E-government Skills Identification and Development: Toward a Staged-Based User-Centric Approach for Developing Countries*

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One of the prominent challenges of e-government identified in developing countries is low level of ICT literacy and skills of e-government users. For those countries at the nascent stage of e-government development, it is crucial to identify and provide e-skills needed from the demand side. However, prior research has mostly focused on the supply side of e-skills, ignoring the consumption side of e-skills. In addition, no user centric approach for e-skills identification and development for e-service consumption, with respect to the stages of e-government development, have been proposed and validated. The purpose of this article is thus to: 1) Identify skills required for e-services utilization by all participants-citizens, public, and private sector employees-involved in G2C, G2B, and G2E e-government relationships respectively; assuming they are consumers of e-government and to 2) Propose and validate an user-centric approach for e-skills identification and development based on stages of e-government utilizing the Delphi method. As a result of the study, a comprehensive list of e-skills (N = 81) was generated. We found that e-skills required for e-service consumption are not merely technical; they include a wide variety of related skills that can be applied to enhancing e-skills. Therefore, the findings can serve as a standard curriculum for training and educating both citizens and government employees in developing countries. Moreover, the findings of this research may also facilitate international organizations in indentifying and measuring citizens' readiness for e-government in terms of e-skills.

Keywords : E-government Service, E-government Stages, Consumption Side E-skills, E-government
            Consumers, Developing Countries

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I. Introduction

E-government is defined as the practice of public service provisioning to citizens, businesses, and other government agencies where government services can be accessed through the internet, mobile, fax, mail, telephone, and personal visits [Bonham et al., 2001; MGAHA, 2005; World Bank, 2009]. Expectedly, the E-government initiative, especially in developing countries, faces a number of challenges [Layne and Lee, 2001; Holden, et al., 2003; Ndou, 2004; Gebremichael and Jackson, 2006; Chen et al., 2006]. One of the prominent challenges of e-government, on the demand side, is the low level of ICT (information and communication technology) literacy and skills of e-government users. The demand side e-skills are generally measured by indexes such as e-government and ICT development index [UN, 2005; ITU, 2009]. The E-government index, for example, considers the level of education as a factor of measuring human resource readiness for e-government, whereas, the ICT development index utilizes the level of education as a representative of ICT skills for measuring information society [UN, 2005; ITU, 2009]. However, these measures in case of most of the developing and least developed countries are not true representatives of e-government skills, due to the unavailability of data [ITU, 2009] and the fact that computer literacy is not yet fully embedded in the curriculum in some developing countries [MOE, 2008]. Moreover, a nation's high e-readiness index in

term of ICT infrastructure, institutions, policies, and political commitment does necessarily assure the e-readiness of citizens [Shalini, 2009].

Furthermore, the demand side e-government literature stresses the need to identify and provide certain basic and specialist e-skills needed by all e-government users [Leitner, et al., 2005; Reddick, 2005; MIT, 2002; Blessing, et al., 2008]. Still, inadequate or no literature that deals with e-skills required by all e-government consumers is available, especially for developing countries with limited or no ICT skills. We believe that identifying and developing the right e-government skills are crucial. The purpose of this article is, thus, to: 1) Identify skills required for e-services utilization by all participants-citizens, public, and private sector employees-involved in G2C (Government to Citizen), G2B (government to business), and G2E (government to employee) e-government relationships respectively; assuming they are consumers of e-government and to 2) Propose and validate a user-centric approach for e-skills identification and development based on stages of e-government through involvement of experts using the Delphi method. We define following terms for the purpose of this study:

1.1 E-service

In this article, e-service or electronic service is used to refer to the generic government services provided through the Internet to

citizens, public and private sector employees.

1.2 E-skills

E-skills are defined as, "The set of skills, knowledge, and concepts that are needed for effective consumption-access, locate, operate, manage, understand, and evaluate-of e-services provided in different stages of e-government." We classified the e-skills needed for e-service consumption as technical: PC usage skills, standard program skills, and applied e-skills and Internet skills: operational, formal, strategic, and informational skills [Deursen and Dijk, 2008a] as show in <Table 2>.

1.3 Citizens

By citizens we mean the general public to whom the e-services are provided and are involved in the G2C e-government relationship.

1.4 Private sector employee

Private sector employees are those employees of private sectors who are responsible for interacting with G2B e-government relationship for utilizing e-services provided to the business sector.

1.5 Public sector employee

Public sector employees are all government sector employees to whom e-services are provided during G2E relationship.

1.6 E-skill acquisition method

In this study, the e-skill acquisition method is define as "the policies and programs initiated by a government or private sector for citizens to acquire the e-skills needed for e-service consumption."

The rest of this paper is organized as follows: next section provides literature on e-government in developing countries, the stages, and services of e-government, and the literature on e-skills, followed by Section 3, which contains the methodology applied in research. Section four presents an analysis of the results and a detail discussion about the e-skills required at each stage of e-government and the acquisition methods identified by the experts. Finally, implication and avenues for future research are explored in the discussion.

Ⅱ. Theoretical background

2.1 E-government challenges in developing countries

Developing countries, utilizing the late comer advantage, are mimicking the trends of paperless government with the expectations to reap the same benefits enjoyed by developed countries. The move towards a paperless government can be justified by the numerous benefits associated with it, which includes increased quality and efficiency of government services and operations, cost re-

duction, transparency, reduction in corruption, accountability, and improved decision making [Ndou, 2004; Moon, 2002]. However, e-government initiative has not always been successful in developing countries [Heeks, 2003]. According to the study conducted by Heeks [2003], the rate of e-government success in developing countries accounted for only 15%.

Developing countries are a long way behind developed countries in e-government implementation, and the gap is widening over time as the talk of the next generation e-government is evident in literature [Marijn, et al., 2009]. The ever widening gap between developing and developed countries can be attributed to several challenges that span from human resources to technical and legal issues. The need for skilled human resources for e-government success has been clearly discussed in the literature [Chen et al., 2006; Shin et al., 2008]. Human capital development along side with improvent in management, ICT infrastructure, legal framework, and access to information, strategy, and leadership role, cultural, and budgetary constraints are some of the main challenges faced by e-government of developing countries [Carter and May, 2001; Layne and Lee, 2001; Ndou, 2004; Gebremichael and Jackson, 2006]. Chen et al. [2006] listed the challenges that hinder the way of e-government in developing countries as being technical (no technical staff and outsourcing ability), economical (low economical growth and productivity), infrastructural (lack of national informational

infrastructure, low internet access for citizens and employees), and literacy (insufficient knowledge and skills of citizens and employees to use the Internet).

In their study Shin et al. [2008] identified six factors associated with e-government success in developing countries, among which are "changes in work process" and "technical/human resources." Others include organizational culture and values, the vision and strategy of internal leadership, financial support, corporate laws, regulations, and policies. In addition, they found that developing countries need to fulfill certain unique requirements to implement e-government successfully.

2.2 E-government stages, relationships, and services

So far, different approaches of e-government development have been proposed. According to Layne and Lee [2001], e-government is a four-stage developmental process comprising cataloguing, transaction, vertical integration, and horizontal integration. Silcock [2001] and Deloitte and Touche [2002] see e-government as a six-stage dynamic model starting from information publishing and dissemination, official two-way transaction, multi-purpose portals, portal personalization, clustering of common services, and finally full integration and enterprise transformation. The UN [2002] categories e-government as a five stage process: emerging, enhancing, interactive, transactional, and full integra-
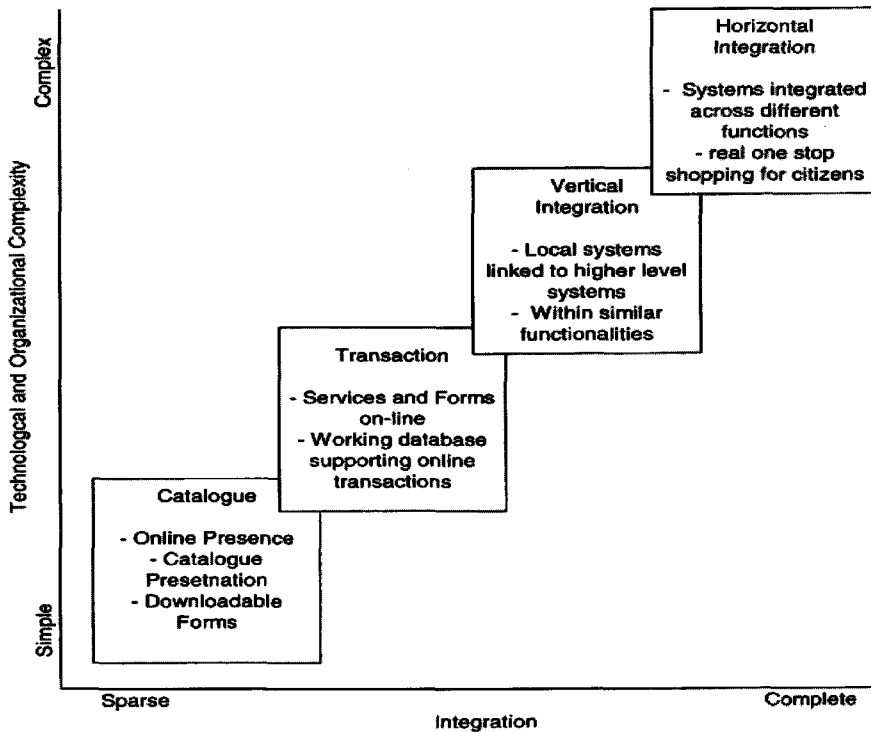
tion. Reddick [2004] proposes a two-stage model of e-government growth, whereas Andersen and Henriksen [2006] develop a four-stage e-government maturity model, focusing mainly on the end user benefits aside from technological integration and feasibility. More recently, Bram and Janssen [2009] suggested a five stage e-government model starting from stovepipes to integrated organizations, nationwide portal, inter-organizational integration, and customer-driven joined-up government with dynamic capabilities.

