

Briefing on ICT Competency Standards



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1. Introduction

1. Introduction

In order for a country to successfully harness the possibilities of ICT technologies and knowledge for development, it must develop its human capacity in ICT. It is this human capacity in ICT in planning, developing and implementing hardware and software that makes the difference in whether ICT might help or hinder development.

How does one go about developing human capacity? A key factor lies in using competency standards, which are used to define the qualifications needed to practice in a profession. Competency standards, as defined in an APCICT Report of February 2015, are a “cluster of related knowledge, skills and attitudes that affects a major part of one’s job (a role or responsibility), that correlates with performance on the job, that can be measured against well accepted standards, and that can be improved via training and development.”¹ In other words, competency standards are, as the name suggests, standards that measure how competent someone is to perform a role or responsibility in a job.

ICT competency, further, was defined as the “confident and critical use of electronic media for work, leisure and communication. These competencies are related to logical and critical thinking, to high-level information management skills, and to well-developed communication skills.”²

ICT competency standards can help a country transform its workforce that progressively leverages on ICT technologies can be facilitated through ICT competency standards. By specifying the skills needed at varying levels of proficiencies, ICT competency standards focus the efforts of government in its engagement with industry sectors and the general population through its training and education initiatives. At the private sector level, ICT competency standards become the framework both for businesses and individuals to refer to in their manpower practices and skills acquisition respectively.

For the individual, competency standards offer recognition that a person has attained an ability to perform at a level of professionalism. These standards provide a roadmap for the individual to achieve the professional aspiration.³ Competency standards also improve training because they effectively test the quality of training. As competency standards are often placed on a scale going from lower skills to higher skills, employees can see a path to upgrade themselves through attaining higher levels of competency. This leads to higher productivity, greater job satisfaction and better employee retention.

1 Parry, S. R. (1996). The Quest for Competence. Training Magazine. (as cited in UN-APCICT, 2010)

2 UNESCO Bangkok Communication and Information Unit (2008). Strategy Framework for Promoting ICT Literacy in the Asia-Pacific Region. Bangkok: UNESCO Bangkok.

3 *ibid.*

For employers, competency standards assure them that the person is qualified for the tasks the job requires. This helps businesses and governments to hire, train, appraise and promote staff for better management and planning of labour needs.⁴

At the regional level, recognised competency standards facilitate the exchange of the ICT workforce across the region. That is, the ICT workforce can be more mobile.

1.1 Regional and Global Integration

ICT competency standards can also facilitate a country's integration into the regional and international markets. Having clear and well-accepted standards increases a country's appeal to foreign investment and avail the importation of technologies critical in its growth and industrialisation.

Competency standards also allow a nation to integrate economically within an affiliated bloc, and enjoy the benefits of productivity gains, job creation and economic growth with the efficient utilisation of resources across the member countries.⁵

1.1.1 Format of This Report

This Report is laid out in the following sequence: first it reviews the existing ICT national standards, comparing Australia, Indonesia, Philippines, Singapore, UK and USA. The broad sweep is intended to convey the diversity of approaches as well as to pick up relevant best practices.

Second, the Report proposes a framework that encompasses both ICT development and the state of economic development of a country. Two countries at a similar stage of economic development may require different ICT competency standards frameworks because of the different states of ICT readiness.

Third, the Report proposes step-by-step guidelines towards developing competency standards. Other considerations not hitherto listed, such as regional and supranational standards, will be discussed as well.

4 UN-APCICT. (2015). ICT Competency Standards for Public Sector. Outcome Report of iSEED Programme. At p.2.

5 http://elibrary.worldbank.org/doi/abs/10.1596/9780821397268_CH01

1.1.2 Review of Existing ICT National Standards

All existing ICT competency standards that have been first covered by the APCICT stock-take would be analysed and compared in terms of the specific indicators and/or job roles as they pertain to distinct target segment. In other words, this Report would not repeat the overview of each national ICT competency standard that have been covered by the initial stock-take, but go right into the comparisons of the actual skill standards and definitions that are used to address the different target segments.

ICT competency standards typically have the following target segments in mind:

- a) Government or public officials: ICT skills and certification levels for the workings of the government, often for the purposes of enabling e-government processes;
- b) General workforce/population: basic digital literacy for everyone in the population, and especially for preparing or upgrading the skills of the workforce;
- c) Core ICT industry: skills for ICT professionals within the core ICT industry in the country, including telecommunications, software development and systems management, IT architecture and project management, etc.;
- d) CT professionals across sectors: where skills are defined for a broad spectrum of industries beyond the core ICT sector above, i.e. ICT skills are developed to address the varying needs of cross-section of key industries within the country.

Many of the national ICT competency standards, especially those in ASEAN, are also covered in greater depth through the individual country case studies that are appended to this Report.

The development of the human capacity in any country is often conducted in tandem with its larger ICT development efforts. This is recognised in the review of the country standards in terms of how each target segment would fit in the overall attempts to develop ICT Access & Diffusion, ICT Usage & Adoption and ICT Impact.

1.1.3 ICT Development & Stages of Economic Growth

Development of the ICT industry and its ICT human capacity are part of the overall growth and development of a country. This section reviews ICT development and skills against the national needs of a country at the different stages of economic growth, from emerging to developing and developed economies. The ICT development life cycle of Access & Diffusion, Usage & Adoption and Impact are charted along the stages of economic growth.

This Report hopes to become a useful reference for policy planning and review through its proposed framework, bridging ICT development and the competency standards for the different target segments, and that of stage of economic growth. The gaps of existing national ICT competency standards as they relate to their current stages of economic development would also be suggested for further review.

1.1.4 Steps in Setting Up Country ICT Competency Standards

Gleaning from the review of the existing national ICT standards, this section would propose steps for the planning and implementation of a country's competency standard in line with its economic development and target segments.

1.1.5 Regional & Supranational ICT Competency Standards

The additional objectives of regional or supranational ICT competencies are considered next, with the review of existing regional standards in Europe and ASEAN.

1.1.6 Additional Considerations/Conclusion

The last section of this Report would look into other issues and related areas, as it concludes the discussion of ICT competency standards.

2. Country ICT Competency

2. Country ICT Competency

The stock-take of various international ICT competency standards unveiled a myriad of different country and regional standards. In order to understand them better it is important to review each country's standard in light of their respective objectives, goals and target segments that the ICT competency framework addresses. This is encapsulated in Table 1 below.

Country - ICT Competency Standards Grouped by Target Segments				
	e-Government	General workforce	ICT Professional Competencies	
			ICT-industry only	ICT & All Sectors
Country / Standards	UK : SFIA US : Clinger-Cohen core competencies Philippines : NICS India : eGCF	Australia : AQF Philippines : NICS *ECDL Foundation : ICDL	Malaysia : Skills Competency Matrix Australia : AQF	UK : SFIA Singapore : NICF
Objectives / Goals	<ul style="list-style-type: none">•ICT Diffusion / Access•Set up national ICT architecture and data infrastructure•E-Government a start to a critical mass of ICT deployment to start local ICT industry & workforce	<ul style="list-style-type: none">•ICT Adoption / Usage•Basic ICT skills for general workforce•Increase digital and information literacy•Complement national education initiatives for ICT literacy	<ul style="list-style-type: none">•ICT Adoption / Usage / Impact•Grow core ICT sector to automate & digitize information & services	<ul style="list-style-type: none">•ICT Usage / Impact•Competencies leveraged beyond ICT sector across industries•Integration of data, processes & systems within economy for ICT advantage

Table 1: Categorisation of ICT Competency Standards by Target Segments & Objectives

It may be observed from the above that ICT competency standards may relate and target four different audience segments. The categories are not mutually exclusive, as a country standard may include more than one segment. For example, the Philippines' NICS addresses public officials in enabling e-government initiatives while also encompassing basic literacy skills for its general workforce.

Requiring special mention are the last two columns under "ICT Professional Competencies." Where the Malaysia and ASEAN standards target only the core ICT industries, other countries not only include skills for the core ICT industries, but also ICT competencies across other sectors and business domains.

The objectives for the four different competency standards that are aimed at different target segments are categorised according to the stages of ICT development by the World Summit of Information Society (WSIS). In it, ICT development is characterised as a trajectory of Access, Usage and Impact.

2.1 ICT Competencies for e-Government: ICT Access & Diffusion

ICT development begins with infrastructure and when a country looks to diffuse ICT services and products. In this first stage of Access & Diffusion, governments often attempt to kick-start ICT development through e-government initiatives that seek to computerise national systems and automate government services across agencies. In tandem with broad infrastructural build-up in its telecommunications sector, e-government initiatives create a critical mass of ICT deployments in the public sector. These deployments catalyse the formation of a core ICT industry because they bring together people, resources, and expertise in hardware and software. The ICT competency standards at this stage of development address the skills and proficiencies required for the implementation and maintenance of the national data architecture and infrastructure across the public sector. Often these standards are targeted at public officials across the spectrum of e-government processes.

There are four national ICT competency standards that address e-Government initiatives, in targeting public or governmental officials: from US, UK, India and Philippines, and they are covered below.

1) United States: Clinger-Cohen Core Competencies

The Clinger-Cohen Core Competencies were developed by the U.S. Federal CIO Council, and target specifically the Government Chief Information Officers (CIO) at the top of the management chain for ICT systems and processes. They define the set of competencies and responsibilities for Government CIOs across the Federal government.

They encompass 12 competency areas for the effective management of technology assets and IT resources: from the strategic areas in Policy and Organisation, Leadership and Human Capital Management, Process and Change Management, and Information Resources Strategy and Planning, to the operational in IT Performance Assessment, Project and Program Management, Enterprise Architecture, etc.

The 12 competency areas branch into a further 83 subordinate competencies or skills with clear learning objectives that are used to assess the levels of ICT human capacity across the Federal Government annually.

2) United Kingdom: Skills Framework for the Information Age (SFIA)- Competency Framework for Government IT Profession

The UK's competency framework is owned and managed by the SFIA Foundation, a non-profit organisation that extends accreditation to training agencies for SFIA certification. Originally developed for business, it is an ICT industry standard that has been adopted by the UK Government in measuring the ICT capabilities of the public sector, through the subset of the competency framework for Government IT Profession. Thus, UK's SFIA is unique in having a consistent framework across both public and private sectors, a consistency that would encourage manpower mobility and efficiency.

The Competency Framework for Government IT Profession defines six competency areas of Strategy and Architecture, Business Change, Solution Development and Implementation, Service Management, Procurement and Management Support, and Client Interface.

In turn, these six competency areas are cascaded over seven skills or proficiency levels, from the bottom two levels for practitioners, to the middle two for management, and finally, Level 7 for the most senior Government CIO. This is encapsulated in Figure 1 below.

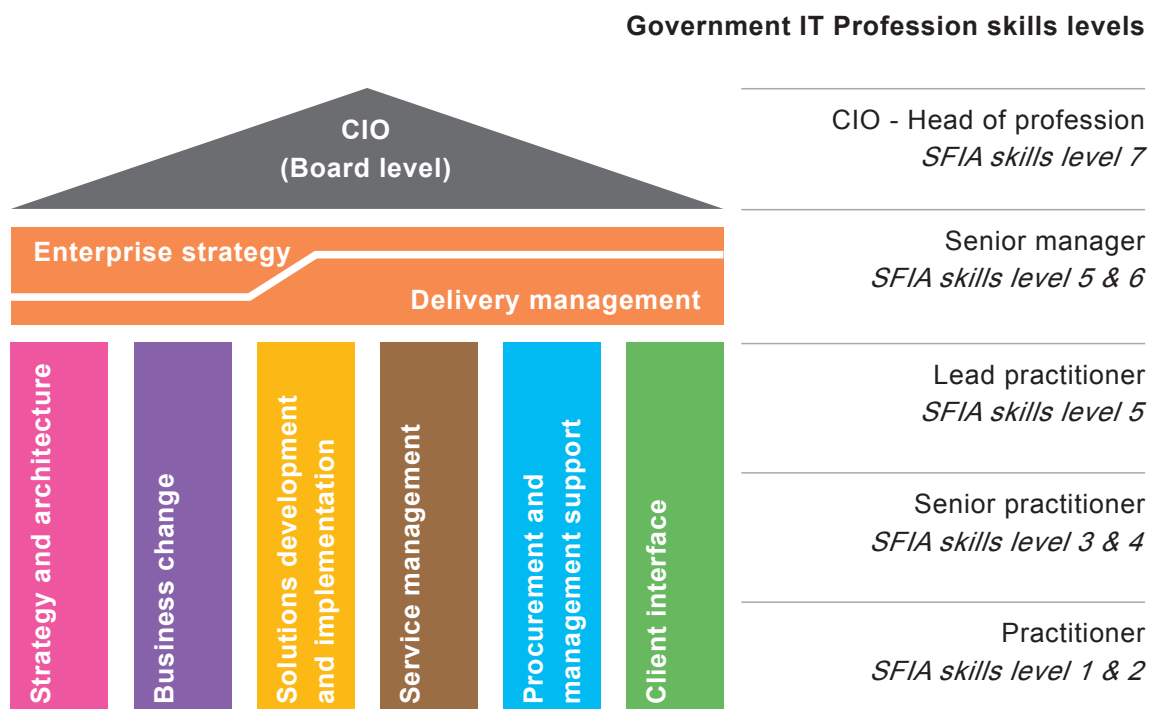


Figure 1: Competency Framework for Government IT Profession (U.K. Civil Service)

The SFIA Framework has also been adopted in close to 200 countries, across 2,500 corporate users and by 25 million people.

