Planning for sustainable development in the emerging information societies

Mona Taghavi
*Department of Electrical, Electronics and Systems Engineering,
Faculty of Engineering and Built Environment,
Universiti Kebangsaan Malaysia (The National University of Malaysia),
Bangi, Malaysia*

Kaveh Bakhtiyari
*Department of Computer & Cognitive Science, Faculty of Engineering,
University of Duisburg-Essen, Duisburg,
Germany and Department of Electrical, Electronics and Systems Engineering,
Faculty of Engineering and Built Environment, Universiti Kebangsaan
Malaysia (The National University of Malaysia), Bangi, Malaysia*

Hamed Taghavi and Vahhab Olyaee Attar
*Faculty of Information Technology and Computer Engineering,
Islamic Azad University Parand Branch, Parand, Iran, and*

Aini Hussain
*Department of Electrical, Electronics and Systems Engineering,
Faculty of Engineering and Built Environment,
Universiti Kebangsaan Malaysia (The National University of Malaysia),
Bangi, Malaysia*

Abstract

Purpose – This research work aims to investigate the recent status of the information and communication technology (ICT) services industry in Iran. It proposes a systemic applicable approach at policymaking level and appropriate strategic planning steps to enlighten developing countries toward achieving their target objectives of an information society.

Design/methodology/approach – Largely based on existing literature and usage statistics in ICT services, global technology trends and results from a survey to obtain consistent and up-to-date information about current issues of ICT services in the public and private sectors in Iran.

Findings – This study elaborates on all issues, points and best practices relevant to the ICT services industry in Iran which is addressed by recommending some documented policies.

Research limitations/implications – Majority of the experts who attended the workshop and responded to the questionnaire were service consumers rather than service providers.

Practical implications – This paper discusses some of the implications for the development of this ICT services strategy and provides policy recommendations.

Social implications – To enhance the information society with the most advanced ICT services for accelerating human development.

Originality/value – This study provides a government refining process policy to address the common gaps in the ICT services industry in these developing countries and emphasizes a formidable policy foundation before implementing and monitoring of the Flagship ICT projects.

Keywords Strategic planning, Emerging economies, Information society, Policy making, Developing countries, ICT services

Paper type Case study

1. Introduction

Information and communication technologies (ICTs) have a great potential to support sustainable development in information societies in both underdeveloped and developed countries. Not only do they constitute an industry in their own right but they also act as a technological base for all sectors of the economy. By increasingly permeating all layers of the economic and social fabric, ICT presents a unique opportunity to deliver competitiveness while enhancing sustainability, human development and fulfillment. Given the recognized role of ICT resources in enabling business capabilities, it is arguable that ICT resources should be deployed to develop infrastructure and human capabilities to address sustainability issues and deliver sustainability values to stakeholders (Watson *et al.*, 2010). Since the emergence of the Internet in the late 1980s, the ICT services has developed into the most important industry in the ICT world, dubbed the Information Age for an Information Society (IS). The ICT services industry is a subsector in the ICT sector, and it is vital to productivity, innovation, performance of the economy and future growth. ICT, in its rapid emergence and take-off, has created a digital divide between those that have it and those that do not have it. Most developing countries are playing catch-up.

Although the digital divide has become prominent in global discourses, it still falls short of advocating and designing an appropriate set of instruments for an effective policy to reduce this digital divide (Audenhove *et al.*, 1999). It has not reached maturity. There is a lack of consensus and failure to address the core issues related to the digital divide. Thus, it has serious implications for developing an IS in any country (Mariscal, 2005). The potential impact that ICT services can have on individuals, businesses and governments depends largely on how policies are formulated in the face of the evolving technology and markets. National policies promoting universal access to ICT services have been around for decades in developed countries. But, in spite of immense progress in expanding the delivery of basic and new ICT services and applications in developing countries, especially by and in their governments, Iran barely delivers any quality services.

This paper focuses on the critical analysis of the main policy issues, strengths and weaknesses of the Iranian ICT services as a sample of a developing country. It also discusses some of the implications for development of ICT services strategies in a set of structured processes that aim to leverage the potential of the industry to a higher level. The strategic perspectives of ICT services have been somewhat neglected in developing countries as well as Iran (Jahangard, 2004; International Telecommunication Union, 2009). Using Iran as an example, the analysis provides insights into the ways of refining ICT policies in developing countries by alerting the policymakers' attention to grasp this opportunity to achieve an IS as a major target objective. This will be of immense benefit to policymakers in developing and transitional countries engaged in similar strategic processes.