Primarily, e-government users include citizens, businesses, governments, and government employees [Garcia and Moyano, 2007]. At each stage of e-government there are at least four possible relationships that e-governments can hold with the users, namely, government to citizen (G2C), government to business (G2B), government to employees (G2E), and government to government (G2G) [Hiller and Belanger, 2001; Ndou, 2004]. According to Ndou [2004], the first relationship is G2C in which governments deliver services or benefits to citizens by establishing or maintaining a direct relationship with them. In the G2C relationship, customers access government information and services directly everywhere by using several access technologies.
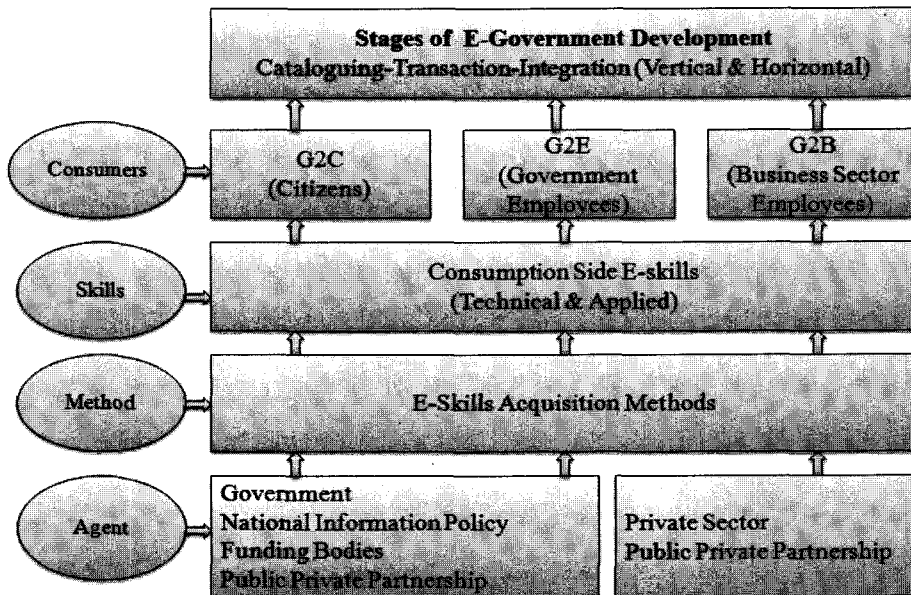
The second relationship G2B consists of the electronic interactions between government agencies and private businesses. The typical example of the G2B transaction is paying taxes online and e-procurement. The

third relationship identified by Ndou [2004] is G2G, which refers to the relationship between governmental organizations. In the G2G relationship, national, regional, and local governmental organizations or other foreign governments collaborate and/or provide services to one another [Hiller and Belanger, 2001]. The fourth and final relationship is between a government and its employees (G2E). Under the platform of G2E relationship, governments provide e-learning and facilitate knowledge sharing among their employees using the Intranet [Ndou, 2004].

Similarly, several studies have identified the services and features that e-government provides to the customers [Steyaert, 2004; Johnson, 2007]. Deshazo et al. [2001] identified 51 different e-governments' services and organized them into 12 categories: online payments, registration and permits, customer service, communication, license, images, audio/video, documents, applications, and procurement, among others. These services are mainly provided to the users in the G2C, G2B, G2E, and G2G e-government relationships [Hiller and Belanger, 2001; Ndou, 2004]. In order to indentify e-government stages we use the Layne and Lee [2001] four stage e-government growth model: Catalogue, Transaction, Vertical, and Horizontal Integration (see <Figure 1>). F or the simplicity's sake, we combinedlast two stages as "Integration." Furthermore, e-government relationships-G2C, G2B, and G2E-are derived from Ndou [2004] as depicted in the conceptual model <Figure 2>.

<Figure 1> Dimensions and Stages of e-government Development [Layne and Lee, 2001]

<Figure 2> Conceptual model: Consumption Side e-skills Identification and Development Based on Stages of e-government

2.3 E-skills and e-government

Skill can be defined as the ability to produce a desirable result with the utilization of minimum energy or time or both [Guthrie, 1952]. ICT (information communication technology) skills can be classified into three broad areas: professional, applied, and basic IT (information technology) skills [López-Bassols, 2002]. Professional IT skill is the ability to use advanced IT tools and/or to develop, repair, and create them; applied IT skill is the ability to apply simple IT tools in general workplace settings; and basic IT skill is the ability to use IT for basic tasks and as a tool for learning, working, and recreation [López-Bassols, 2002]. OECD [2005] classified ICT competences into three groups: ICT specialists who have the ability to develop, operate and maintain ICT systems; advanced users who have the skills to use advanced and sector-specific software tools; and basic users who can use generic tools such as Word, Excel, Outlook, and PowerPoint.

EPAN [2003] identified four sets of skills, both technical and managerial, as essential for e-government: information technology (IT), information management (IM), information society (IS), and updated management skills. The skills framework for the information age (SFIA) is a common reference model used by the IT industry and the governments in the UK (United Kingdom) for the identification of a wide range of skills needed to develop effective information systems (IS) [SFIA, 2005]. According to CIO [1999], 11 core competencies for federal IT executive officers are needed: policy and organization, leadership and management, process and change management, performance assessment, project and program management, planning and investment assessment, acquisition, e-government, e-business and e-commerce, IT security and information assurance, technical competence, and, finally, desktop technology tools. More recently, Bram and Janssen, [2009] identified additional skill factors needed by e-government to move up from one stage to another: stakeholders, technology, transformation, and service delivery dynamic capabilities.

However, all these skills identified are needed for e-service provisioning (supply side) and should be considered as important factors in providing e-services. In addition, we try to identify e-skills required for e-service consumption (demand side) and consider all the actors involved in G2B, G2C, and G2E relationships as consumers of e-services as shown in <Figure 2>. Furthermore, Deursen and Dijk [2008a] and Deursen and Dijk [2008b] identified four types of internet skills which are needed by citizens while using e-government services. However, possessing only of the internet skills is not enough for citizens to interact with e-governments in developing countries; they must also possess others relevant skills to operate computers and standard programs such as word process. In addition, most of the skills identified are irrespective of the services provided at each stage of e-government development.

In developing countries, their national in-

formation policies must address such salient issues as the citizens' and organizations' ICT literacy, training, and cross disciplinary effect [UN, 1999; Arnold, 2004]. The following section discusses several national information policies and their roles in developing ICT skills.

2.4 E-skills and national information policy in developing countries

National information policy, is also referred as different names such as national communication policy, national information and communication policy, or national information technology policy [Arnold, 2004] while the role of the policy responsible for educating citizens, developing, and administering ICT skills in developing countries is clearly defined in the literature [Menou, 1991; UN, 1999; Arnold, 2004]. According to the UN [1999], a common objective of ICT policies in developing countries are: providing individuals and organizations with a minimum level of ICT knowledge; helping to understand information technology and its cross-disciplinary effect; providing a chance of access to citizens; and ICT training. Arnold [2004] proposed six factors that must be considered for developing national information policy in developing countries, namely, socio-economic development, public policy on the application of information, application of information itself, access to and the availability of information, and social and economic factors. Social factors that impact people's ability to use and get access to information includes levels of education, literacy, information literacy, and computer literacy [Arnold, 2004]. Thus, developing and administering the e-skills required for effective utilization of information and e-services must be addressed by a national information policy in developing countries. Other agents that may contribute to developing ICT skills include funding bodies, PPP (public private partnership), and private sectors such as universities and international organizations as show in the conceptual model <Figure 2>.