3) India: e-Government Competency Framework (eGCF)

India's eGCF was developed by its Ministry of Communications & IT for the public sector specifically. The framework is skills- or needs-centred, and is not structured around the process of ICT management or operations, but in terms of job roles and specific tasks required for ICT project management. A total of 19 job roles are specified under the government ICT standards for administrative, managerial and technical roles. Each job role align competency along four dimensions of Professional Skills Set, Knowledge Set, Behavioural Set and the Training Courses/Certifications/Qualification Set required (see Figure 2 below). The Professional Skills Set identified 96 skills; the Knowledge Set identified four levels, viz., Expert, Proficient, Familiar, and Aware; the Behavioural Set identified four components, viz., Ethos, Ethics, Equity and Efficiency.

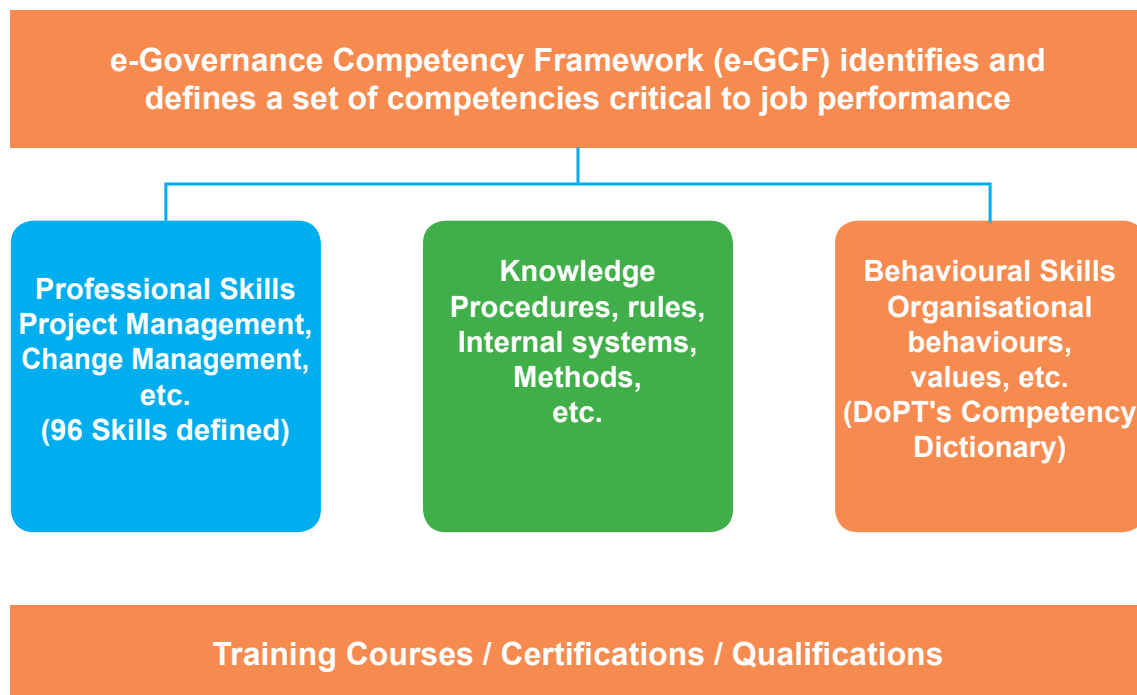


Figure 2: India's e-Governance Competency Framework (eGCF)

Of the four national ICT competency frameworks aimed at government or public officials, India's ICT competency framework is unique in being the only one that focuses on managing the project life cycle of ICT projects. This unique focus may have stemmed from the Indian government's single-mindedness on enabling ICT implementation across the country. In enabling ICT implementation and the project management thereof, it addresses the wide spectrum of ICT skills from the most basic (e.g. MS Office) to advanced technologies, while targeting the specific needs of the country (e.g. language requirements and national ICT vision). The unique focus illustrates how competency standards may include components that can help in national development. An area that many countries should consider having in its competency standards is disaster risk management, a subject that will be discussed later.

India's ICT competency standard framework in its current form is incomplete without the complementary skills sets and requirements for on-going ICT management and operations. These aspects of the longer-term management of ICT systems and continuing ICT development need to be integrated into the framework to address the post-implementation needs of the government agencies.

4) Philippines: National ICT Competency Standards (NICS)

Philippines' NICS is the national ICT competency standards that addresses government officials as well as general citizens. Three volumes of the competency framework were developed jointly with the Department of Education to cater for the general population and workforce: NICS-Basic, NICS-Advanced and NICS-Teachers.

The remaining eight volumes under NICS were developed with different governmental agencies to cater to their specific needs. They are listed according to ICT or non-ICT related job scopes below:

i. Non-ICT civil servants:

Developed with the Career Executive Service Board, which oversees eight key government agencies including the Civil Service Commission and the President's Office

- NICS-CESO: core competencies for non-IT governmental staff in enabling e-government processes;

ii. ICT-related government job roles:

Developed with Civil Service Commission, Academe and ICT industry

- NICS-Civil Servants: basic knowledge and skills for government professionals in ICT fields or job roles
- NICS-Application Developers: planning, development, testing, and release of services and applications
- NICS-Network Professionals: planning, setting up, configuring, testing, troubleshooting and maintaining of network environment or infrastructure
- NICS-Webmasters: regulation and management of user access, appearance and website navigation, content placement and management, advertising, and marketing

Developed with the ICT Office e-Government Program

- NICS-Project Managers: knowledge, skills, tools, abilities and management processes required for managing ICT projects or to undertake a project successfully
- NICS-Chief Information Officers: that the CIO is able to provide strategic leadership and stewardship on the organisation's information delivery capabilities and assets
- NICS-Enterprise Architects: in governing the enterprise's strategy, processes, information and information technology assets
- NICS-Information Security Managers: planning, coordinating, and implementing security measures for information systems
- NICS-Information System Auditors: in performing audit in accordance with IS auditing standards, guidelines and best practices

iii. Developed with the Telecentre.org and Philippine Community e-Center Network

- NCS-CeC Knowledge Workers: to assist and empower urban and rural communities to the network of governmental network of e-Centers

Although the different volumes do cater to the 10 specific job roles listed above, the different agencies and their different standards unfortunately, resulted in a confusing array of competency standards with overlaps in the skills and ICT areas covered. For example, it is unclear if the basic skills required for those in non-ICT job roles (in NICS-CESO) that pertain to enabling of e-government processes would be similar to the basic knowledge in NICS-Civil Servants. Or, if the skills for NICS-Network Professionals represent a scaled proficiency from those who are managing the public network of e-Centers in NCS-CeC Knowledge Workers. And if so, how the progression of Network-related skills differ in scope and skills.

NICS also groups them in competency clusters (see Table 2 below). The overlap in skills and scope are not apparent in the cluster groups. For example, if Cluster 1 represents the lowest or most basic level of skills as compared with Cluster 2 and 3 sequentially. Cluster 3 includes a group of distinct job roles from CIO to Project Manager and Enterprise Architects, each ranging from high-level strategy and management, to mid-level implementation and operational planning respectively. The lack of a clear framework in which the job roles are rationalised can make it difficult to understand and apply.

CLUSTER	NICS JOB ROLE
Cluster 3	Enterprise Architect Project Manager Career Executive Service Officer Government Chief Information Officer Information Systems Auditor
Cluster 2	Application Developers Network Specialists Webmasters Information Security Specialist
Cluster 1	Basic Advanced Teachers Civil Servants CeC Knowledge Workers

Table 2: Competency Clusters in the Philippines NICS

The competency framework outlines three levels of proficiency, Basic-Intermediate-Advanced, which is easily understandable classification. That is, at each cluster, there are basic, intermediate and advanced levels. But it is unclear how this is applied across the different agencies as many of the scopes have already defined basic (e.g. NICS-Basic, NICS-Civil Servants) or advanced (e.g. CIO).

2.1.1 Summary - National ICT Competency Standards for e-Government & Public Officials

The brief overview of each of the four national ICT competency standards that target the needs of the public sector in enabling e-government processes are summarised in Table 3 below.

The ICT competency frameworks are outlined in terms of the number of proficiency levels catered to senior management (e.g. CIO) versus middle (e.g. managerial) and lower management (e.g. practitioner, operational staff). For each of the management levels, the competency areas or skills are listed to provide a view of the scope of the ICT framework and its rationalisation.

The last row in Table 3 gives an indication of the number of specific job roles listed under each national standard. It is interesting to note that neither the US nor the UK has specific job roles specified, but instead leave the interpretation of the required competencies and proficiency levels of job roles to the discretion of the frameworks' users. On the other hand, the developing countries India and Philippines have specified 19 and 10 job roles respectively under their ICT competency frameworks for the governments. This may reflect the needs of these countries, as well as a result of the relatively low levels of ICT literacy and understanding currently, hence requiring particularity.

The focus of the US standard for the most senior level of ICT management is shown through the single proficiency level that is dedicated to defining the skills and capabilities of the CIO to strategise, plan, execute and manage the ICT resources of the government. It offers the broadest, and conceptually most developed scope of skills for senior ICT management, and is also used to measure the human ICT capacity of the government as benchmarked against the CIO.

The UK's SFIA for the Government IT Profession is the only one that attempts to measure the ICT human resources across all levels of the government with the same set of competency areas, with its seven levels of proficiency spread out between the top, middle and lower management. This contrasts with the US Clinger-Cohen in that only half the number of competency areas, six competency areas in all, is used in UK to measure the skills requirements of the entire continuum of staffing levels. The tradeoff in the smaller breadth of competencies covered is compensated by depth in its application across the governmental ICT functions.

	US Clinger-Cohen core competencies	UK SFIA - Competency Framework for Government IT Profession	India e-Governance Competency Framework (eGCF)	Philippines National ICT Competency Standards (NICS): CESO & Civil Servants
By Proficiency Levels : Senior Management / CIO	Yes: single level 12 competency areas: Policy & Organisation; Leadership & Human Capital Mgmt; Process & Change Mgmt; Information Resources Strategy & Planning; IT Performance Assessment: Models & Methods; IT Project & Program Mgmt; Capital Planning & Investment Control; Acquisition; Information & Knowledge Mgmt; Cybersecurity/ Information Assurance; Enterprise Architecture; Technology Mgmt & Assessment.	Yes: single level (skill level 7) 6 competency areas: Strategy & Architecture; Business Change; Solution Development & Implementation; Service Mgmt; Procurement & Mgmt Support; Client Interface.	No.	Yes: single level NICS-CIO Not categorised by competency areas
Middle & Lower Management	No.	Yes: by 6 competency areas above Middle mgmt (level 5 & 6); Lower mgmt (level 1-4).	Yes: single level Not categorised by competency areas	Yes: various ICT areas listed in 9 job roles Not categorised by competency areas
Number of Job Roles	None.	Job roles not specified; determined according to combination of competency areas & skills required.	19 e-Gov/ICT job roles.	10 job roles across support, operational and ICT functional areas.