In this paper, Section 2 gives a brief review of previous efforts in deploying ICT in different areas in Iran. The methodological approach which was developed to make ICT policies is presented in Section 3. The policy-making processes based on the policy framework is discussed in Section 4, and the analysis of the policy issues and strategic outlook is provided in Section 5. Section 6 discusses the key issues, and main points, and proposes the policy recommendations. The overall conclusion of this paper is outlined in Section 7.

2. Background

The development of ICT has caused a significant shift from an industrial to an information age in the global development of human kind as can be noticed from the use of the Internet (Venturelli, 2002). This new opportunity helps to promote economic growth and productivity, creates new economic activities and jobs and improves the quality of life (Taghavi *et al.*, 2013). Iran perceived ICT and telecommunications as openings with unprecedented opportunities to improve life conditions through enabling market mechanisms and recognized that creating national and international synergies is essential in formulating ICT-related development plans. Iran has been keen to integrate into the global IS and open up channels of communication to rapidly close the digital divide.

The growth of ICT has been acknowledged with the establishment of the "Iran Development and Use of Information and Communication Technology Plan" TAKFA in 2002 which had the following four objectives:

(1) systematic development of ICT technologies and services in a manner to materialize a "knowledge-based economy" for sustainable national development;

(2) human resource (HR) development as a strategic priority for ICT understanding, take-up and development in creating value-added jobs;

(3) cultural development and strengthening of a national synergic environment creation of infrastructural facilities for ICT development, including Internet connectivity, mobility communications, security, laws, regulations, resources and facilities; and

(4) creation of the environment and opportunities for the participation of the private sector as a strategic and essential component of ICT development and deployment.

TAKFA's key project report of 2005 (Iranian Supreme Council of ICT, 2005) confirms that ICT has a major role in realizing an "enabling environment" for sustainable development. Seven *strategic* plans of TAKFA included 110 major projects in specific fields and funded under the supervision of one dominant ICT-champion as the project leader. The entire operation comprised more than 5,000 sub-projects in different sectors and departments. Results of these projects include a holistic approach and an ICT master plan for sustainable national development, infrastructural and HR development, awareness and propagation of ICT and fostering increased organizational collaboration across all sectors of the economy and society.

Given the fact that TAKFA was disbanded later in 2005 and the subsequent lack of data collection and tracking of the various flagship projects, progress of those projects is

unclear. However, the concept of flagship projects is a familiar one in Iran, and the breadth and variety of the samples outlined in the TAKFA report reflect the commitment and level of importance attributed to ICT by the government and their officials. Nevertheless, as outlined earlier, the current approach to ICT policy development and its implementation has been largely fragmented with no clear selection and monitoring of ICT flagships being evident in later years. Difficult to judge what really occurred after its disbanding, substantial evidence suggest the lack of a strong *policy* foundation. Accordingly, a second plan (TAKFA 2) initiated in 2006 had been designed to address this gap and coordinate a suitable relationship between ICT supply and the demand in different industries (Ministry of Science Research and Technology, 2004a, 2004b; Atashak and Mahzadeh, 2008) as executed under TAKFA2. From this experience, it is emphasized throughout this research study that there must be a strong political will, leadership, support, competent management, governance and participative change before any other group of Flagship's projects are successfully implemented in the future.

3. Methodology of the ICT policy-making process

This section briefly describes the research methods used to draw our findings and observations from the terms of reference and the study of ICT Strategic Master Plan (Iranian Supreme Council of ICT, 2009), as well as other pertinent sources.

After an extensive review of the literature, we found that there is very little public domain information about the ICT services industry, and it is extremely difficult to obtain reliable statistics and details. This made the task of conducting research into the ICT program and industry complex and challenging. A field study survey was used to partially cover the lack of inconsistent statistics, as well as to investigate and determine the ICT industry in more details with respect to the supply and demand market and its forces. The questionnaire was distributed to 40 top managers in ICT, who were mostly service consumers rather than service providers, from public and private sectors in different industries such as education, security and telecommunication and so on. As a follow-up, data collection analyses were conducted in brainstorming sessions to assess the current situation of ICT services.