III. Research Method

In order to identify e-skills and skill acquisition methods we used the Delphi method. The Delphi method is based on a structured process for collecting and purifying knowledge from a group of experts for consensus-building by the means of a series of questionnaires, interspersed with controlled opinion feedback [Dalkey and Helmer, 1963; Adler and Ziglio, 1996]. The Delphi method has been widely used to generate forecasts in technology, education, program planning, needs assessment, policy determination, resource utilization, and other fields [Turoff, M., 1970; Schneider, 1972]. The Delphi method may take two forms: paper-pencil version and the real-time Delphi [Gordon and Pease, 2006]. Paper-pencil Delphi is a classical method in which a series of paper-pencil questionnaires are administered through the mail whereas in the real-time Delphi panelists

have access to a web-based questionnaire [Gordon and Pease, 2006; Geist, 2009]. In a paper-pencil version, the rate of participation is better; however, in terms of quantity and quality of data both versions perform equally [Geist, 2009]. The primary purpose of the Delphi method is to overcome the limitation of formal meetings, interviews, and face-to-face group discussions such as following a single thought, getting side tracked, and losing sight of the goal of the discussion [Dunnette et al., 1963]. These problems can be eliminated through four stages of the Delphi method: anonymity, iteration, controlled feedback, and statistical group response [Rowe et al., 1991]. Anonymity is achieved by using questionnaires completed in the comfort of home or office without the influence from other group members [Rowe et al., 1991]. Iteration is the process of presenting the questionnaires to each group member over a number of rounds until the consensus among the participants is reached [Murry and Hammons 1995]. Controlled feedback stage occurs during the iteration process where each participant is informed of the opinion of the other group members. Finally, in the statistical group response stage, after the final iteration, results and opinions are produced using descriptive statistics such as medians and interquartile ranges, or means and standard deviations [Rowe et al., 1991; Geist, 2009].

3.1 Subjects

We selected 37 experts from 28 countries from Asia, Africa, South America, Middle East, and Europe. The subjects include IT directors, IT managers, IT specialists, and heads of departments, e-government experts, senior ICT officers/Administrators, researchers, and lecturers. The experts were responsible for the tasks related to ICTs, e-government, and human resource establishment and development in their organizations with at least six years of experience in their respective fields. In addition, being participants of the IT technology program (details can be found here: http://ittp.kaist.ac.kr/Intro.php) all the experts had an average of two years of experience in utilizing and experiencing different e-government services in South Korea, a leading country in terms of e-government implantation [UN, 2008]. E-government services, in a majority of developing countries, are immature and lagging behind [Heeks, 2003]; however, the move towards advance and complex services in developing countries is underway [Chatfield and Alhujran, 2009]. Therefore, the practical experience regarding the utilization of advance e-government services in Korea facilitated the experts in recommending skills required for the initial services currently available in developing countries and advance e-services that may be available in near future. Furthermore, assumption here was that almost all end-users in developed and developing countries use generic technologies for accessing e-government services including personal computer, browser, and world processor software, all of which require a generic skill-set.

The demographic profile of the experts is show in <Table 1>.

<Table 1> Demographic Profile of the Experts

	Number	Percent
Organizational level:		
Senior Management	5	14
Middle Management	6	16
Supervisor	8	22
Expert	7	19
Officer	5	14
Researcher	3	8
Lecturer	3	8
Functional area:		
Information System	18	49
Human Resources	10	27
Research and Development	3	8
Others	6	16
Experts by region:		
Asia	17	46
Africa	7	19
South America	7	19
Europe	4	11
Middle East	2	5
Gender:		
Male	30	81
Female	7	19
Total:	**37**	
Experience:		
Average experience at organization	6 years	
Average experience in utilizing e-government services in Korea	2 years	

3.2 Instrument development

A Delphi instrument which consisted of 62 items was developed. Survey questions were based on the e-skills set required by all con-sumers at each stage of e-government devel-opment and the skills acquisition methods. As the starting point, several e-skills were identified and categorized as technical and applied e-skills (see <Table 2>) through liter-ature review, a method considered appro-priate if basic information concerning the target issue is available and usable [Kerlin-ger, 1973].

<Table 2> Type and Number Items (Skills) Included in First Round Questionnaire

Domain	Sub Domain	Number
Technical e-Skills	Document Management Skills	9
	PC Environment Management Skills	14
	Standard Programs Usage Skills	5
	Applied E-skills	13
	Sub Total	41
Internet Skills	Operational Skills	10
	Formal Skills	3
	Information Skills	4
	Strategic Skills	4
	Sub Total	21
Total		62

The internet skills were adopted from stu-dies by Deursen and Dijk [2008a] and Deur-sen and Dijk [2008b] while basic PC utiliza-tion, standard program, and applied e-skills were selected from [OECD, 2003] and [ECDL, 2007]. Experts were asked: "How important are the following e-skills for utilizing e-serv-ices provided at each stage of e-government for a specific user?" They had to rate each item on a Likert scale ranging from *totally*

unimportant (= 1) to *very important* (= 5). In addition, open-ended questions were provided for adding and/or removing any e-skills that expert thought were important and/or unimportant for that specific domain. Furthermore, open-ended questions were included in the questionnaire for identification of e-skill acquisition methods.

3.3 Procedure

In order to remove ambiguity, prevent misinterpretations, and insure reliability of the Delphi instrument a pilot was carried out [Okoli and Pawlowski, 2004] in which three experts were asked to give their judgment on the Delphi-questionnaire. Selected experts (N = 37), who agreed to participate in the Delphi study, answered the online Delphi questionnaire from June 18, 2009 to June 25, 2009. Beside the questionnaire, instructions (including stages of e-government and the service provided to each consumer) were also provided to the experts. They rated the items on Likert-scale. Later, the data were analyzed and the second round questionnaire (pencil-paper version) was distributed on July 8, 2009 to 32 panel members who had responded to the round one questionnaire. The second round questionnaire included the ratings of the individual panel member to each item, the mean and standard deviation of all participants' responses, and the new e-skills recommended in round one by all the experts. Panel members were asked to re-rate or confirm the original ratings of each item. Com-

mon method bias was controlled through procedural remedies by introducing proximity and temporal separation or time lag [Podsakoff *et al.*, 2003]. Proximity was introduced by administering the round-1 questionnaire online, whereas a paper-based approach was used in round two questionnaires. Similarly, about two weeks time lag was kept between round one and round two questionnaires for controlling common method biases. Proximity and temporal separation or time lag can avoid biases in the response reporting or editing stage by reducing respondent's ability and motivation to use previous responses to answer succeeding questions [Podsakoff *et al.*, 2003].

IV. Analysis

We analyzed the data using descriptive statics, an approach frequently used in the Delphi method [Hill and Fowles, 1975; Rowe *et al.*, 1991]. Descriptive statistics such as the level of dispersion-standard deviation and inter-quartile range and measures of central tendency-means, median, and mode are major statistics used when reporting data in the Delphi studies [Hasson *et al.*, 2000]. The use of median scores, based on Likert-type scale, is strongly favored by the researchers [Hill and Fowles, 1975; De Vet *et al.*, 2005; Jacobs, 1996]. Jacobs [1996] states that, "considering the anticipated consensus of opinion and the skewed expectation of responses as they were compiled, the median would inherently appear best suited to reflect the resultant

convergence of opinion." [p. 57]. Researchers, utilizing a large sample size, have also employed inferential statics for calculating consensus in the Delphi method [Buck, *et al.*, 1993]; however, the samples size in our study prohibited us from using inferential statistics [Gordon, 1992]. Furthermore, the true value of the Delphi method concerns the generation of ideas rather than the determination of statistically significant results that can be generalized to a larger population [Gordon, 1992].

The Delphi method is a process consisting of a series of rounds; in each round, every participant is presented the results of the previous rounds and asked to update his rating until a consensus or stability of the results is reached. Consensus on a topic can be decided if a certain percentage of the votes falls within a prescribed range [Miller, 2006]. In our study, 75% was taken as a minimum percentage of agreement on any particular item [Murry and Hammons, 1995]. For calculating consensus, the scores 1 and 2 were computed as *(totally) unimportant*, 3 as average, and 4 and 5 as *(very) important*. Any item is viewed as *(very) important* when 75 percent of the experts rated it with a score of 4 or 5.