Table 3: Comparison of Competency Frameworks

India's eGCF is the only framework that does not categorise ICT skills by competency areas at all, choosing instead to focus on the 19 job roles that the country needs at the lower or operational levels of ICT implementation. While this may address India's current needs for project management and implementation of ICT systems, it does not offer the conceptual framework needed to outline the longer-term requirements of the different management levels in the government as well as the operational needs post-implementation.

The Philippines' NICS is structured around different ICT areas, particularly towards the needs of the different governmental agencies profiled. Although there are three proficiency levels of Basic-Intermediate-Advanced, it is unclear as to how these levels correspond alongside the varying seniority of the job areas from CIO to basic, non-ICT staff. The two competency areas specified for senior management, in e-government awareness and the management and implementation of e-government initiatives, also seem to fall short of the broad range of top-level skills needed for strategy, planning and resources management. Further, it lists 10 job roles for its middle and lower ICT management without reference to the competency areas or skill sets.

2.2 Review - National ICT Competency Standards for e-Government & Public Officials

The advantages and disadvantages of the various national ICT competency frameworks for public officials and e-government initiatives are considered along the following parameters.

2.2.1 Management levels: Senior management versus Operational management

The Clinger-Cohen core competencies from US are the most targeted in terms of the depth and scope considered for the highest management level of CIO (Chief Information Officer) for the federal government. The US has one of the most developed ICT landscape internationally, and the competency framework should arguably be the most comprehensive for the single CIO or senior management role alone. The 12 competency areas are further expanded into a detailed list of 83 subordinate skills and competencies for the most senior governmental CIO functions. The Clinger-Cohen core competency framework would therefore be thought of as the ideal reference for any government looking to build up the CIO or senior management skills in its government.

This framework, however, suffers from the absence of its application for the middle and lower operational levels in the government. The framework does not spell out how the ICT competencies for the lower levels of the government can be measured or appraised.

The UK's SFIA for Government IT Profession is a good example of a consistent framework that extends across all levels of ICT management in the government. The same six competency areas that covers the different aspects of ICT management and operations are consistent across the seven skill or proficiency levels that apply to senior management/CIO (level 7), to middle management (levels 5 to 6) and operational/practitioner levels (levels 1 to 4). This allows for a common basis for staff development and assessment, and can be easily understood across the different levels of ICT management in government.

2.2.2 Operational Requirements versus Project Management & Implementation

India's eGCF is focused almost exclusively on its national needs to execute e-government initiatives through ICT implementation. Hence, its ICT competency framework outlines an implementation toolkit that provides guidance for the required skills at different stages of e-government life-cycle. This is an important focus for a country at the start of its ICT development, where the ability to coordinate and implement various components of the national ICT masterplan is key. However, as noted earlier, the focus on ICT implementation should be balanced with its needs for the operational management over the longer-term as well.

Philippines' NICS, on the other hand, has 10 job roles that are specifically detailed for the operations of its existing ICT systems across the different functional areas in administration, design, programming and technology as well as one role dedicated to project management. They are, however, operational roles pertaining more to on-going maintenance instead of the higher level needs of strategy, planning, human capital etc.

For developing countries high-level strategy and planning, project management and implementation, and operational maintenance are all integral in first building up their ICT capabilities and infrastructure, and then establishing a stable ICT ecosystem that can continue to develop and grow with their needs.

The UK's SFIA would be a good reference, as the framework contains a comprehensive scope of competencies across strategy and planning, implementation, as well as service management and support and maintenance.

2.2.3 Competency Areas versus Job Roles

The competency areas and job roles of developed nations such as US and UK may be contrasted with that in developing countries such as India and Philippines. The US and UK have taken a more conceptual approach and drawn up standards for competency areas. In contrast, India and the Philippines specify competency standards for job roles. While addressing job roles makes the standards more easily understandable and accepted, the lack of a broader conceptual framework limits the extension of the ICT standards as technology develops and the job functions change.

2.2.4 Scalability

The flexibility of a clear conceptual framework, as in the case of UK's SFIA, boasts several advantages. Foremost is having a common language by which ICT competencies can be understood and measured across all levels of its governmental ICT functions and through the different proficiency levels.

It is noteworthy that the SFIA in UK for the Government IT Profession was extended from its initial focus on private industry, thus becoming a common language that was scaled to the needs of the public sector as well. This promotes understanding and the adoption of the framework across all sectors in the country, and encourage resource mobility and efficiency between them.

The scalability of a clear framework of competency areas across does not need to compromise on the specificity required in sought-after job functions. Instead, it may offer a flexible framework upon which the myriad of job roles and needs across industries could be developed upon. Tools such as "role builder" and "assessment screening" have been developed for the SFIA , thus allowing both job seekers and companies to be able to specify and measure the skills required for respective job roles.

2.2.5 International Adoption

The consistency, scalability and flexibility of UK's SFIA are reasons for its wide adoption internationally, where the standard is now used in 195 countries. This reinforces the appeal of SFIA⁶ as a standard of reference and adoption by other countries.

2.3 ICT Competencies for General Workforce: ICT Usage & Adoption

As a country builds up its access infrastructure in telecommunications, the wider diffusion of connected services in e-government and consumer adoption is boosted with a focus on the basic literacy skills of its general population and workforce. In this second and parallel stage of Usage & Adoption, the ICT competency standards look at enabling basic digital skills for everyone in order to ramp up the intensity and pervasiveness of ICT usage. Governments often incorporate ICT literacy and skills as part of its national education framework for students while upgrading its existing workforce with the ICT competency standards. In addition to country standards in Australia and Philippines, the European Commission's ICT literacy program International Computer Driving Licence is noteworthy in how it has been extended to more than 150 countries. ICDL was started by the ECDL (European Computer Driving License) Foundation under the auspices of European Commission in 1995, with certification programs for both workforce and student communities.

6 <http://www.sfia-online.org/en/get-help/software-products>

Each of these competency standards that target the general population and workforce is examined next.

1) Philippines: National ICT Competency Standards (NICS) - NICS-Basic, NICS-Advanced and NICS-Teachers

These three volumes in Philippines' NICS target the digital fluency and aptitude of the general population. It was developed with multiple governmental agencies, including the Department of Education. NICS-Basic addresses the most basic level of computer use in common office tools, basic digital literacy in accessing and using the Internet, as well as information security and ethics. NICS-Advanced addresses the next level of office and database use to a higher level. NICS-Teachers look to specific computer and Internet tools for the education sector to use and the social and ethical issues involved.

2) Australia: Australian Qualifications Framework (AQF) - Digital Literacy & e-Skills

The AFQ is Australia's national qualifications framework in the country's education and training system across all sectors. Digital Literacy and e-Skills was developed by IBSA (Innovation & Business Skills Australia), one of 11 Industry Skills Councils funded by the Australian Government under the AFQ for ICT specifically.

ICT capabilities are organised into three levels of use, with general workforce skills in Foundation, followed by ICT-specific job roles in Extension and ICT Strategic for ICT deployments and adoption across business sectors (see Figure xx diagram below). This section discusses Foundation ICT for the target segment of general workforce, and leaves the other two levels for the respective target segments in later sections.

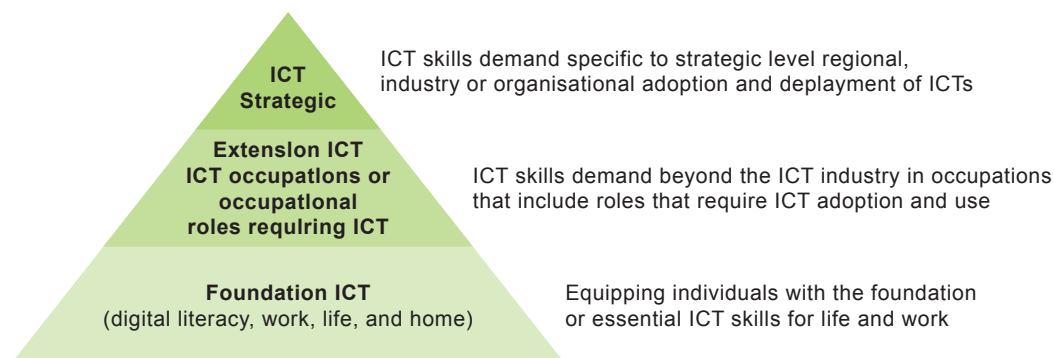


Figure 3: Australian ICT Competency Pyramid

Foundation e-Skills 1 certifies the basic essential skills in basic office tools, internet use and social networking, before this is extended into skills necessary for small home office set-up, and digital content and web development in Foundation e-Skills 2 to 3.

3) International Computer Driving Licence (ICDL) by ECDL Foundation

The ECDL Foundation was set up under the auspices of the European Commission in 1995 to raise the standards of digital literacy across Europe. Its computer literacy certification programme, International Computer Driving Licence (ICDL), has been rolled out internationally. The ECDL Foundation is a non-profit organisation that maintains a network of national operators to certify and offer training for the ICDL programmes. It acts as the central coordinating body to ensure quality implementation of ICDL certification. ICDL is now widely adopted in 150 countries worldwide with more than 14 million certifications in 14 different languages. The widespread acceptance of ICDL is illustrated by Australia's AQF containing ICDL as a standard for the Australian qualifying Foundation e-Skills 1.

Although ICDL is not a national competency standard, it is included in this review as its geographical coverage indicates an internationally recognised standard that countries new to ICT skills training may consider for quick deployment and wide acceptance.

ICDL contains three distinct levels of ICT skills, from base to standard and advanced modules for the general workforce, as well as specific segment for teachers. The ICDL Path of Digital Proficiency (see Figure 4 below) charts the progress in ICT skills for workforce individuals.

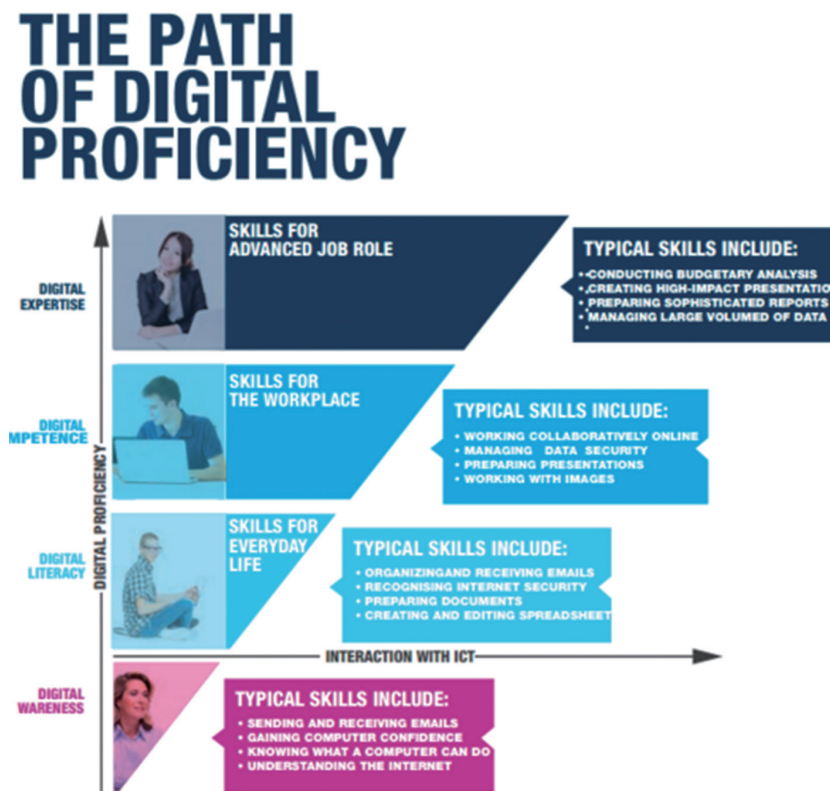


Figure 4: ICDL Path of Digital Proficiency

- Review -ICT Competency Standards for General Workforce

The components of the three ICT competency standards for the general workforce are listed in the Table 3 below.