The salient literature, including existing statistical information about ICT penetration, Internet user access, government policies and previous studies and reports relevant to the current study were reviewed from national and international sources and references. Also, the national ICT development plans containing strategic and long-term perspective *guidance* documents were investigated to extract the overall rules and policies. However, due to advancing ICT services and applications with the rapid technology growth, global ICT trends have been studied to capture new and future requirements. From a set of ICT-driven countries, three countries, in particular, Canada, Germany and South Korea, based on their leading position in ICT policy area and mentioned in the ICT Master Plan as practical pattern models were selected as learning models for benchmarking and evaluating of the applied ICT policies. From the results, derived from the analysis and evaluation, a set of recommendations and policies were proposed that can be used within any developing country. The research methodology, shown in Figure 1, consists of the terms of reference to gather all the necessary information from the literature review (including national development plans,
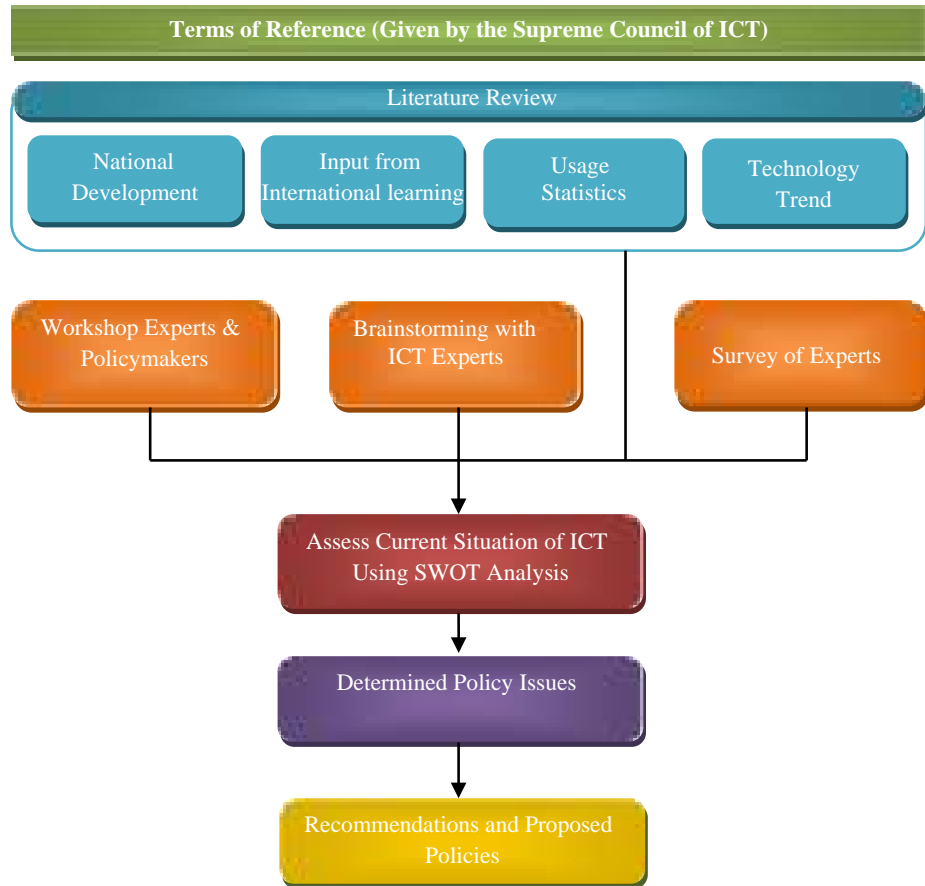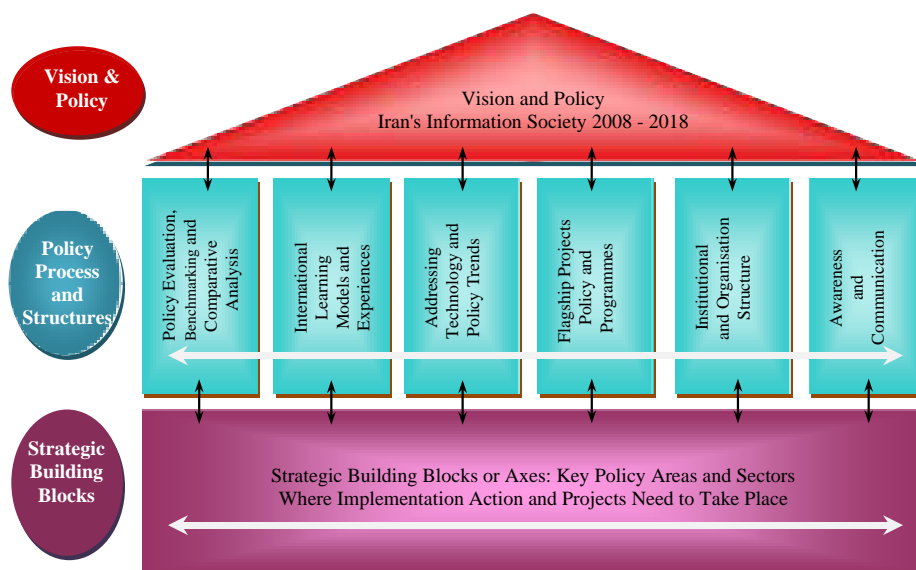
Figure 1.
Research methodology of
a policy-making process