4.1 Results

The number of experts that agreed to participate in the Delphi study was 35 out of 37 (94%). Round-1 questionnaire was completed by 32 experts out of 35 (91%). The mean, standard deviation, and percentage were computed for each item and included in the round-2 questionnaires. Out of 32 experts, 28 (87%) proceeded to the round-2 questionnaires. The items that 3 or more experts (10% of the experts) rated as *(totally) unimportant* were removed (<Appendix 1> and <Appendix 3>).

Similarly, the new items suggested by experts in round-1 and 75% or more experts rated them as *(very) important in* round-2 were added to the list (<Appendix 2> and <Appendix 3>). The results of round-2 were stable in accordance with the results of round-1, i.e. the shift on the mean score on all items was less than 15%, and the consensus among the experts in round-2 was more than 75% for the new items added in round-1. Therefore, it was not necessary to proceed to round three.

A total of 62 items were included in the round-1 questionnaire; among them 41 represented the "technical e-skills" domain and 21 were used for "internet skills" as shown in <Table 2>. Technical e-skills were further divided into four sub domains: document management skills, PC environment management skills, standard programs usage skills, and applied e-skills while operational skills, formal skills, informational skills, and strategic skills represented internet skills domain.

4.1.1 Round-1 results

After round-1, 14 out of 95 items (15%)

were omitted because 3 or more experts rated them as *(very) unimportant* whereas 31 new items (33%) were added because 75% experts agreed to be included as shown in Appendix 1. In the domain "technical e-skills" out of 62 items 12 items (19%) were omitted and 21 new items (33%) were added. In the sub domain, "PC environment management skills" 27%; the highest number of items has been omitted followed by "document management skills" sub domain (25%). The number of items omitted was 14% in "standard program usage skills" and 9% in "applied e-skills" sub domains. The highest number of items (8 items) added were in "PC environment management" and "applied e-skills" sub domains, respectively.

Similarly, in the domain "internet skills" out of 33 items 2 items (6%) were omitted and 10 new items (30%) were added. In the sub domain, "strategic skills" 12% items has been omitted followed by "operational skills" sub domain (8%). No items were omitted in "formal skills" and "informational skills"; however, (3) new items were added respectively in each domain. Furthermore, new (2) items were added in "operational skills" and "formal skills" sub domains respectively. Overall, in the "internet skills" domain the percentage (30%) of addition of news skills was higher as compare to omission percentage (15%). The results of Round-1 are represented in <Appendix 1>.

4.1.2 Round-2 results

After completion of round-2, in total, tak-

ing the level of agreement or consensus as 75%, the experts agreed on 81 e-skills (items) out of 95 items (85%), including 31 newly added items (62%) as shown in Appendix 2. All the items on which experts reached consensus were rated as important or very important on the Likert scale. The percentage of consensus in all domains was higher than 75%. In the domain "technical e-skills" the number of *(very) important* items was 29 (58%). The highest number of (very) important items in "technical e-skills" domain was 11 items (53%) in "applied e-skills" sub domain followed by 8 items (50%) in "PC environment management skills", 6 items (67%) in "document management skill", and 4 items (66%) in "standard program usage skills" sub domain. Furthermore, the number of *(very) important* items was 21 (68%) in "internet skills domain." The highest number of (very) important items in "internet skills" domain was 10 (83%) in "Operational skills" sub domain, followed by 4 items (57%) in "informational skills" and "strategic skills" respectively. Detail description of the omitted items (5% of the experts rated them as 1 or 2), items that were added and *(very) important* items (75% of experts rated them as 4 or 5 on Likert scale), are shown in Appendix 3.

In addition, open ended questions were provided to the experts in the Delphi questionnaire. Based on their experience and knowledge, they were asked to identify e-skills acquisition methods that can be utilized by the government and private sector in developing countries. Based on their expe-

rience and knowledge, a comprehensive list of skill acquisition methods for citizens, public, and private sector employees were suggested as shown in <Table 3>.

4.2 E-skills and e-government development stage 1

The type of e-skills needed during each of the e-government development stages, by each consumer, depends upon the service provided at that stage. The first and initial stage of e-government is one way and non-transactional in nature and involves efforts of governments to establish an online presence, offer static information about agencies, services, and their activities, and provide downloadable forms to the citizens and organizations [Layne and Lee, 2001; UN and ASPA, 2002; Reddick, 2004]. At this stage of e-government basic internet skills comprise of browsing, downloading, uploading, and emailing; document management skills include opening, closing, saving, copy and paste. S kills such as PC and standard programs usage skills are a precondition all e-government users. Ordinary civil servants and managers, citizens as well as private sector employees need basic e-skills for instant internet skills to operate an internet browser, contact skills by having the knowledge of the internet address of most important online public services, feedback and inquiry skills by knowing how to fill inquiries and send feedback to e-government websites, and applied skills by learning to recognize threats

and vulnerabilities in IT systems. Understanding legal and policy issues in IT systems and how IT system can be misused is needed for effective utilization of the e-services provided at this stage of e-government. For developing countries that do not utilize ICTs to conduct business, it is crucial for the success of G2B relationship that business sector employees must possess the minimum level of internet skills, standard programs usage skills, pc utilization skills, documents management skills, and applied e-skills.

4.3 E-skills and e-government development stage 2

The second stage of e-government adoption is the two-way and transaction phase where government allows citizens to have secure access to online databases and provides them with the options to pay taxes, fines, apply for ID cards, birth certificates, and passports. During stage-2 of e-government, citizens occasionally use passwords for accessing services; accordingly, the interaction between citizens and different government agencies increases in the form of email and forums [Hiller and Bélanger, 2001; Layne and Lee, 2001; UN ASPA, 2002]. For efficient utilization of the services provided during stage-2, all the consumers must possess advance internet skills, namely, operational skills and formal skills. Consumers must be able to handle secure communication using passwords and other security procedures. Among others, advanced technical e-skills

such as setting security on files and folders, sending compressed file and documents as attachment with email, using file transfer protocol (FTP), using specialized programs (e.g. word processer and email clients), filtering the range of options provided by e-government website, and handling minor computer errors are required at stage-2. Applied e-skills, such as knowledge of privacy issues, information assurance, and trust on e-government, are also crucial at this stage.

4.4 E-skills and e-government development stage 3 and 4

The third and fourth phases concentrate on vertical and horizontal integration. Vertical integration is the connection of a municipal government's systems with higher levels of government in similar functional areas. In horizontal integration, systems are integrated across different functions, which break down the walls of information distribution [Layne and Lee, 2001]. During this stage, different services at a national level are merged together and, as a result, one-stop shop service is provided to the citizens [Layne and Lee, 2001]. All consumers are required to have knowledge of online transaction for paying online taxes, bills, and fines by the means of secure procedures for instance encryptions keys and certificates. Consumers must be aware of the risk associated with the internet use, able to evaluate the source of information before any transaction, and to contact help disk in case of an emergency. The next

section discusses possible skills acquisition methods.

4.5 Methods of skills acquisition

The following section discusses the methods and techniques recommended by the experts in the light of prevailing literature.

4.5.1 Citizens

Governments in developing countries must alter national education programs aimed at and injecting IT literacy and skills in order to prepare IT professionals through the educational system [MIT, 2002]; therefore, early introduction of computers and other new technologies to the students [OECD, 2000] at schools is of one of the best approaches for familiarizing citizens with the basic e-skills set required. Also, installing a large numbers of computers with free internet access in public buildings, for example libraries, post offices, and hospitals, waiting rooms of ministries, school, colleges and universities, and providing instruction or on spot training for utilizing the technology were recommended. Opening information technology access centers in disadvantaged districts is also crucial. Besides, providing the information kiosk, citizens' effort expectancy (friendliness) of these machines, ease of use, facilitating conditions, and training issues must be addressed to foster access points utilization [Wang and Shih, 2009].

