16, 2015.
04 Kasititorn Pooparadai, personal interview, November 4, 2015.

approval committee, which made up of representatives from private and public authorities in the ICT industries who have higher ranks than those in the working committee. After passing the approval process, TPQI promoted the ICT competency standards to the public and those in the ICT industries through mass media and online media. Also, TPQI was responsible for certifying assessment centers under ISO17024 standards to run the assessment.[05] The steps in the standards development are depicted in Figure 2 below.

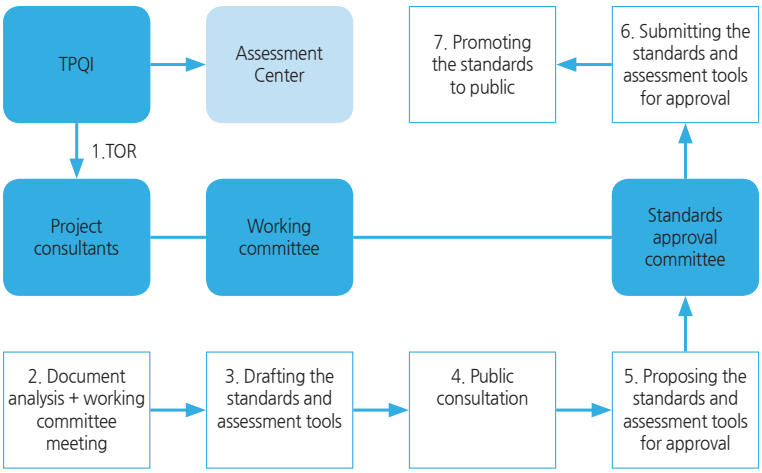

Figure 2: Steps in developing TPQI's national ICT competency standards

5. Assessment of the ICT Competency Standards

As TPQI's ICT competency standards have been established as a national ICT competency framework for only a few years, recognition of the TPQI's standards among ICT industry members is still uncertain. In comparison, vendors' standards have been well known among many countries and designed for special or advanced ICT competence.[06] Also, the importance or benefits of ICT competency standards have not been as widely accepted in Thailand as in some other countries. The TPQI and ICT industry associations therefore have the task of persuading those in the ICT industries to consider these ICT competency standards as tools for HR management and for increasing competitive advantage in global markets, especially ASEAN.

05 Noppadol Piyatrapoomi, personal interview, December 15, 2015.
06 Kasititorn Pooparadai, personal interview, November 4, 2015.

Realising such a weakness, after having launched six ICT competency standards, TPQI appointed a steering committee, which included relevant stakeholders from both private and public ICT sectors to promote the use of the standards.

State subsidy is also important in drawing more participants in the assessment, so TPQI offers a discount of 75% off the assessment fees. Moreover, TPQI sees an opportunity to further promote the standards to ICT workforce who have not graduated from ICT-related fields but have much work experience in the ICT industries for it will be a benefit for their career path.[07]

In aiming to establish the national ICT competency standards, one lesson that Thailand quickly learnt is that it is vital to include all relevant stakeholders or "multi-stakeholderism" in the development and implementation of the standards; these stakeholders include state agencies, ICT operators, and ICT-related organisations. Suitable incentives for both public and private sectors are also important for encouraging employment of the standards as strategic tools for developing human resources.

6. Moving Towards Digital Workforce Under Thailand's Digital Economy policy

The new Digital Economy Master Plan approved in February 2016 is aims to boost the digital economy. The Master Plan emphasizes a digital workforce strategy for ICT professionals and non-ICT professionals in both public and private sectors, similar to previous ICT master plans. During the public consultation phase, the TFIT submitted its own digital economy development plan, which addressed the importance of standardising ICT professionals by assessing their competencies using the ICT standards.[08] This shows that ICT competency standards have gained more importance in a policy level; the issue is how the standards would be effectively implemented at the operational level.

Looking ahead, the TPQI plans to further encourage the use of the standards by directly approaching prospect companies and updating other countries about the employment of Thailand's ICT competency standards apart from the current academic degree system. TPQI signed a contract with project consultants to study more ICT competency standards in different job roles i.e. mobile application, cloud computing, and satellite, and how to tie current vendor certification with the TPQI's standards in order to attract more participants. Also, TPQI plans to certify more assessment centres under ISO17024.

07 Noppadol Piyatrapoomi, personal interview, December 15, 2015.

08 Thai Federation of ICT Technology Association (TFIT). (2015). "Proposal to develop a digital economy plan," [online] Retrieved form : http://www.digitaleconomy.in.th/project-updates/srupkhxsenxkarphathnanyobaydigitaleconomykhxngthangklumsmakhmnixutsahkrrmxisithi

In addition, the Digital Economy Master Plan also emphasizes building of human capital for digital economy by increasing digital and information literacy, which is under a Digital Citizen strategy. This strategy aims to upgrade the function of current technology centres in rural areas, which are just ICT access centres at present, to digital literacy centres that serve local people with interactive activities to improve their digital literacy. Accordingly, TPQI is now conducting studies on IT literacy standards and ICT users and general workforce.

In conclusion, under the Digital Economy policy, ICT competency standards have been reemphasized in the policy level. TPQI, as a host organisation in developing the standards, has learned some lessons from previous work and employed a multi-stakeholder approach to develop and implement the standards in order to increase effectiveness of ICT competency standards in both ICT professionals and general IT users. However, support from other relevant stakeholders is still necessary for success.

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