Philippines NICS	Australia AQF	ECDL Foundation ICDL
NICS-Basic Word Processing Spreadsheets Presentation Information & Communication Computer Ethics & Security	e-Skills 1 e-Citizen essential skills Digital literacy - essential Internet technology & social networking (essential)	Base Modules Computer essentials Online essentials Word Processing Spreadsheets
NICS-Advanced Advanced Word Processing Advanced Spreadsheet Database Desktop Publishing	e-Skills 2 Small & home office set up (essential)	Standard Modules Presentation Databases Web, Image editing Project planning IT Security Online collaboration & info
	e-Skills 3 Digital content development Web development Small office network set-up	Advanced Modules Advanced Word Processing Advanced Spreadsheet Advanced Database Advanced Presentation
NICS-Teachers Use of technology & tools Legal & ethical issues		For Teachers Save time - efficiency tools Improve teaching - plan / share / motivational tools Communicate - best practices / professional development

Table 4: Competency Standards for General Workforce

Given that ICT knowledge and skills are a recognised as a prerequisite for further development it may come as a surprise to many that there are few existing national ICT competency standards for the general workforce. Most developed countries have instituted basic ICT skills and digital literacy as part of their national education framework and so do not specifically cater for this target segment in their competency framework. Australia's AQF is an exception to the rule because the AQF is the unifying standard across educational, vocational and training sectors in the country, and has therefore included digital literacy and e-skills as part of the framework.

For developing countries such as Philippines, however, the competency standards for the general workforce are an important one as it tries to leapfrog its population towards ICT Usage & Adoption.

The comparison of modules and skills offered by the three competency framework is remarkably similar, and bears testament to the universality of basic computer and Internet use across countries. This is further reason to consider the adoption of a framework such as the ICDL standard. With the experience of administration, training and implementation of national providers in 150 countries over 14 different languages, the non-profit can offer quick deployment of an internationally recognised standard for countries who are starting out on ICT skills upgrading for their population. The extensive network and coverage that ECDL Foundation has would also ensure that the ICT standards would be regularly updated in line with changing technological landscape worldwide.

2.4 ICT Professional Competencies: ICT Impact

A national data infrastructure for Access & Diffusion coupled with increasing digital literacy in Usage & Adoption set the foundation for growth in a country's core ICT industry. In this period of growth, the momentum in encouraging ICT usage and adoption continues even as the country leverages ICT further for Impact. A central aim of the local ICT industry is to grow as the country attempts to assimilate and up-skill its local workforce to attract foreign ICT investment and technologies.

ICT Impact refers to the ability to differentiate and enhance the competitiveness of the economy through the use of ICT technologies and skills. Beyond the early e-government initiatives, the goal shifts to enlarge the efficiencies and effectiveness afforded by ICT to the wider economy. For example, Singapore sought to promote the effectiveness of its trading hub by integrating the government database with the trade sector and accelerate its growth in its Second National IT Masterplan in the early 1990s. In order to grow the local ICT industry, competency standards are developed to address the specific ICT skills needed for the adoption and implementation of core ICT skills.

In the final and ideal stage of ICT development, the nation's ICT capabilities continue to mature as it looks to permeate the competitive advantages from ICT across all its economic sectors. The transformation into a knowledge economy requires a broad base of ICT skills that are spread across the country's economic sectors. This is consequently reflected in the breadth of capabilities, industries and job roles that its ICT competency standards would encompass.

This section covers four national competency standards that focus on ICT Professionals. The first part looks at those focused specifically on the core ICT industry only, with Malaysia's Skills Competency Matrix and Australia's AQF. The latter part reviews UK's SFIA and Singapore's NICF that have broadened their competency standards to address the wider breadth of ICT Impact across economic sectors.

2.4.1 ICT Competency Standards Focused on Core ICT Industry Skills

1) Malaysia: MSC Skills Competency Matrix

Malaysia's Skills Competency Matrix was jointly developed by the Multimedia Development Corporation (MDeC) and DeltaKnot International (DKI). MDeC was set up by the Malaysian Government in 1996 to encourage the growth of the local ICT industry through a government programme known as MSC Malaysia. Companies were encouraged to apply for MSC status in order to enjoy economic and fiscal incentives for the ICT adoption. DKI, on the other hand, is a private consulting company that aims to assist companies in their investment and measurements of human resource.

The Skills Competency Matrix was conceptualised to provide the standards for skills in relation to job functions, which are organised into four clusters. Each cluster is further broken into job groupings, totaling 17 altogether (see Figure 5 below).



Figure 5: Structure of MSC Skills Competency Matrix

Within the Matrix and its various clusters, there are 432 job roles that are identified for technical and non-technical roles. Each job role has skills delineated according to the four clusters of skills and ordered in five levels of skills proficiency (see Figure 6 below).

No	Description												
1	<p>Industry Cluster in which this job type falls under. There are 4 clusters covered under the ICT industry in this matrix:</p> <ul style="list-style-type: none"> • Creative Multimedia (CMM) • System Design & Development (SDD) • Information Technology (INT) • Shared Services & Outsourcing (SSO) 												
2	<p>Job Code assigned to this job type. A unique Job Code is assigned to each Job Type and Job Title. The Job Code is made up of 8 alphanumeric codes as shown below.</p> <div style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <p>Job code WWWXYZZZ</p> <p>WWW is the code assigned for the cluster</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>WWW Value</th><th>Cluster Represented</th></tr> </thead> <tbody> <tr> <td>CMM</td><td>Creative Multimedia</td></tr> <tr> <td>SDD</td><td>System Design & Development</td></tr> <tr> <td>INT</td><td>Information Technology</td></tr> <tr> <td>SSO</td><td>Shared Services & Outsourcing</td></tr> </tbody> </table> <p>X is the code assigned for each job grouping within the cluster YY is the code assigned for each job type ZZ is the code assigned for the similar job titles within the same job type</p> </div>	WWW Value	Cluster Represented	CMM	Creative Multimedia	SDD	System Design & Development	INT	Information Technology	SSO	Shared Services & Outsourcing		
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<p>Job Level & Industry Experience applicable for this job type. For most of the job types, there are multiple job levels depending on the knowledge, capability and experience of the individuals. Five job levels are defined here to give an indication on whether the job type is suitable for fresh graduates and experienced professionals.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Job Level</th><th>Description</th></tr> </thead> <tbody> <tr> <td style="text-align: center;">Level 1 (Entry)</td><td> <ul style="list-style-type: none"> • Less than 2 years of relevant experience. • Fresh graduate with little or no working experience is acceptable. • CPGA 3.0 and above is preferred. • Basic oral, written and listening comprehension skills in English are required. </td></tr> <tr> <td style="text-align: center;">Level 2 (Intermediate)</td><td> <ul style="list-style-type: none"> • 3-6 years of relevant experience is required. • Good communication and presentation skills in English are required. • Professional certification and relevant track records are preferred. </td></tr> <tr> <td style="text-align: center;">Level 3 (Senior)</td><td> <ul style="list-style-type: none"> • 7-10 years of relevant experience is required. • Good communication and presentation skills in English are required. • Professional certification and relevant track records are required. • Leadership and project management skills are required. </td></tr> <tr> <td style="text-align: center;">Level 4 (Advanced)</td><td> <ul style="list-style-type: none"> • 11-15 years of relevant experience is required. • Good communication and presentation skills are required. • Good leadership and business acumen are required. • Master in Business Administration (MBA) degree or relevant Master's / Doctorate's degree is preferred for some of the jobs in this group. </td></tr> <tr> <td style="text-align: center;">Level 5 (Master)</td><td> <ul style="list-style-type: none"> • More than 15 years of relevant experience is required. • Good communication and presentation skills are required. • Good leadership and business acumen are required. • Master in Business Administration (MBA) degree or relevant Master's / Doctorate's degree is preferred for some of the jobs in this group. </td></tr> </tbody> </table>		Job Level	Description	Level 1 (Entry)	<ul style="list-style-type: none"> • Less than 2 years of relevant experience. • Fresh graduate with little or no working experience is acceptable. • CPGA 3.0 and above is preferred. • Basic oral, written and listening comprehension skills in English are required. 	Level 2 (Intermediate)	<ul style="list-style-type: none"> • 3-6 years of relevant experience is required. • Good communication and presentation skills in English are required. • Professional certification and relevant track records are preferred. 	Level 3 (Senior)	<ul style="list-style-type: none"> • 7-10 years of relevant experience is required. • Good communication and presentation skills in English are required. • Professional certification and relevant track records are required. • Leadership and project management skills are required. 	Level 4 (Advanced)	<ul style="list-style-type: none"> • 11-15 years of relevant experience is required. • Good communication and presentation skills are required. • Good leadership and business acumen are required. • Master in Business Administration (MBA) degree or relevant Master's / Doctorate's degree is preferred for some of the jobs in this group. 	Level 5 (Master)	<ul style="list-style-type: none"> • More than 15 years of relevant experience is required. • Good communication and presentation skills are required. • Good leadership and business acumen are required. • Master in Business Administration (MBA) degree or relevant Master's / Doctorate's degree is preferred for some of the jobs in this group.
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Figure 6: Skills & Job Clusters in Malaysia's Skills Competency Matrix

2) Australia AQF: Extension e-Skills (4-5) & ICT Strategic (6)

Australia's national competency framework breaks down the ICT skills in Digital Literacy & e-Skills into three components and six levels. Foundation e-skills are targeted at the general workforce, while the higher levels in Extension e-skills and ICT Strategic e-skill, are focused on ICT-specific skills. The ICT area of each level of skills is summarised in Table 4 below.

AQF Skill Set	ICT Areas & Skills Involved	Management Level
Extension e-skills (AQF level 4 & 5)	Network set-up, management & security	Entry level
	Web management	
	System & network security	
	Business requirements & vendor management	
Strategic e-skills (AQF level 6)	IT project management & systems implementation	Middle level
	e-Business design & solutions	
	ICT out-sourcing & contracting	
	IT planning & design	
	Cloud computing services	

Table 5: Australia AQF Competency Standards for ICT-Specific Skills

2.4.2 ICT Competency Standards Broadened Across Economic Sectors

1) United Kingdom: SFIA (Skills Framework for the Information Age)

The UK's SFIA is a framework for ICT professionals. SFIA is managed by the SFIA Foundation, a non-profit organisation helmed by its five corporate members consisting of ICT stakeholders from industry and education groups.⁷

The framework for business sectors is organised into six competency groups as follows:

- Strategy & Architecture
- Business change
- Solution development & implementation
- Service management
- Procurement & Management support
- Client interface

Each ICT competency group is structured across seven levels of responsibility, as shown in Figure 7 below.



Figure 7: The 7 levels of SFIA

Each level of responsibility is further described by the following attributes of Autonomy, Influence, Complexity and Business Skills. Figure 8 below illustrates how the level of responsibility, which in this case is Level 1, is defined by the attributes.

⁷ <http://www.sfia-online.org/en/about-us>

How the levels of responsibility are defined by the attributes

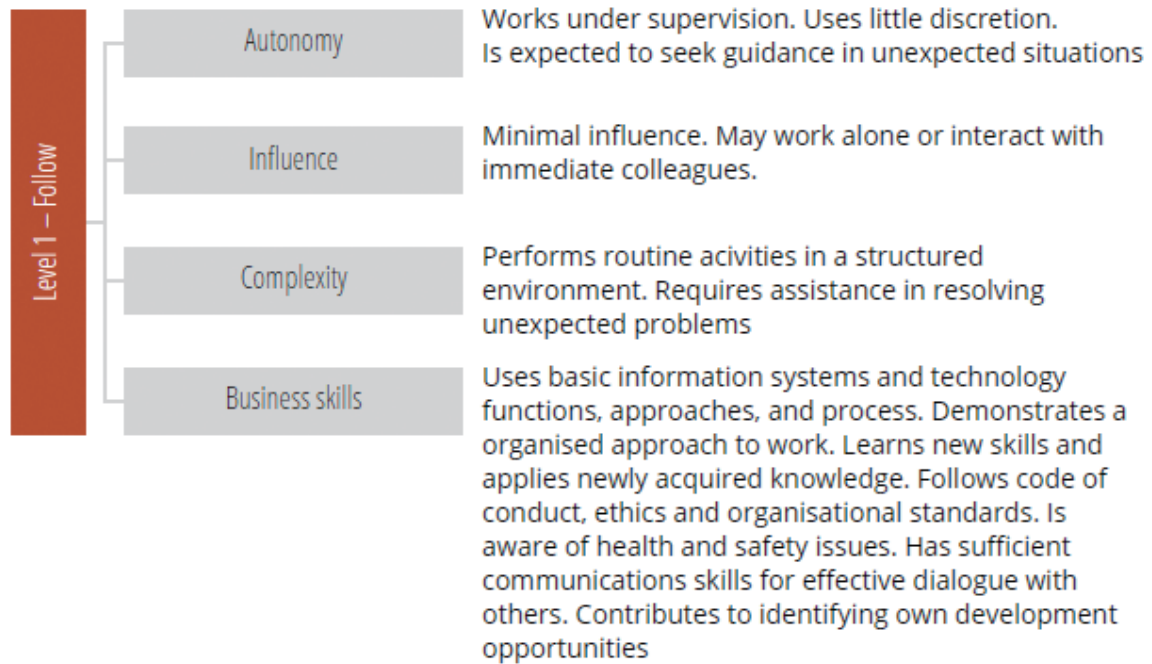


Figure 8: Defining Attributes across Different Levels of Responsibility

Together, the competency groups and the seven levels of responsibility combine to form meaningful descriptions of the 97 ICT skills across technical and non-technical job scopes. The framework is intended to form the template from which businesses can create customised profiles of job roles according to the skills and levels of responsibilities required. For individual ICT professionals, this also form the reference from which they can measure their suitability for different ICT job responsibilities and plan for skill or career upgrading. The competency groups and their component skills are shown in Table 5 below, mapped according to the seven levels of responsibility.