As mobile penetration is high compared to

<Table 3> E-Skills Acquisition Methods Recommended By Experts for Citizens, Public, and Private Sector Employees

Consumer	Acquisition methods	Agent
Citizens	○ Introduction of computer subject into curriculum at all levels; ○ Establishment of free internet access and training points in public buildings (e.g. libraries, post offices, hospitals, and Ministry's waiting rooms, schools, colleges, and universities) and providing onsite training with special emphasis on basic IT skills set; ○ Establishing information kiosk and tele-centers; ○ Opening "digital playgrounds" in disadvantaged districts; ○ Establishing training spots with special emphasis on basic skill acquisition; ○ Designing e-government service model based on mobile phone access; ○ Provision of subsidized PCs, provision of subsidized internet connection for private use, and incentives for electronic working; ○ Mobile ICT training center for reaching out to remote areas; ○ ICT training through media: Radio, Television, and Newspaper; ○ Opening free ICT training class for everyone; ○ Info-Bus: A bus with computers inside and internet connection (e.g. wireless and satellite) that can go from place to place teaching people; ○ Providing customized IT training depending on age, gender, occupation, and literacy level. For example ICT training programs for elderly citizens and specially women; ○ E-learning through DVD, displaying videos through government's websites, and social media like YouTube; ○ Promoting self learning attitude among citizens;	○ Central and local Government; ○ National information policy; ○ PPP (public private partnership) for example joint programs with private schools and universities; ○ Foreign Direct Investment; ○ Joint venture between public and private sector; ○ Out sourcing;
Public and Private Sector Employees	○ Formal training method for example on job training; ○ Informal training method for example class and providing tutorial materials; ○ Out sourcing e-skill training and development; ○ PC and internet access in offices; ○ PPP: Joint training programs by government and private sector; ○ E-learning: Short term and long term programs; ○ Inviting foreign experts for e-skills training; ○ Incentives to attract experts who are working abroad; ○ E-Learning through a government extranet where different public servants can share knowledge and experiences; ○ Establishing minimum IT skills standards for recruiting new employees for example ICDL or MOUS certificates; ○ ICT training through media: Radio, Television, and newspaper; ○ Periodic internships at IT departments/organizations; ○ Provision of subsidized PCs, provision of subsidized internet connection for private use, and incentives for electronic working; ○ Government sector should have a training and capacity building standard that should be obeyed by public servants; ○ Providing Training with collaboration of universities/institutes; ○ Socialization and capacity building through FAQ, providing manual book/guidance, and through help desk center; ○ Stimulating and motivating employee's for acquiring ICT skills; ○ Development of IT Skills/Competency Assessment modules; ○ Make IT Skill/Competency acquisition as one of the requirements of promotion in the civil/public service; ○ Encourage life-long learning programs in the civil/public service; ○ E-learning through DVD, displaying videos through e-government websites, and social media like YouTube;	○ Respective government body and private organization; ○ PPP (public private partnership); ○ National information policy; ○ Joint Venture; ○ Out sourcing; ○ Foreign Direct Investment;

computer and internet penetration in most of the developing countries [ITU, 2006], it is a good candidate for e-government service delivery [Blessing, et al., 2008]. Similarly, experts suggested that the provision of subsidized PCs and internet connections for private use and providing ICT training through the media (e.g. radio, television, and newspaper) is one of the best options available for developing countries. E-learning by displaying videos through a government's websites, and other web technologies like web portals and "YouTube" are also recommended. <Table 3> contains a full list of possible acquisition methods for each e-skill set.

4.5.2 Public and private sector employees

Both formal and informal skill acquisition methods were recommended during the Delphi process <Table 3>. Skills acquisition methods or training in organizations can be either formal or informal [HBS, 2002]. The latter is done through on-the-job training and is less expensive, whereas the former is more structured and takes place in a classroom or e-learning setting and is more expensive. For acquiring basic ICT skills, for example, an informal method can be used by both government and private sector.

The experts suggested that, formal training methods can be used for acquisition of internet skills and technical e-skills either in a classroom setting, e-learning, or by outsourcing to local and international institutes. Countries may also acquire international expertise to transfer skills and knowledge [MIT,

2002; HBS, 2002]. Other measures by public and private sectors to acquire ICT skills are to enhance access of their workers to IT by providing low-cost PC programs including the Internet. Experts agreed that joint training programs through public private partnership (PPP) can be utilized in developing countries. A common example is e-learning through a government extranet where public and private sector employees can share knowledge and experience. Experts suggested that there should be minimum IT skills standards, for instance, ICDL (European Computer Driving License) and MOUS (Microsoft Office User Specialist) certificates for recruiting new staff, and IT skills and competencies must be considered as one of the requirements of promotion in the civil and public services; this will facilitate the rapid diffusion of basic IT skills in developing countries.

V. Discussion and Implications

5.1 Discussion

The aim of this paper is to facilitate a clear understanding of the e-skill-set needed, based on the stages of e-government for e-service consumption. One of the important expectations from the study was to consider a broad range of e-skills in order to give room to several competencies needed for e-service utilization. We believe that it has been achieved, for the results indicate the broader range of e-skills including internet, docu-

ments management, and PC management; in addition, applied and standard programs usage skills have emerged as (very) important.

Another key focus of the approach was to equally emphasize the significance of the e-skills for all consumers: citizens, public and private sector employees. The results indicate that this requirement was fully met; the items in each domain that were rated as *(very) important* for citizens were rated *(very) important* for public and private sector employees as well. Similarly, the items (skills) that were dropped for public and private sector employees were also dropped for citizens indicating perfect synchronization of results. For example, the skill "to able to format removable disk media, diskette and zip disk," was rated as unimportant for all actors. The reason might be the concern of the experts about the damage that could be caused by format command. Furthermore, in the domain "internet skills", very few items were omitted and a high number of *(very) important* items and large number of new items were added, reflecting the significance of this domain for e-service utilization, which is consistent with the finding of prior research [Deursen and Dijk, 2008a; Deursen and Dijk, 2008b]. In general, in all the domains, the addition rate of new skills was higher compare to the omission rate. This suggests the need for a wider range of e-skills by e-service utilization. Moreover, the large number of e-skills acquisition methods and high addition rate of new skills suggested by the experts indicate the high level of interest and active involvement of participants in the survey.

5.2 Implications

This study contributes to e-government literature both conceptually and empirically. By integrating the literature on e-government from e-government stages, e-government relationships, and e-kills, we conceptualized the process of e-skill identification and development based on the stages of e-government. Empirically, we contribute by indentifying and validating the e-kills needed for e-service consumption by utilizing the Delphi method. This study will also contribute to the literature seeking utilization of the Delphi method in the field of technology [Coenen, 1972; Martino, 2003]. Furthermore, contrary to current literature [CIO, 1999; EPAN, 2003; Klievink and Janssen, 2009], we clearly separated the demand side skills from the supply side skills and identified all the consumers that must be equipped with e-skills. The study also contributes to the literature of digital divide and e-government by providing a comprehensive view that takes into consideration in parallel e-government initiatives and digital divide issues such as ICT education and identification of individual needs [Helbig, et al., 2009].

The findings of this study have important implications for e-government practitioners in developing countries. By providing practitioners with some insight into the e-government stages, consumers, and the skills required the findings can serve as a standard curriculum for training and educating citizens, public, and private sector employees in developing coun-

tries. We believe that the findings of this research will also facilitate international organizations in indentifying and measuring citizens' readiness for e-government in term of e-skills. Furthermore, the study will promote awareness in developing countries regarding e-government skills from a consumption perspective and will facilitate developing countries to put their effort and money in right direction. Doing so will have significant effect on users behavior toward the use and adoption of e-government services. On the other hand-once the users are equipped with necessary e-skills-it will have profound effect on e-government services consumption, which will further shape the appropriation, consequences, and reaction toward e-services. Finally, for the developing countries at the initial stage of e-government implementation the findings can serve as a roadmap for skills acquisition at earlier stages of e-government and prepare for more advanced e-services provisioning.

5.3 Limitations and future work

This study has some limitation that must be mentioned. First, the number and complexity of skills identified from the consumption side may be different from countries to countries depending on the complexity of their governments' applications and services. However, the skills identified in this study are generic in nature and are mostly based on the initial and common services provided by e-governments [Layne and Lee, 2001; UN and ASPA, 2002; Reddick, 2004]. Second, the skills identified may not be an issue for de-

veloped countries where the computer literacy is high, and employees as well as citizen possess the minimum skills required.

We comprehensively identified the demand side of e-skills set whereas prior research has mostly focused on the supply side [Ojo et al., 2007; Klievink and Janssen, 2009]. Therefore, future research work may involve improving the proposed approach and applying it to developing countries for identification of the skills needed for next-generation of e-service consumption. While the e-skills identified in this study are generic in nature, future research work may identify more specific skills by taking into account the number and complexity of the e-services provided by e-governments of different developing countries to different consumers. Furthermore, future research may also focus on identifying the e-service provisioning skills with a top-down approach within an organizational hierarchy.

VI. Conclusion

In this study, we proposed and validated a stage-based user-centric approach for identification and development of e-skills required for e-service consumption by integrating different streams of e-government literature. A comprehensive list of e-skills was generated by involvement of 28 knowledgeable experts from 28 countries, utilizing the Delphi method. In total, taking the level of agreement or consensus as 75%, the experts agreed on 81 e-skills (items) out of 95 skills (85%). We found that the number and com-

plexity of e-skills required increase with the progress from first stage to higher stages of e-government. We also found that e-skills required for e-service consumption are not merely technical but include a wide variety of e-skills. We also provided a list of e-skills acquisition methods. The findings can serve as a standard curriculum for training and educating citizens, public, and private sector employees in developing countries. Moreover, the findings of this research may also facilitate international organizations in indentifying and measuring citizens' readiness for e-government in term of their e-skills.

〈References〉

[1] Adegboyega Ojo, Tomasz Janowski, Elsa Estevez, and Irshad Kamal Khan, Human Capacity Development for e-Government, Technical Report 362, UNU-IIST, P.O. Box 3058, Macau, http://www.iist.unu. edu/ newrh/III/1/docs/techreports/report 362.pdf, 2008.

[2] Adler, M. and Erio Ziglio, The Delphi Method and its Contribution to Decision-Making, in Erio (ed.), Gazing into the Oracle: The Delphi method and its application to social policy and public health, Jessica Kingsley Publishers, London, 1996, p. 3.

[3] Akemi Takeoka Chatfield and Omar Al-hujran, "A Cross-Country Comparative Analysis of E-Government Service Delivery among Arab Countries," *Information Technology for Development*, Vol. 15, No.3, 2009, pp. 151-170.

[4] Andersen, K.V. and Henriksen, H.Z., "E-government maturity models: Extension of the Layne and Lee model," *Government Information Quarterly*, Vol. 23, 2006, pp. 236-248.

[5] Arnold, A.M., "Developing a national information policy-Considerations for de-veloping countries," *International Information and Library Review*, Vol. 36, No. 3, 2004, pp. 199-207.

[6] Bertot, J.C., "The multiple dimensions of the digital divide: More than the technology 'haves' and 'have nots'," *Government Information Quarterly*, Vol. 20, No. 2, 2008, pp. 185-191.

[7] Blessing Mukabeta Maumbe, Vesper Owei, and Helen Alexander, "Questioning the pace and pathway of e-government development in Africa: A case study of South Africa's Cape Gateway project," Government, Vol. 25, No. 4, 2008, pp. 757-777.

[8] Bonham, G., Seifert, J., and Thorson, S. The transformational potential of e-government: The role of political leadership, paper presented at 4th Pan European International Relations Conference of the European Consortium for Political Research, www.maxwell.syr.edu/maxpages/faculty/gmbonham/Transformative_Potential_of_E-Government.doc, 2008.

[9] Buck, A.J., Gross, M., Hakim, S., and Weinblatt, J., "Using the Delphi process to analyze social policy implementation:

A post hoc case from vocational reha-
bilitation," *Policy Sciences*, Vol. 26, No. 4,
1993, pp. 271-288.

[10] Carter and May, "One kind of freedom:
Poverty dynamics in post apartheid South
Africa," *World Development*, Vol. 29, No.
12, 2001, pp. 1987-2006.

[11] Chen, Y.N., Chen, H.M., Huang, W., and
Ching, R.K.H., "E-government strategies in
developed and developing countries: An
implementation framework and case stu-
dy," *Journal of Global Information Manage-
ment*, Vol. 14, No. 1, 2006, pp. 23-46.

[12] Chitu Okoli, and Suzanne D. Pawlowski,
"The Delphi method as a research tool: an
example, design considerations and appli-
cations," *Information and Management*, Vol.
42, No. 1, 2004, pp. 15-29.

[13] Christopher G. Reddick, "A two-stage
model of e-government growth: Theories
and empirical evidence from U.S. Cities,"
Government Information Quarterly, Vol. 21,
No. 1, 2004, pp. 51-64.

[14] Christopher G. Reddick, "Citizen Interac-
tion with e-government: From the streets
to servers?," *Government Information Quar-
terly*, Vol. 22, No. 1, 2005, pp. 38-57.

[15] CIO Council, Federal IT Workforce Com-
mittee, CIO University-Learning Objec-
tives Version 1.0, 1999.

[16] Coenen, R., "The use of technological fore-
casts in government planning," *Research
Policy*, Vol. 1, No. 2, 1972, pp. 156-172.

[17] Dalkey, N.C. and Helmer, O., "An ex-
perimental application of the Delphi me-
thod to the use of experts," *Management
Science*, Vol. 9, No. 3, 1963, pp. 458-467.

[18] Deloitte and Touche, "The citizen as a cus-

tomer," *CMA Management*, Vol. 74, No. 10,
2002, p. 58.

[19] Deshazo, R.C. Kaylor, and D.V. Eck,
Gauging e-government: A report on im-
plementing services among small Ameri-
can cities, Foundations of Electronic Go-
vernment in America's Cities: A Multi-
Disciplinary Workshop, Chicago, IL, 2001.

[20] Deursen Van, A. and Van Dijk, J. Measu-
ring digital skills. Performance tests of op-
erational, formal, information and strate-
gic internet skills among the Dutch pop-
ulation', *Presented at the ICA Conference*,
Montreal, Canada, 2008a.

[21] Deursen Van, A.J.A.M. and Van Dijk, J.A.
G.M., "Improving digital skills for the use
of online public information and services,"
Government Information Quarterly, Vol. 26,
No. 2, 2008b, pp. 333-340.

[22] De Vet, E., Brug, J., De Nooijer, J., Dij-
kstra, A., and De Vries, N.K., "Determi-
nants of forward stage transitions: a Del-
phi study," *Health Education Research*, Vol.
20, No. 2, 2005, pp. 195-205.

[23] Dunnette, M., Campbell, J. and Jaastad, K.,
"The effect of group participation on bra-
instorming effectiveness for two industrial
samples," *Journal of Applied Psychology*, Vol.
47, 1963, pp. 308-318.

[24] European computer driving license and
international computer driving license (EC
DL and ICD), "European computer driving
license and international computer driving
license," *syllabus version* 5.0, 2007, URL,
http://www.ecdl.org/files/products/
docs/20080425123440_ECDL_ICDL_Syllab
us_Version_5.pdf, 2008.

[25] European Public Administration Network

(EPAN), Current and Future Use of New Technology in Human Resources Management in European Public Administrations, KPMG Business Advisory Services prepared for the 41st Meeting of the European Directors-General responsible for Public Administration, Rome, 2003.

[26] Gebremichael, M.D. and Jackson, J.W., "Bridging the gap in Sub-Saharan Africa: A holistic look at information poverty and the region's digital divide," *Government Information Quarterly*, Vol. 23, No. 2, 2006, pp. 267-280.

[27] Geist, Monica R, "Using the Delphi method to engage stakeholders: A comparison of two studies," *Evaluation and Program Planning*, In Press, Corrected Proof, doi: 10.1016/j.evalprogplan.2009.06.006, 2009,

[28] Gil-Garcia, J.R. and I.J. Martinez-Moyano, "Understanding the evolution of e-Government: The influence of systems of rules on public sector dynamics," *Government Information Quarterly*, Vol. 24, No. 2, 2007, pp. 266-290.

[29] Glaser, B.G. and Strauss, A.L. "The Discovery of Grounded Theory: Strategies for Qualitative Research," Aldine Publishing Company, New York, NY, 1967.

[30] Gordon T.J., "The methods of futures research (Electronic version)," *Annals Am Academy Political Soc Sci.*, Vol. 522, 1992, pp. 25-36.

[31] Gordon, T. and Pease, A., "RT Delphi: An efficient, 'round-less' almost real time Delphi method," *Technological Forecasting and Social Change*, Vol. 73, No. 4, 2006, pp. 321-333.

[32] Guthrie, E.R., "The Psychology of Lear-

ning," New York: Harper and Row, 1952.

[33] Hardware Business School (HBS), "Developing the talent you have: strategies for training and development, hiring and keeping the best people," *Harvard business school press*, Boston, Massachusetts, 2002.

[34] Hasson, F., Keeney, S., and McKenna, H., "Research guidelines for the Delphi survey technique," *Journal of Advanced Nursing*, Vol. 32, No. 4, 2000, pp. 1008-1015.

[35] Heeks, R.B., Most eGovernment-for-Development Projects Fail: How Can Risks be Reduced?, IDPM i-Government Working Paper, University of Manchester, Vol. 14, 2003.