Skills Framework for the Information Age version 5

		1 Follow	2 Assist	3 Apply	4 Enable	5 Ensure, advise	6 Initiate, influence	7 Set strategy, inspire, mobilise
Strategy and architecture	Information strategy					IT governance GOVN		
						Information management IRMG		
							Information systems co-ordination ISCO	
						Information security SCTY		
	Advice and guidance					Information assurance INAS		
						Information analysis INAN		
		Information content publishing ICPM						
						Consultancy CNSL		
	Business strategy and planning					Technical specialism TECH		
						Research RSCH		
						Innovation INOV		
						Business process improvement BPPE		
	Technical strategy and planning					Enterprise and business architecture development STPL		
						Business risk management BURM		
					Sustainability strategy SUST			
					Emerging technology monitoring EMRG			
					Continuity management COPL			
					Software development process improvement SPIM			
Business change	Business change implementation					Sustainability management for IT SUMI		
						Network planning NTPL		
						Solution architecture ARCH		
						Data management DATM		
	Business change management					Methods and tools METL		
						Portfolio management POMG		
						Project management PRMG		
						Programme management PGMG		
	Relationship management					Portfolio, programme and project support PROF		
						Business analysis BUAN		
						Requirements definition and management REQM		
						Business process testing BPTS		
	Skills management					Change implementation planning & management CIPM		
						Organisation design and implementation ORDI		
					Benefits management BENM			
					Business modelling BSMD			
					Sustainability assessment SUAS			
					Stakeholder relationship management RLMT			
Solution development and implementation	Systems development					Learning and development management ETMG		
						Learning and development assessment LEDA		
						Learning design and development TMCR		
						Learning delivery ETDL		
	Human factors					Teaching and subject formation TEAC		
						Resourcing RESC		
						Professional development PDSV		
						Systems development management DLMG		
	Installation and integration					Data analysis DTAN		
						System design DESN		
						Database/repository design DBDS		
						Programming/software development PROG		
	Service management					Animation development ADEV		
						Safety engineering SFEN		
					Sustainability engineering SUEN			
					Information content authoring INCA			
					Testing TEST			
					User experience analysis UNAN			
Client interface	Supply management					Ergonomic design HCEV		
						User experience evaluation USEV		
						Human factors integration HFIN		
						Systems integration SINT		
	Quality and conformance					Porting/software integration PORT		
						Systems installation/decommissioning HSIN		
						IT management ITMG		
						Financial management for IT FMIT		
	Sales and marketing					Capacity management CPMG		
						Availability management AVMT		
						Service level management SLMO		
						Service acceptance SEAC		
	Client support					Configuration management CFMG		
						Asset management ASMG		
					Change management CHMG			
					Release and deployment RELM			
					System software SYSP			
					Security administration SCAD			

Table 6: SFIA Skills Framework by 6 Competency Groups across 7 Levels of Responsibility

2) Singapore: NICF (National Infocomm Competency Framework)

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 is a “manpower planning tool” that defines the needed competencies across different levels in ICT job roles, to facilitate the skill development and career progression of the country’s ICT professionals.

NICF launched in 2008 with 31 job roles focused on core ICT-specific skills. This expanded rapidly to 334 job roles currently, with 631 “competency units”. Where NICF is broad beyond the core ICT and telecommunication industries to include ICT requirements across sectors and business domains, it is also deep in the segmentation of job scopes within each one. Figure 9 below gives an overview of the different business sectors included.

WHAT'S COVERED BY THE NICF?

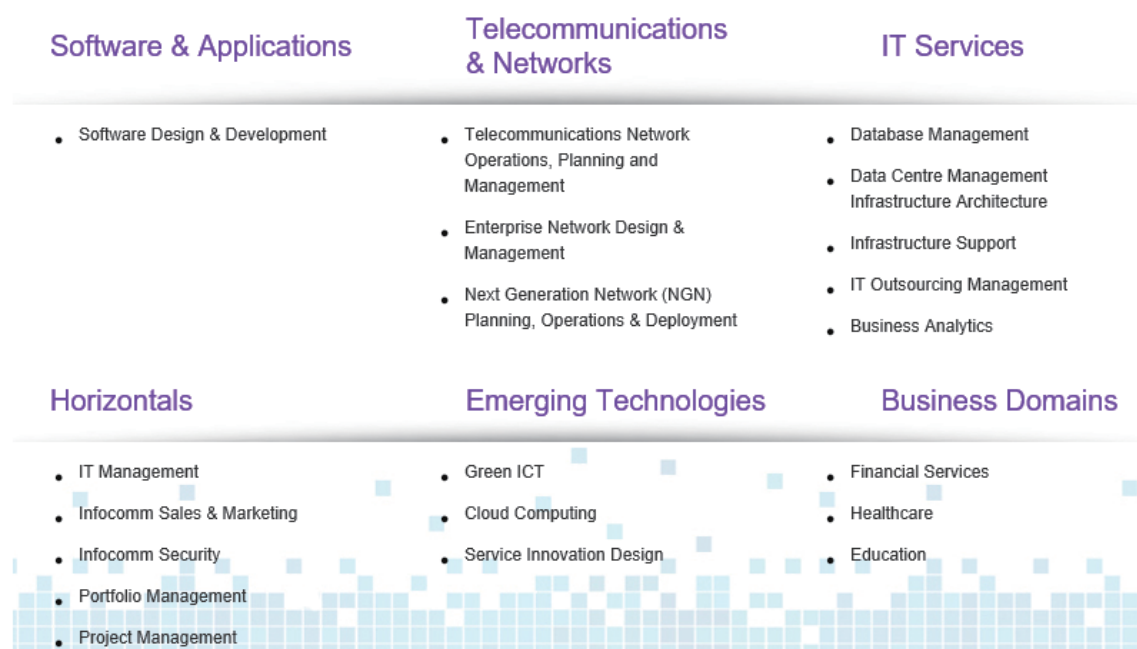


Figure 9: Coverage of NICF - an overview⁸

⁸ <https://www.nicf.sg/home.aspx>

The left column of “Software & Applications” and “Horizontal” roughly corresponds to the various ICT-specific skills covered in the other competency frameworks that target the core ICT industry. The middle and right columns represent business sectors in ICT and beyond that NICF also addresses. While “Telecommunications & Networks” and “IT Services” are core ICT industries that are also reflected in other national standards, the job scopes listed are specific to the local industry needs (e.g. NGN planning, operations and deployment in line with Singapore’s plans for fibre-optic networks). Singapore’s NICF is the only national standard that focuses attention on developing “Emerging Technologies” and its national ICT advantages in non-ICT “Business Domains”.

Within each of the sectors above, NICF drills down further into sub-sectors (shown in Table 6 below), before expanding into sub-categories within each with hierarchical job roles. Each job role is organised into four levels of responsibility/seniority, from “Entrant” to “Senior Management”. Table 6 below shows an example of the first sector of “Software & Applications”. This sector 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 ΣΔX	• 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

Table 7: Example of Job Roles under Software & Applications in Singapore’s NICF

This provides an indication as to how the 334 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.

The complexity of the extensive matrix of ICT sectors, sub-sectors, sub-categories and job hierarchy is mitigated for the ICT professionals with the interactivity of the NICF website. Individuals or businesses would use the combination of competency units and job roles described as a basis of reference.

2.5 Review of ICT Professional Competency Standards

The review of four national ICT Professional competency standards throws up a set of common skill denominators. That is, every national standard on professional ICT skills will include specific skills in the following ICT areas:

- Content & Web development & management
- Software & solutions
- IT Management
- Project Management
- System Design & Security
- Outsourcing & Vendor Services
- Client Interface / IT Sales & Marketing

The differences between the first set of ICT-specific competency standards by Malaysia and Australia, versus the second set that looks to extend ICT professional skills across all business sectors (by UK and Singapore) are discussed below.

2.5.1 Maturity of ICT Competencies in Seniority & Responsibility Levels

The ICT-specific standards comprise of the common ICT skill areas and are focused on entry and middle-level responsibilities. This focus contrasts with the broader ICT standards by UK and Singapore.

Although Malaysia’s MSC Skills Competency Matrix is structured in five proficiency levels of “Entry level” to “Master”, a large majority of the job roles listed are entry and middle level positions. This is also apparent in Australia’s AQF, where the Extension and ICT Strategic e-Skills are mostly concentrated for entry and middle level ICT professionals.

This is contrasted against the seven levels of responsibility (or seniority) in UK’s SFIA. Singapore’s NICF has only four proficiency levels but senior responsibilities are separately listed within the six sectors (such as Enterprise Network Design & Management, NGN Planning, Operations & Deployment, Data Analytics and Infrastructure Architecture).

2.5.2 Progression of ICT Skills beyond Immediate Deployment & Enablement

ICT Professional Competencies across sectors also reflect the breadth of skills that goes beyond the immediate ICT deployment in the local ICT sector. While countries still looking to boost their local ICT industry would focus skills for enabling ICT deployments, developed ICT countries such as UK and Singapore go beyond these in forward-looking areas in Green ICT, cloud computing, etc.

2.5.3 Focus to Extend ICT Impact as Competitive Advantage Across Business Sectors

It is only natural that countries with a robust local ICT industry will want to extend its competitive advantage in this field across its economy. In Singapore's case, this extension is reflected in its specific focus on "Emerging Technologies" and deep ICT skills in each of its business domains in Financial Services, Healthcare & Education.

2.5.4 Considerations For ICT Professional Competency Standards

For countries that are now looking to adopt or customise their own ICT professional competency standard, many of the same considerations raised earlier under the e-Government target segment apply.

Having a common framework and language across both the public and private sector such as UK's SFIA and Singapore's NICF encourages better understanding, use and acceptance by both individuals and industries. A universal reference for ICT skills and capabilities would also boost labour mobility and efficiency across the industry and government and increase the overall dynamism of the ICT sector of the country.

Singapore's NICF is another instance where the particularity of job roles are prioritised over that of a conceptual framework of competency areas. It is currently the broadest and deepest national standard with its 631 competency units across 334 job roles. However, the mix of industries (e.g. telecommunications) against ICT areas (e.g. infrastructure architecture) can make it difficult to understand and therefore use.

While it is natural, and perhaps more efficacious, to focus on the national needs for ICT-specific skills in building up the local ICT industry, countries would do well if they leapfrog such considerations by starting their ICT competency standards on a clear conceptual framework. UK's SFIA may be a natural candidate, as its wide adoption internationally implies recognition and scalability.

3. ICT Development in Stages of Economic Growth

3. ICT Development in Stages of Economic Growth

It should come as no surprise that the sequential stages of ICT development, and the capabilities targeted through the competency standards (characterised above), closely parallel the overall stages of economic growth and development of a country as it progresses from a developing to a developed country.

3.1 Stages of Economic Growth

The original framework for the stages of economic development was set out by Porter, Sachs & McArthur in the Global Competitiveness Report (2001-2002) by the World Economic Forum (WEF)⁹, and is still used to categorise countries in its annual reports. Countries' developments are charted across three stages of economic development from low to developed economy. The framework is condensed below in Figure 10.