[36] Helbig Natalie, J. Ramón Gil-García, and Ferro Enrico, "Understanding the complexity of electronic government: Implications from the digital divide literature," *Government Information Quarterly*, Vol. 26, No. 1, 2009, pp. 89-97.

[37] Hiller and Bélanger, Privacy strategies for electronic government, In: M.A. Abramson and G.E. Means (Ed.), E-government, Rowman and Littlefield Publishers, Lanham, MD, 2001, pp. 162-198.

[38] Hill, K.Q. and Fowles, J., "The methodological worth of the Delphi forecasting technique," *Technological Forecasting and Social Change*, Vol. 7, 1975, pp. 179-192.

[39] Holden, S.H., Norris, D.F. and Fletcher, P.D., "Electronic government at the local level: Progress to date and future issues," *Public Performance and Management Review*, Vol. 26, No. 4, 2003, pp. 325-344.

[40] ITU, *ICT and Telecommunications in the Least Developed Countries*, International Telecommunication Union, Geneva, URL

http://www.itu.int/ITU-D/ldc/pdf/icta nd_telinldc-e.pdf, 2006.

[41] ITU, *Measuring the information society: The ICT development index*, International Telecommunication Union, Place des Nations CH-1211, Geneva Switzerland, 2009.

[42] Jacobs, J.M., "Essential assessment criteria for physical education teacher education programs: A Delphi study," *Unpublished doctoral dissertation*, West Virginia University, Morgantown, 1996.

[43] Johnson Craig, L., "A framework for pricing government e-services," Electronic Commerce Research and Applications, Vol. 6, No. 4, 2007, pp. 484-489.

[44] Kerlinger, F.N., "Foundations of behavioral research," New York: Holt, Rinehart, and Winston, Inc., 1973.

[45] Klievink Bram and Marijn Janssen, "Realizing joined-up government: Dynamic capabilities and stage models for transformation," *Government Information Quarterly*, Vol. 26, No. 2, 2009, pp. 275-284.

[46] Layne, K. and Lee, J., "Developing fully function e-government: A four stage model," *Government Information Quarterly*, Vol. 18, No. 1, 2001, pp. 122-136.

[47] Leitner Christine, Antonio, A., Guadalupe, S.M., and Matthias, K., Organizational Changes, Skills and the Role of Leadership required by e-Government, *Survey for the 44th meeting of the Directors general responsible for Public Administration of the EU member states*, Luxembourg, 2005.

[48] López-Bassols, V., ICT Skills and Employment, OECD Science, *Technology and Industry Working Papers*, OECD Publishing. doi: 10.1787/110542373678, 2002.

[49] Marijn Janssen, Soon Ae Chun, and J. Ramon Gil-Garcia, "Building the next generation of digital government infrastructures," *Government Information Quarterly*, Vol. 26, No. 2, 2009, pp. 233-237.

[50] Martino, Joseph, P., "A review of selected recent advances in technological forecasting," *Technological Forecasting and Social Change*, Vol. 70, No. 8, 2003, pp. 719-733.

[51] Michel, J. Menou, "National information policy in the less developed countries: an educational perspective," *International Library Review*, Vol. 23, No. 1, 1991, pp. 49-64.

[52] Miller, G., "The development of indicators for sustainable tourism: Results of a Delphi survey of tourism researchers," *Tourism Management*, Vol. 22, pp. 351-362.

[53] Ministry of Education (MOE), *Books*, Syllabus for schools from grade 1 to 12, Islamic Republic of Afghanistan, Ministry of Education, URL http://www.moe.gov.af/ books.htm#, 2008.

[54] Ministry of Government Administration and Home Affairs (MGAHA), *Annual report for E-government*, South Korea, URL (consulted March 2008): http://unpan1. un.org/intradoc/groups/public/documents/APCITY/UNPAN023900.pdf, 2005.

[55] Ministry for Innovation and Technologies (MIT) *Plan of Action: E-Government for Development*, Government of Italy, URL (consulted March 2008): http://www.itu.int/ wsis/docs/background/themes/egov/ action_plan_it_un.doc, 2002.

[56] Moon, J., "The evolution of e-government among municipalities: Rhetoric or reality?," *Public Administration Review*, Vol. 62, No. 4, 2002, pp. 24-433.

[57] Murry, J.W.J. and Hammons, J.O., "Delphi: a versatile methodology for conducting qualitative research," *The Review of Higher Education*, Vol. 18, No. 4, 1995, pp. 423-436.

[58] Ndou, V., "E- Government for developing countries: Opportunities and challenges," *Electronic Journal on Information Systems in Developing Countries*, Vol. 18, No. 1, 2004, pp. 1-24.

[59] Organization for Economic Co-operation and Development (OECD), "Schooling for tomorrow: Learning to bridge the digital divide," Paris, 2000.

[60] Organization for Economic Co-operation and Development (OECD), New Perspectives on ICT Skills and Employment, *Report No. DSTI/ICCP/IE (2004)10/FINAL*, 75 775 Paris Cedex 16, France. http://www.oecd.org/dataoecd/26/35/34769393.pdf, 2005.

[61] Organization for Economic Co-operation and Development (OECD), the eGovernment Imperative, 2003.

[62] Podsakoff Philip, M., Scott B. MacKenzie, Jeong-Yeon Lee, and Nathan P. Podsakoff, "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology*, Vol. 88, No. 5, 2003, pp. 879-903.

[63] Rowe, G., Wright, G. and Bolger, F., "Delphi: A reevaluation of research and theory," *Technological Forecasting and Social Change*, Vol. 39, No. 3, 1991, pp. 235-251.

[64] Schneider, J.B., "The policy Delphi: a regional planning application," *Technological Forecasting arid Social Change*, Vol. 3, 1972.

[65] SFIA Foundation, *Skills Framework for the Information Age (SFIA)*, (consulted April 2009): http://www.sfia.org.uk/public/File/SFIA_Foundation/SFIA_documentation_v4/IntroLeafletSFIAv4.pdf, 2008.

[66] Shalini, R.T., "Are Mauritians ready for e-Government services?," *Government Information Quarterly*, Vol. 26, No. 3, 2009, pp. 536-539.

[67] Shin, S., Song, H. and Kang, M., Implementing E-Government in Developing Countries: Its Unique and Common Success Factor, *Paper presented at the annual meeting of the APSA 2008 Annual Meeting*, Hynes Convention Center, Boston, Massachusetts, http://www.allacademic.com/meta/p280176_index.html, 2008.

[68] Silcock, R., "What is e-Government?," *Parliamentary Affairs*, Vol. 54, 2001, pp. 88-101.

[69] Steyaert, J.C., "Measuring the performance of electronic government services," *Information and Management*, Vol. 41, 2004, pp. 369-375.

[70] Turoff, M., "The design of a policy Delphi," *Technological Forecasting and Social Change*, Vol. 2, 1970.

[71] UN and ASPA, Benchmarking e-government: a global perspective, United Nations Division of Public Economics and Public Administration and the American Society for Public Administration, New York, URL (consulted 30 Feb. 2008): http://unpan1.un.org/intradoc/groups/public/documents/un/unpan003984.pdf, 2002.

[72] UN, *E-government index*, URL (consulted February 2008): http://unpan1.un.org/intradoc/groups/public/documents/un/unpan021888.pdf, 2005.

[73] UN 2008, *e-Government Survey: From e-*

Government to Connected Governance, New York, ST/ESA/PAD/SER.E/112, URL: http://unpan1.un.org/intradoc/groups/public/documents/un/unpan028607.pdf

[74] UN, Economic and Social Survey of Asia and the Pacific-Asia and the Pacific in twenty-first century: Information Technology, Globalization, Economic Security and Development, ISBN-10: 92111 98755, ISBN-13: 978-9211198751, 1999.

[75] World Bank, Definition of e-government, URL (consulted April 2009): http://web. worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTEGOVERNMENT/0,,contentMDK:20507153~menuPK: 702592~pagePK: 148956~piPK: 216618~theSitePK: 702586,00.html, 2009.

[76] Yi-Shun Wang and Ying-Wei Shih, "Why do people use information kiosks? A validation of the Unified Theory of Acceptance and Use of Technology," Government Information Quarterly Volume, Vol. 26, No. 1, 2009, pp. 158-165.