STAGES OF ECONOMIC DEVELOPMENT World Economic Forum - Global Competitiveness Report 2001-2002 (Porter, Sachs & McArthur)			
	Stage 1 Emerging	Stage 2 Developing	Stage 3 Developed
Characteristics	Resource-based economy Factor-driven	Efficiency-based Investment-driven Technology-importing	Knowledge-based Innovation-driven Technology-generating
Objective	Achieve effective utilisation of resources	Integrate economy to international production systems	Increase rates of social learning & rapid shifts in technology
Gov't's Role	Maintain political & macroeconomic stability	Improve physical infrastructure Improve regulatory environment	Direct role to increase innovation enhance R&D, higher education enhance capital markets & regulatory systems
Challenges	Developing free & efficient markets	Having positive business environment supportive of investment	Creating environment supportive of technology start-ups

Figure 10: WEF Stages of Economic Development

Note: Stages and descriptions of economic development are condensed from Porter, M. E., Sachs, J., & McArthur, J. (2001). Executive summary: Competitiveness and stages of economic development. The Global Competitiveness Report, 2002, 16-25.

⁹ Michael E Porter, Jeffrey D Sachs, and John W McArthur. 2001. Executive summary: Competitiveness and stages of economic development. The Global Competitiveness Report 2001-2002 (edited by Michael E Porter et al.). New York, NY: Oxford University Press, pp. 16-25.

At the earliest stage of development, emerging economies are primarily resource-based. Whether founded on agricultural or extraction or low-cost manufacturing, these economies grow through the more effective use of the nation's resources. This requires governments to maintain a stable political and macroeconomic environment and an efficient free-market economy so that resources can be optimised for production.

As these economies grow, and incomes rise, governments face the challenges of transitioning into an efficiency-based, industrialised, developing nation. Rising incomes and costs limit growth through resource utilisation alone, and these economies find that they need to increase their productivity and efficiencies as they compete with other emerging, factor-rich economies. At this stage of development, the focus is often to attract foreign investments and technological know-how that the country needs in order to industrialise its production and integrate into the world production systems. Governments would need to build the necessary infrastructure and improve their regulatory environment in order to draw in the needed investments.

The last stage was cited as “the hardest transition” as economies move from an efficiency-based, technology-importing nation to an innovation-driven, knowledge-based economy. Governments have a direct role in fostering the educational, R&D, business, legal and capital environments that are necessary to enable the high rates of social learning and adapt to rapid technological shifts internationally. The developed, knowledge economy now generates growth through new innovations through local and foreign start-ups and would boost of high standards of living and work for its population.

3.2 Economic Growth & ICT Competency & Development

The needs and challenges faced by governments at the different stages of economic development translate into their focus on ICT development and human competencies.

Governments of factor-driven, commodity-based, emerging nations in Stage 1 look to kick-start ICT development through e-government initiatives that computerise and automate the public sector while building the telecommunication infrastructure and introducing basic digital literacy to its population. Countries at this stage of development would focus on ICT competencies for its public officials to enable e-government, while introducing general, basic ICT skills for the population. The diffusion of key ICT technologies through e-government processes and the increasing access of ICT connectivity are central in Stage 1 countries as they modernise and develop free-market systems for more effective utilisation of resources.

As economies move into Stage 2 industrialisation, the continued drive to improve ICT Access & Diffusion is coupled with Adoption & Usage. ICT plays a key role in enabling the integration of the country's production into global markets. Higher basic literacy and digital skills are required now, as the economy seeks to attract the needed foreign investment to industrialise production for greater growth. Hence, countries at this stage would incorporate digital literacy and ICT skills as part of their national education programs while encouraging its existing workforce to upskill through continual training programs.

The efficient industrialised developing economy in Stage 2 would need to further leverage its ICT competencies for the next thrust towards becoming the innovation-based knowledge economy. As it imports the technological know-how in Stage 2, its ICT competencies framework would now focus on deepening the proficiencies and sophistication of their local ICT workforce and industry. Competency standards here are often ICT-focused, and developed jointly with the key telecommunications and technology stalwarts in the country.

Once the core ICT industries in telecommunications, systems and software development have taken root, ICT competencies are broadened to address the wider economy. The transition to a full knowledge-based economy would require these countries to leverage ICT for competitive advantages across key distinct business domains and industries, requiring much higher rates of learning and tertiary education across their national workforce.

3.3 ICT Competencies by Countries' Stage of Economic Development

The analysis of the characteristics and challenges of economies at the different stages of economic development and their consequent focus in ICT development and competencies required are shown in Table 7 below. The focus of ICT development and competencies is reiterated according to the stages of the economic growth. As this is also matched to the latest WEF 2014-2015 Global Competitiveness Report, the three stages of economic growth for the respective countries are broken further into transition stages from Stage 1 to 3 (Table 7 below)

Stage 1: Factor-driven		Stage 2: Efficiency-driven		Stage 3: Innovation-driven
Stage 1	Transition 1 ~ 2	Stage 2	Transition 2 ~ 3	Stage 3
ICT Development - Focus				
ICT Access : Build infrastructure e-Government initiatives Improve basic and digital literacy		Increase ICT Usage Grow core ICT industry & skills		ICT Impact : ICT as advantage across economy
ICT Competencies - Focus by Target Segment				
e-Government General workforce		Core ICT industry		ICT & All Sectors
Country Stage of Development - WEF Global Competitiveness Report 2014-2015				
Stage 1	Transition 1 ~ 2	Stage 2	Transition ~ 3	Stage 3
Factor-driven		Efficiency-driven		Innovation-driven
India (e-Government)	Philippines (e-Gov & General workforce)	Indonesia (Core ICT) Thailand	Malaysia (Core ICT)	Australia (Core ICT) Korea (All sectors) Singapore (All sectors) United Kingdom (e-Gov & All sectors) United States (e-Government)

Table 8: ICT Focus - Matched by Countries' Stage of Economic Development

Not surprisingly, the ICT competency frameworks for the countries closely mirror the demands of their national economy at their respective stage of development.

India, categorised as a Stage 1 emerging economy, has focused its ICT competencies on the skills for its public sector as it seeks to transform e-government processes. Philippines, an emerging country in the transition phase to Stage 2, includes e-government as well as basic digital literacy standards for its general workforce in its NICS.

Indonesia, as a Stage 2 economy, has also developed its ICT competency standard to focus on the core ICT industry skills at the entry and middle management levels. This is consistent with the attempts to grow its nascent base of local ICT human capabilities. Malaysia, in transition for the next lap into a knowledge economy, shows its focus in deepening the proficiencies of its core ICT industry through its Skills Competency Matrix that was jointly developed with and for the ICT industry.

The countries listed in Stage 3 are developed countries that have broadened their ICT competency framework to encompass the rest of their economies. The frameworks are designed to deepen and broaden ICT competencies to leverage ICT as a competitive advantage across all economic sectors. US and Australia, however, are the exceptions to the rule. US's national framework is centred only on e-government. Australia's Digital Literacy & e-Skills framework is part of the larger national Australian Qualifications Framework (AQF). It appears to be designed as standards for the entry and middle-level vocational qualifications at lower management levels, while Bachelor and post-graduate degrees are tiered as part of the overall AQF framework for tertiary education.

3.4 Framework for ICT Competencies according to Economic & ICT Development

The above analysis strongly suggests that national ICT competency standards are established based on the stages of economic and ICT development of the respective countries. The proposed framework sets out the economic development needs of emerging, developing or developed countries and the ICT competencies sought after for sustaining growth. For countries new to ICT human capacity, the framework provides a guide for planning its national focus and a reference to existing competency standards.

3.4.1 Stage 1 Emerging Countries

Countries at Stage 1 of economic development have typically started by building up the ICT infrastructure and focused on e-government initiatives. Such infrastructure investments jumpstart the ICT industry while e-government initiatives increase efficiency and make the government more responsive to demands of the citizens. Together, these investments create a critical mass of ICT projects to attract and import foreign technologies and ICT vendors in software, hardware, systems and project management.

The focus on enabling e-government processes in the public sector should also dovetail with an overall attempt to upgrade ICT access and use for the general workforce. Skills upgrading for the general population in basic computer applications and tools can be enhanced through the adoption of an international standard such as the ICDL. At the same time, the focus on developing human ICT capability should be integrated with the national education plans of the country, to cultivate and grow the pool of trained ICT workforce.

3.4.2 Stage 2 Developing Countries

As countries move from a resource-based to efficiency-based economy, the greater impetus on harnessing ICT as a factor of efficiency and growth requires dedicated effort to grow and mature local ICT industry. This often materialises as a focus of competency standards that are focused on core ICT skills and industries. This is evidenced from Stage 2 countries whose national standards are centred on core ICT skills in the entry and middle management levels as the countries seek to sustain the skills transfer to the local ICT workforce.

3.4.3 Stage 3 Developed Countries

The transition from an efficiency-based to a knowledge economy in Stage 3 is the most difficult. For developed countries, the challenge is to keep up with the expansion of local innovation and ICT skills in order to sustain innovation-led growth. The breadth and depth of the ICT capabilities in its competency standards are extended across the diverse economic sectors in the country as the countries seek to leverage ICT as a competitive advantage. In particular, developed nations need to identify and focus on the fast-changing ICT sectors to continue growth.

3.5 Existing ICT Competency Standards: Gaps/Opportunities

The temptation to focus on the immediate needs of the country in the midst of ICT development has sometimes resulted in narrow competency standards that are focused on the specific job roles or areas in demand. India is a prime example, where the focus on meeting the short-term goals for ICT project management and implementation was evidenced in the narrow job roles in its eGCF in these areas. There is a need to plan for, and communicate the longer-term needs for on-going ICT operations, management and strategy.

The Philippines' competency standard was developed specifically to meet the needs of each governmental agency, and has led to overlaps of ICT areas between its different volumes. The risk of customising to specific requirements without an overall framework is manifest.

There is a need, therefore, to adopt or localise a clear conceptual ICT framework. The ICT competency framework should communicate the rationale and progression of skills sets beyond specific job roles. This would improve understanding and acceptance, and also provide a basis where definitions for human capacity become scalable for emerging and new technologies.

Singapore's NICF illustrates the downside of a lack of conceptual framework. The competency standard is centred on job roles and descriptions, an approach similar to that used in India and Philippines. In its attempt to broaden and deepen the matrix in line with its ICT growth, the NICF has become unwieldy with the 631 competency units and 339 job roles. It becomes hard to understand, as individuals may not understand how one job role represent a progression of skills and seniority versus another.

In contrast, national standards that offer a pedagogical framework such as UK's SFIA is able to present the ICT skills through different dimensions and levels of progression. The framework can thus be flexibly scaled in line with new technologies and skills, and used to define new job roles.

4. Establishing A National ICT Competency Standard

4. Establishing A National ICT Competency Standard

Based on the above, the following steps are recommended to be taken in setting up a national ICT competency framework standard. Although it is possible to establish competency standards without an overall conceptual framework, having one will lead to a more robust outcome. For example, how does the competency standard framework fit into education? How can the framework scale when new job roles emerge? A conceptual framework will help answer such questions.

4.1 Environment and Context

The start of the planning process should include a review of the country's contextual factors. ICT human development needs to be undertaken in tandem with the broader literacy and infrastructural development of the country. The first step therefore is to identify the stage of economic development and ICT state in the country. Among the key factors to be considered in the ICT state are the level of ICT infrastructure and basic literacy.

Identifying the stage of development helps in deciding priorities. For example, because many Stage 1 countries have tended to focus on e-government initiatives, ICT competency standards have been aimed at the public sector (so that they can implement the initiatives) and the general population—so that they can use the initiatives. Countries in transition from Stage 1 to Stage 2 countries will require more specific skills and so should work on ICT-specific skills framework to develop the workforce.

For countries who are in transition from Stage 1 to Stage 2, the enabling of e-government processes and the ICT development of public officials should also be linked with the national education to integrate ICT as part of its institutional curriculum and vocational skills upgrading.

Similarly, countries who have successfully made the transition to Stage 2 would need to pre-empt the higher ICT skills required to make the switch into an innovation-driven economy in the last lap towards development.

Table 7 above, therefore, presents a quick overview for countries at the various stages of development as they consider their current developmental context, and decide on the ICT target segment and priorities.

4.2 Step 2. Existing ICT Competency Standards - Review/Adopt

Having decided on the ICT development priorities, the next step is to determine the sectors of human competencies to target. The same Table 7 above is a quick reference of the existing national competency standards in targeting the different ICT segments of public/government sector, general workforce, and ICT professionals respectively.