⟨Appendix 1⟩ Round-1 Results

Number of Item in Each Domain, Number of Items Omitted (3 Experts Rated them as 1 or 2), and Number of New Items Added in Each Domain are represented

Domain	Sub Domain	N of items	N of items omitted	% of items omitted	N of items added	% of items added
Technical e-Skills	Document Management skills	12	3	25	3	25
	PC Environment Management skills	22	6	27	8	36
	Standard Programs Usage skills	7	1	14	2	28
	Applied e-Skills	21	2	9	8	38
	Sub-Total	*62*	*12*	*19*	*21*	*33*
Internet Skills	Operational Skills	13	1	8	2	15
	Formal Skills	5	0	0	2	40
	Information Skills	7	0	0	3	43
	Strategic Skills	8	1	12	3	37
	Sub-Total	*33*	*2*	*6*	*10*	*30*
G. Total		95	14	15	31	33

⟨Appendix 2⟩ Round-2 Results

Final Number of Items, and Number of (Very) Important Items and Number of Newly Added (Very) Important are represented

Domain	Sub Domain	N of items	N of (very) important Items	% of (very) important Items	N of (very) important added Items
Technical e-Skills	Document Management skills	9	6	67	3
	PC Environment Management skills	16	8	50	8
	Standard Programs Usage skills	6	4	67	2
	Applied e-Skills	19	11	58	8
	Sub-Total	*50*	*29*	*58*	*21*
Internet Skills	Operational Skills	12	10	83	2
	Formal Skills	5	3	60	2
	Information Skills	7	4	57	3
	Strategic Skills	7	4	57	3
	Sub-Total	*31*	*21*	*68*	*10*
G. Total		81	50	62	31

⟨Appendix 3a⟩ (Very) Important and Added/Omitted Items during Procedures: Technical e-Skills

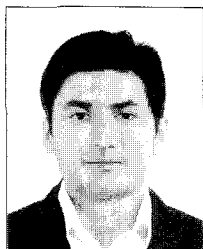| Domain	Sub domain	(Very) Important Items (75% Consensus)	Added Items (75% consensus)	Omitted Items (10% experts disagreed)
Technical e-Skills	Document Management Skills	◦ To be able to manage documents: create, open/close, and rename folders/files; save files/folders to a location on a drive; ◦ To be able to copy, cut, past, delete ,and restore files and folders; ◦ To be able to set security on files and folders; ◦ To be able to search files and folders; ◦ To be able to compress and extract compressed files; ◦ To be able to recognize common file types: word processing files, spreadsheet files, database files, presentation files, image files, audio files, video files, compressed files, and temporary files;	◦ To be able to send files/documents as attachment with email or to use file transfer programs (e.g. FTP); ◦ To be able to edit files and folders; ◦ To be able to print documents;	◦ To be able to convert file formats from one type to another; ◦ To be able to change file status: read-only/locked, read-write; ◦ To be able to backup files and folders;
	PC Environment Management skills	◦ To be able to collapse, expand, resize, move, and close a window; ◦ To be familiar with computer keyboard usage and settings; ◦ To be able to identify the different parts of a window: title bar, menu bar, tool bar, status bar, and scroll bar; ◦ To be able to know main types of storage media: internal hard disk, external hard disk, network drive, CD, DVD, USB flash drive, memory card, and online file storage; ◦ To be able to recognize common desktop icons; ◦ To be able change the computer's desktop configuration: date and time, volume settings, desktop and display options; ◦ To be able to start/shutdown, logs off/login PC using an appropriate routine; ◦ To be able to shutdown a non-responding application;	◦ To able to run different applications and install and uninstall applications; ◦ To be able to manage anti-viruses software e.g. scanning PC for viruses, updating antivirus software; ◦ To be able to know friendly use of different OS, and to possess basic operating system skills; ◦ To be able to handle minor computer error; ◦ To be able to know basic PC installation and maintenance skills: connecting major parts of PC: monitor, CPU block, keyboard, mouse, printer; and setting up necessary properties of PC components: checking and setting up screen resolution, printer properties, and network connection; ◦ To able to use available help functions; ◦ To be able to know about computer energy saving options: applying settings to automatically turn off the screen/monitor, to automatically put the computer to sleep, switching off the computer; ◦ To be able to identify some of the main input devices like: mouse, keyboard, trackball, scanner, touchpad, stylus, joystick, web camera (webcam), digital camera, and microphone;	◦ To be able to create computer users and groups; ◦ To able to format removable disk media: diskette, zip disk; ◦ Should be able to query a database for information; ◦ To be able to empty the recycle bin/wastebasket; ◦ To be able to use "Run" command window for faster starting software applications; ◦ To be able to know advantage between different browser software;

Technical e-Skills	Standard Programs Usage Skills	○ To be able to perform basic tasks using a word processor; ○ To be able to perform basic tasks using a spreadsheet; ○ To be able to use email clients; ○ To be able to perform basic tasks using presentation application software;	○ Create, delete, and rename folders in email clients' software; ○ To be able to understand the basic structure and function of different soft ware;	○ To be able to performing basic tasks using a database application;
	Applied E-kills	○ To be able to recognize threats and vulnerabilities in IT systems; ○ To be able to understand legal and policy issues in IT systems; ○ To be able to understand the misuse of IT systems; ○ To be able to understand capabilities of ICT; ○ To be able to understand IT security issues; ○ To be able to handle secure communication using encryptions keys and certificates; ○ To be able to use security certificates; ○ To be able to use specialized programs; ○ To be able develop a broad range of ICT skills and knowledge of the uses of ICT in vocational contexts; ○ To be able to know good practices such as not sharing passwords, changing them regularly, adequate password length, adequate letter and number mix; ○ To be able to understanding fundamental principles and best practices in information assurance;	○ Should have trust on e-services provided online; ○ To be able to know how to respond to online threats; ○ To be able to contact with call center, or similar service for IT security; ○ Should have knowledge about the consequences of violating IT rules; ○ Should have knowledge about online transactions; ○ Should know the ways a users can participate in government decision making for example feedback, publish, and share content online- posting, photos, video, and audio clips; ○ Should have knowledge of online services provided to citizens: e-commerce, e-banking, and e-government; ○ To be able to understand the limitations of IT;	○ Should understand the concepts of downloading and uploading data to a network; ○ Should have knowledge and understanding of the components, functions and applications of IT;

⟨Appendix 3b⟩ (Very) Important and Added/Omitted Items during Procedures: Internet Skills

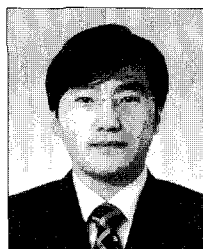| Domain	Sub Domain	(Very) Important Items (75% Consensus)	Added Items (75% consensus)	Omitted Items (10% experts disagreed)
Internet Skills	Operational Skills	**Operate an Internet browser:** ∘ Opening websites by entering the URL in the browser's location bar; ∘ Surfing forward and backward between pages using the browser buttons; ∘ Bookmarking websites; ∘ Changing the browser's preferences (e.g. start page); ∘ Using hyperlinks; **Operate online search engines:** ∘ Entering keywords in the proper field; ∘ Executing the search operation; ∘ Opening search results in the search result lists; **Complete online forms:** ∘ Using the different types of fields and buttons (e.g., drop-down menus); ∘ Submitting a form;	∘ Contact skills: knowledge of the Internet address of most important online public services; ∘ Filling inquiries and sending feedbacks using an e-government website;	∘ To be able to know advantages of different browser software;
	Formal Skills	**Navigate on the Internet:** ∘ By recognizing and using hyperlinks (e.g., menu links, textual links, and image links) in different menu and website lay-outs; ∘ Not getting disoriented when surfing between websites; ∘ Not getting disoriented when browsing through, and opening search result;	∘ Knowing the constructive use of internet; ∘ Knowing the risk associated with internet us;	
	Information Skills	**Locate required information by:** ∘ Evaluating information source Choosing a search system or place to seek information; ∘ Defining search queries that focus on the information problem; ∘ Selecting information; ∘ Evaluating information sources;	∘ Knowing advanced Search techniques to prune search tree and narrow down search results to relevant information, so as to avoid information load; ∘ To be able to filter the range of options provided by an e-government website; ∘ Locating the required information provided by an e-government website quickly and efficiently;	
	Strategic Skills	**Take advantage of the Internet by:** ∘ An orientation towards a particular goal; ∘ Taking the right action to reach this goal; ∘ Making the right decision to reach this goal; ∘ Gaining the benefits belonging to this goal;	∘ Using FAQ, online help, and collaborative tools; ∘ Understand the concept of an online (virtual) community and social groups(e.g. Facebook); ∘ Knowing how to communicate through messaging applications e.g. Messengers, newsgroups;	∘ Understanding e-government technologies like web ActiveX components;

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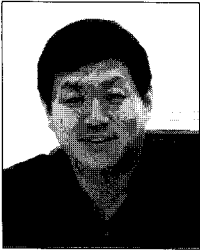
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