A government may use the earlier review of each target segment, as well as the strengths and pitfalls of the existing standards, as the basis of reference and consideration. Here the challenge is in the trade-off between standardisation and customisation. A standardised competency framework, such as UK's SFIA, which is already adopted in more than 195 countries, allows for international recognition and acceptance, but would require time and training before it is understood and accepted locally. In contrast, a national competency standard that is developed organically from the local needs of its economy and ICT sectors would promise immediacy without the challenges of customisation to languages and specific industry or public sector requirements in the country. The adoption of an international standard, however, is important for growing economies in stages 1 and 2 of development for three key reasons. First, these economies need to attract a base of foreign investments and technologies for development and technology transfer. Establishing its competency standards against an international standard facilitates acceptance by the foreign organisations and greater ease in knowledge transfer. Ideally then, locally developed standards should be able to demonstrate equivalence to international standards.

Using an internationally developed standard also enables quick and quality deployment. Both ICDL for general workforce and SFIA for ICT across sectors have been implemented in diverse language regions and national contexts. This means that governments new to ICT capacity building can immediately leverage on their existing networks of accredited training and certification partners for customisation and localisation and scale deployments quickly.

Last but most importantly, using an established conceptual framework lets government leapfrog over the myopic constraints of immediate needs. A clear conceptual framework that is built upon business and development cycles allow the government to scale for future needs as economies and emerging technologies develop. Structuring competencies by job roles can meet immediate needs, but become unwieldy as they grow without a clear conceptual framework for understanding.

4.3 Step 3. Local Stakeholders - Implementation & Review

Engagement with the local stakeholders is the next important step as they must understand the conceptual underpinnings of the competency standard being implemented. Educating and communicating with these local stakeholders is a key to the success of the framework.

Whether the country is adopting an existing international framework such as SFIA, or developing one from the ground up, consultation with all relevant stakeholders is important in translating the dimensions of standard to local contexts. The national experiences of the country case studies in ASEAN shows that this process of initiation, discussion and buy-in from relevant stakeholders is critical in the success of a new competency standard.

4.3.1 Initiation

The prerogative to set up an ICT competency standard is typically recognised in line with the overall impetus towards ICT development. This is usually led by the government as a national initiative to professionalise the ICT sector. The government engagement with the key ICT stakeholders at the initiation of the process may begin in different ways:

i) Literature Review and Mapping

The Philippines began the process of conceptualising its ICT competency standard with a review of the existing literature and ICT standards available, before these are mapped against the country needs and industry contexts. A country new to ICT competency standards may use existing research such as this report, as a reference and guide as they review the existing ICT competency standards. Beyond the first decision to adopt a particular framework, the government would need to customise this with the local stakeholders in the next step for formulation and review.

ii) From the Ground Up

Indonesia has chosen the alternative by developing its competency standards organically based on the needs and experiences on the ground. Initiation of a competency standard in Indonesia can be submitted by any citizen, industry or professional association or training and certification agencies. This may also be generated from the government or other stakeholders such as ICT or related industries. The submission of a new competency standard, termed SKKNI, in Indonesia would then trigger the process to the next step in formulation and review.

iii) Government-led

Singapore's competency standard, the NICEF, was led by its government. The NICEF was conceptualised in response to industry feedback and governmental research as a means to build up its ICT human capabilities and remain competitive continually. The governmental agency, the iDA, led the process by first focusing on the core ICT industry before expanding this to include other economic sectors and new ICT domains.

4.3.2 Formulation & Engagement

Next, the suggested competency standards or framework needs to be formulated and reviewed with key local stakeholders. Engagement across a comprehensive spectrum of stakeholders across government, private industry, academic and professional associations or certification bodies is key in ensuring that the standards that are formulated and adopted are relevant and understandable in the local contexts of use.

This engagement is most often coordinated by a central governmental agency, usually the related ICT or telecommunications authority in the country. The formation of industry or technical committees is undertaken by the ICT agency who identifies key local stakeholders for participation.

In Indonesia, proposed competency standards are first reviewed by the technical ICT committee, sometimes jointly with the Ministry of Manpower, before local stakeholders are engaged for further discussion. Consultations with stakeholders is a two-step process: first with a small group from the particular professional sector, then with the entire ICT stakeholder base to ensure consensus and understanding.

The Philippines takes a similar two-step approach in its engagement with stakeholders, through a series of focus group discussions with subject experts from the particular ICT segment, before conducting an industry-wide workshop across all ICT stakeholders for review and endorsement.

Singapore's process of engagement is also similar, where specific technical committees are separately formed for each of the ICT domain identified. Each one oversees the specifications and validation of the certification levels for the six ICT sectors of its NICF framework.

4.3.3 Implementation & Review

The implementation of the proposed competency standards is typically undertaken through a formal assessment and endorsement by the Minister or related ministries. Indonesia's competency standard, the NCS is established through its Minister Decree and implemented by its technical ICT agency. In Philippines, its ICT authority, the ICTO would release the Memorandum Circular/Policy Advisory to all national government agencies, state universities and colleges, local government units, and other stakeholders promulgating the adoption and implementation.

Unlike other national practices, mplementation in Singapore involved setting up a steering committee comprising ICT industry leaders for ICT competency standards. This steering committee guides the direction of the framework and is also responsible for the final endorsement and approval for implementation.

More significantly, Singapore's implementation of its ICT competency standard, the NICF, is undertaken jointly with its national certification and funding agency, the Workforce Development Authority (WDA). The 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. The NICF was implemented collaboratively with the accredited WSQ training providers for delivery and certification. This means that individuals or employers can enjoy up to 90% of course fee subsidy under the WSQ for NICF certifications, becoming an integral push for adoption and recognition of the competency standard.

All the countries reviewed have underlined the importance of regular review. All acknowledged the need for the national competency framework to be regularly reviewed for effectiveness and relevance. In practice, however, this is impeded by the lack of clear, measurable targets for review. Countries were often reluctant to specify measures of effectiveness in adoption, participation or awareness, without which there is no inherent means of alert or review. In addition, there is a need to establish an on-going forum across related ICT industries so that stakeholders are able to raise issues and suggestions.

5. Regional & Supranational ICT Competency Frameworks

5. Regional & Supranational ICT Competency Frameworks

While national ICT competency frameworks aim to focus the single country's effort towards developing its human capacity in the stage of economic and ICT development, regional and supranational competency frameworks seek to align the skills definition and certification across its member countries. This allows for economic integration within the region, optimising resources by achieving a freer movement of human capital across its member countries.

5.1 Regional & Supranational ICT Competency Frameworks

Supranational competency frameworks aim to facilitate labour mobility and efficiency across regions, thus bringing about closer economic integration within members and growth. Regional ICT competency standards would also align the shared interests by the member countries to promote and develop ICT capabilities for a competitive edge against other competing blocs.

These advantages, however, have to be weighed against the challenges of synthesizing the different standards, definitions and levels. As countries may have customised their competency standards to local requirements, the measurements of skills may vary considerably according to economic stages. Thus, the challenge is to investigate and find the commonalities in ICT areas and industries between the different country standards.

In particular, two supranational frameworks, the e-Competency Framework in the European Union, and the ASEAN ICT Skills Standards, are briefly analysed below.

5.2 European Union's e-Competence Framework (e-CF)

The e-CF divides the spectrum of ICT skills for all businesses across five ICT competence areas of PLAN - BUILD - RUN - ENABLE - MANAGE. A total of 40 key competencies are in turn, spelt out under each of these five e-competence areas, and broken into five levels of proficiency (e1 to e5). The framework is encapsulated in Figure 11 below.

Dimension 1	Dimension 2	Dimension 3				
5 e-Competence areas (A-E)	40 e-Competences identified	e-Competence proficiency levels identified for each competence (related to EQF levels 3-8)				
		e-1	e-2	e-3	e-4	e-5
• A. PLAN	• A.1. IS and Business Strategy Alignment					
	• A.2. Service Level Management					
	• A.3. Business Plan Development					
	• A.4. Product/ Service Planning					
	• A.5. Architecture Design					
	• A.6. Application Design					
	• A.7. Technology Trend Monitoring					
	• A.8. Sustainable Development					
	• A.9. Innovating					
• B. BUILD	• B.1. Application Development					
	• B.2. Component Integration					
	• B.3. Testing					
	• B.4. Solution Deployment					
	• B.5. Documentation Production					
	• B.6. Systems Engineering					
• C. RUN	• C.1. User Support					
	• C.2. Change Support					
	• C.3. Service Delivery					
	• C.4. Problem Management					
• D. ENABLE	• D.1. Information Security Strategy Development					
	• D.2. ICT Quality Strategy Development					
	• D.3. Education and Training Provision					
	• D.4. Purchasing					
	• D.5. Sales Proposal Development					
	• D.6. Channel Management					
	• D.7. Sales Management					
	• D.8. Contract Management					
	• D.9. Personnel Development					
	• D.10. Information and Knowledge Management					
	• D.11. Needs Identification					
	• D.12. Digital Marketing					
• E. MANAGE	• E.1. Forecast Development					
	• E.2. Project and Portfolio Management					
	• E.3. Risk Management					
	• E.4. Relationship Management					
	• E.5. Process Improvement					
	• E.6. ICT Quality Management					
	• E.7. Business Change Management					
	• E.8. Information Security Management					
	• E.9. IS Governance					

Figure 11: European e-Competency Framework (e-CF)

5.2.1 Involvement

e-CF was born out of the 2003 CEN Workshop on ICT Skills, a “network of experts representing the ICT industry, academic institutions, vocational training organisations, ICT professional associations, social partners and research institutions.”¹⁰ The Workshop comprises an extensive body of ICT stakeholders across different countries, and aims to create standardised definitions that would promote ICT professions in Europe and beyond. Being a component of the larger European Union Strategy for e-Skills in the 21st Century, the e-CF was also the first sector-specific implementation of the European Qualifications Framework that lists standardised specifications for skills as EU continues to integrate its human capacity across member countries.

The extent of parties involved in the conceptualisation of e-CF is noteworthy, as it was collaboratively designed between ICT stakeholders across public and private interests across EU countries at varying levels of ICT development. Feedback from more than 120 stakeholders across Europe are also regularly obtained in order to update and keep the framework relevant to the changing needs of the region.

5.2.2 Target Segments

The standardised framework serves as the common European reference for ICT professionals/individuals, as well as private sector companies and HR in staff recruitment and training, specifications for educational and training institutions as well as public officials and policy-makers who manage the rate and investment of ICT development and human capacity.

e-CF is not limited to the core ICT industry alone but speaks to all ICT professions across business sectors and different levels of skill proficiencies. In order to make e-CF directly relevant, 23 representative profiles of ICT professionals were created and explained, so that these can be adapted by companies and industries in accordance to their specific needs. These represent “the top of the ICT family tree”, which is organised over the ICT business process - shown in Figure 12 below as the “six families” of Business Management, Technical Management, Design, Development, Service & Operation, and Support respectively. These are cascaded into the 23 European ICT Profiles as the most representative job roles at the top (i.e., most proficient) of their skill sets.

¹⁰ <http://www.ecompetences.eu/cen-ict-skills-workshop/>

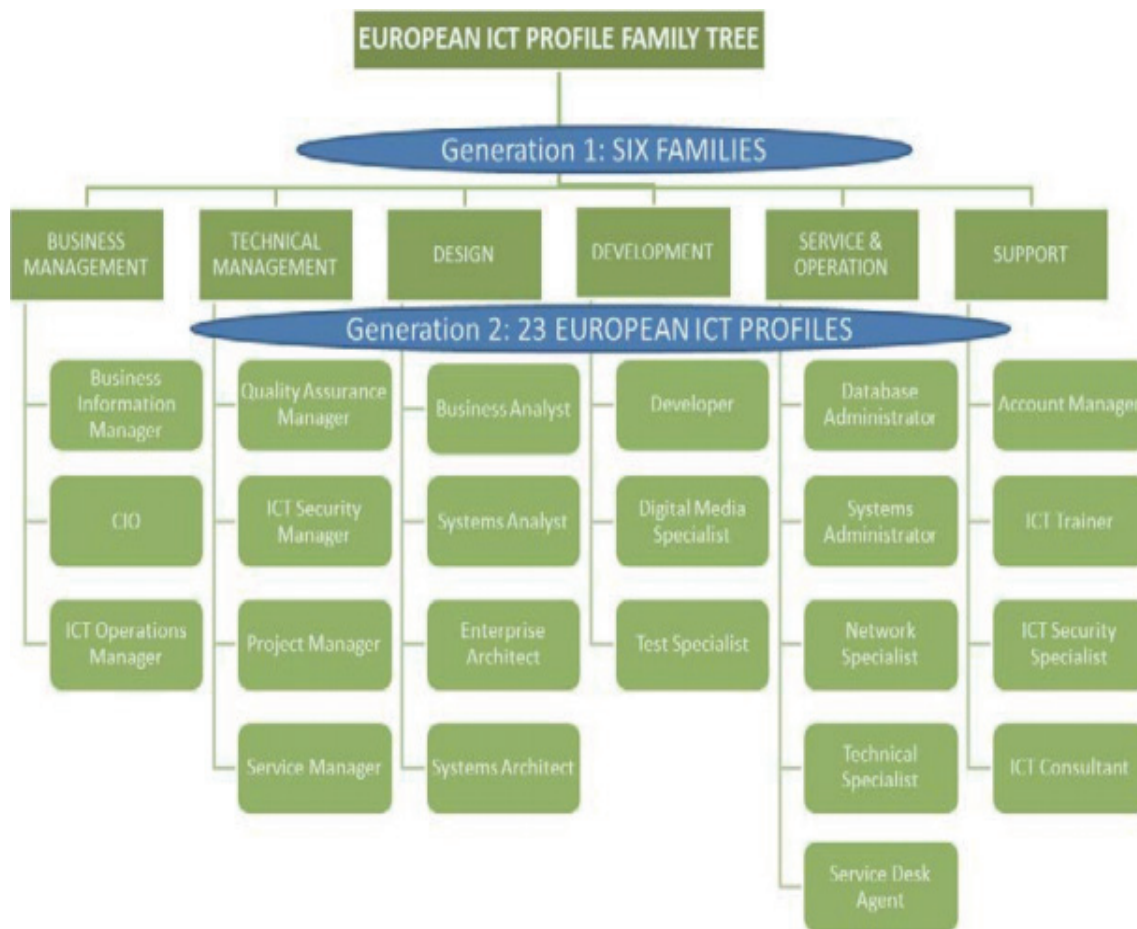


Figure 12: The European ICT Profile Family Tree¹¹

The 23 ICT Profiles in the six families in the ICT business process were in turn matched with the framework's five competence areas - as shown in Figure 13 below. Figure 13 also shows the relationships between the framework bases for skills against those of the ICT business process; companies and individuals can relate the 23 ICT Profiles to their specific domain and adapt them accordingly in respect to their industry and specific skill levels required.

¹¹ <ftp://ftp.cen.eu/CEN/Sectors/List/ICT/CWAs/CWA%2016458.pdf>

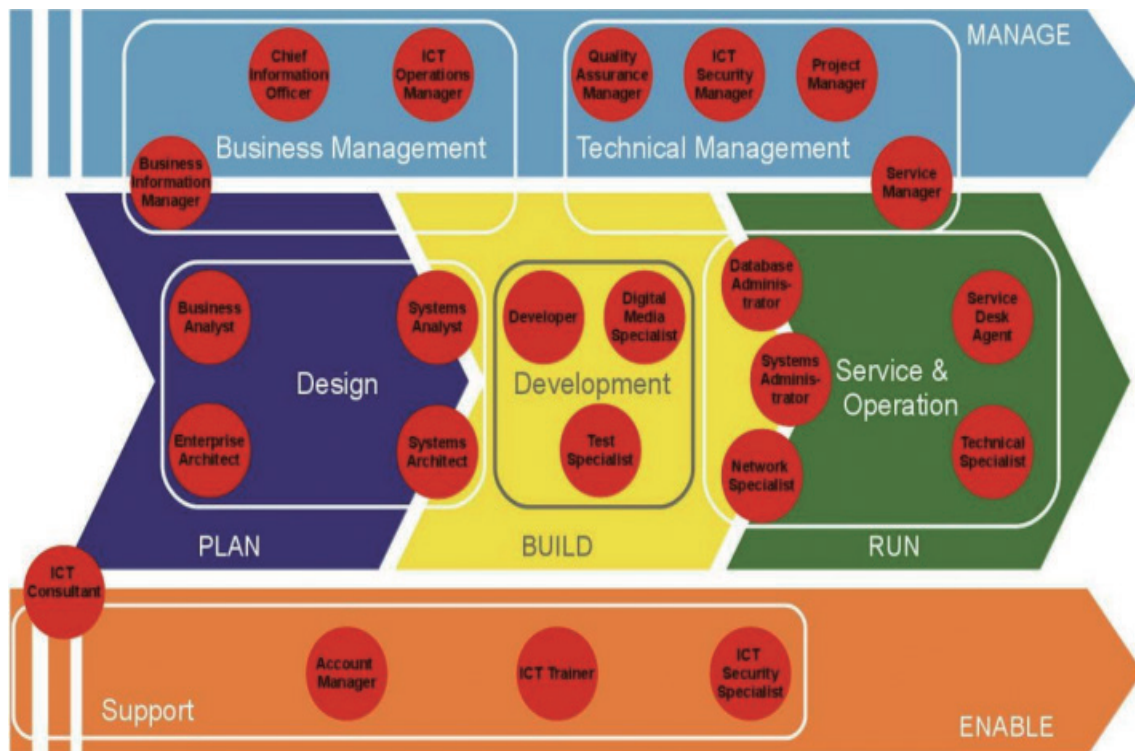


Figure 13: 23 European ICT Profiles Structured by the 6 Families in Business Process and 5 ICT Competence Areas in e-CF

5.2.3 Analysis of European e-Competency Framework (e-CF)

As a supranational framework for ICT competency, the e-CF is a forerunner in terms of the scope of ICT skills defined and its geographical implementation across more than 22 countries in Europe. It is no mean feat to condense the spectrum of ICT roles and responsibilities across different industries in the business process with the balance between granularity and legibility. The test of any framework must lie in how easily it can be understood, yet applied in the specific contexts.

This is especially so for a supranational framework that must relate and apply to differing business and national contexts within the European bloc. This is significant as the EU comprises of countries at different stages of development, and e-CF would need to relate to the different needs of Stage 2, developing countries such as Bulgaria and Romania alongside those of the developed, developed knowledge economies already in Stage 3 of their economic development.

The success of e-CF may be attributed to the political support and involvement of key stakeholders across Europe, in the form of the CEN Workshop on ICT Skills and the political impetus of EU's masterplan in the e-Skills for the 21st Century. The umbrella grouping of public officials and private stakeholders across core ICT industries and business domains ensured that the framework was developed with collaborative buy-in for implementation and review, both of which are critical for the success and sustainability of the competency standard.

Given the geographical scale already represented through the European Union, it would be efficacious for other regional groupings to consider the adoption or integration with e-CF as the uniform standard for ICT proficiencies. This would serve to align skills definitions and promote the transfer and migration of ICT professionals internationally.

5.3 ASEAN ICT Skills Standards Definition and Certification

Part of the ASEAN ICT Masterplan 2015, the ASEAN ICT Skills Standards was conceptualised to standardise the definitions of key ICT competencies in order to facilitate the development and movement of ICT professionals in the ASEAN countries. Unlike EU's e-CF however, the ASEAN Skill Standards prioritised and focused on five key areas within the core ICT industries, namely, Software Development, ICT Project Management, Enterprise Architecture Design, Network and System Administration and Information System and Network Security. These six key ICT areas are further divided into 23 sub-areas within these fields across three proficiency levels accordingly.

5.3.1 Involvement

Little public information is available on the process of conceptualising the ASEAN ICT Skills Standards, though available online presentations point to largely to an inter-governmental effort to align standards across the different proficiency levels (see screen grabs in Figure 14 below).

Competency Level (ASEAN)	Description (ASEAN)	Malaysia	Philippines	Singapore	Thailand	Vietnam
Level 3: Advanced Level	Has professional knowledge and skills in both technical and management to lead a team in inexperienced environment	Level 4: Advanced	Competency levels are varied depending on groups of skill.	Level 4: Senior Management	Level 4: IT professionals	Level 4: IT professionals
Level 2: Intermediate Level	Has professional knowledge and skills to perform a given task(s) independently, and, if required, can supervise others; understand a number of comparative approaches to problems in their fields; and be able to apply them efficiently	Level 3: Senior		Level 3: Expert/Management Level 2: Specialist	Level 3: Perform all assigned duties independently	Level 3: Perform all assigned duties independently
Level 1: Basic Level	Has basic knowledge and skills which is adequate to perform a given task(s) under supervision of management.	Level 2: Intermediate		Level 1: Entrant	Level 2: Perform assigned duties under the supervision	Level 2: Perform assigned duties under the supervision

Figure 14: Mapping of ICT Standards - ASEAN ICT Masterplan 2015, presented 25-26 August 2014, Bangkok¹²

¹² <http://slideplayer.com/slide/4357718/>

5.3.2 Target Segments

The ASEAN Skills Standards speak primarily to the core ICT industry, in line with the focus of most of the ASEAN member states, which are developing Stage 2 economies. It is noteworthy, however, that the ASEAN Skills Standards appeared to be an effort to align definitions across national standards that are aimed at different target segments. For example, Philippines' NICS targets public/government officials and the general workforce while Malaysia's Skill Competency Matrix is focused on the core ICT industry. Singapore's NICF, on the other hand, has the broadest scope in reaching out to all ICT professionals across business domains and expertise areas.

5.3.3 Recommendation and Next Steps for ASEAN Skills Standards Definition and Certification

The ASEAN Skills Standards is a tentative framework that is still a work-in-progress. The effectiveness of the eventual framework would require the larger involvement of private ICT stakeholders and businesses in order to ensure relevance across the different national contexts. More importantly, the focus on developing the core ICT industry must mean that only ICT-industry specific standards are drawn out of the respective national frameworks and consolidated for skills alignment beyond the proficiency levels themselves. This would be much more technical and require the involvement of ICT experts and private industry stakeholders akin to the conceptualisation process that the CEN Workshop in EU had undertaken.

At this early stage of planning, the ASEAN community could usefully draw lessons from the more comprehensive framework of the EU's e-CF. The e-CF framework offers a tried-and-tested conceptualisation broad enough to encompass the needs of Stage 2 and Stage 3 economies. ASEAN members vary by state of economic development. So while the focus on building the core ICT industry is the predominant aim of most of the ASEAN members, the regional bloc also includes countries in transition to, and already at Stage 3 (Malaysia and Singapore respectively), who would require the broader scope to build and maintain ICT skills across all economic sectors.

Matching the EU's e-CF framework allows for the integration of ICT human capacities between Europe and ASEAN, thereby fostering vibrancy and excellence in the ICT profession. For ASEAN countries who need to import ICT expertise, this represents an incentive for its workforce to upskill to an internationally recognised standard and raises the professionalism and appeal of an ICT career. For the developed knowledge economies, its ICT workers enjoy the mobility that mutual recognition brings within the two large regional blocs.

6. Additional Considerations and Conclusion

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6.1 ICT Competency Standards and Disaster Risk Management

ICT competency standards seek to clarify and focus the human development efforts of governments. One area that emerging and developing economies need to clarify and focus on is that of disaster risk management. Emerging and developing countries are often overwhelmed when disaster strikes. Being able to manage such risks through having trained personnel is therefore advantageous.

The pervasiveness of ICT usage in public, private and educational sectors complement the effectiveness of disaster management tools in affected countries. Digital literacy and use by the general population is instrumental for quick alert and recovery during and in the aftermath of a natural disaster. The development of ICT skills in the public sector would also allow for governments to effectively implement and use disaster management software during such emergencies.

6.2 Issues in Revising ICT Competency Standards

The need to regularly review and revise competency standards is well-acknowledged. Governments, however, often struggle with the politics of engagement that makes revision difficult. Philippines may find that its different government agencies reluctant to give up their individual volumes of specific ICT skills and job roles in exchange for a clearer structure of skills and proficiency levels across the board.

Often times, competency standards remain stagnant after its initial implementation as the national focus moves to a different area of need. In order to sustain attention, governments should set out clear measures for the adoption and review of the ICT competency standards regularly.