international learning models, usage statistics and technology trends), survey of experts, brainstorming workshop with experts and policymakers.

4. Policy-making processes and framework for information society

It is a known fact that the sustainable use of ICT alone will not deliver the goals of social and environmental sustainability if systemic approaches are not introduced at all levels of the policy-making hierarchy (Pamlin, 2005). Systemic approaches and common efforts from governments, civil societies and businesses alike are needed. The overall policy framework for the IS which is shown in Figure 2, contains three main layers: vision and policy, policy process and structures and strategic building blocks (Iranian Supreme Council of ICT, 2009). Establishment and work on each of these layers is vital for a successful policy development and implementation for the following three reasons:

(1) Establishing and articulating a high level vision and policy statement that is based on the society's values while expressing the aspirations and ambitions for the IS in the form of "Terms of Reference".

Source: Iranian Supreme Council of ICT (2009)

Figure 2.
Overall policy framework
for the IS

(2) Establishing a continuing policy process that provides a placement for the people and budget capacities, work processes, tasks, practices and methodologies. It clarifies the roles, responsibilities and collaboration in the institutional framework that will drive the policy and lead to the achievement of the national vision.

(3) Instigating action and determining progress in strategic building-blocks or axes, i.e. concrete projects and initiatives in key policy areas of the sectors (e.g. communication infrastructure, oil and gas) and thematic areas (e.g. regulatory procedures or new/amended legislation) that would deliver change and facilitate progress monitoring.

The importance of vision, leadership and other key principles in advancing the IS is highlighted in numerous high-level multilateral statements and documents. These have to be translated and transmitted into effective policy design, development and implementation and grounded in structured processes that ensure policy dialog, policy evaluation, policy learning and sharing experiences.

Policy evaluation, benchmarking and comparative analysis, international learning models, experiences and addressing technology trends represent *inputs* that help to evaluate, inform and shape the policy process layer. Flagship projects policy and programs, institutional and organization structures, awareness and communications represent *outputs* as implementation initiatives and structures.

Having established the vision and policy framework, it is important that the policy work process, the methodologies to be used and essential organization structures are put in place to address the broad issues on a continuing and regular basis. The determination of the strategic axes depends on the stage of a country's

184

progress within the IS spectrum, on the priorities attached to specific areas for policy action, implementation and on the needs and demand by the civil society. Iran organized its strategic axes in the areas of e-Government, legislations and regulations, educational learning and skills, culture and the use of the Persian language, business use of ICT and e-Commerce, communications connectivity and its supporting infrastructure.

The policy process and structures are applied to the ICT services industry. Implementation of the related policies requires national collaboration and joint action to make a substantial paradigm shift to realize the narrowing of the digital divide gap.

4.1 National development plans

The process of extracting appropriate key statements, reviewing and constructing the vision has been guided by analysis of the National Development Plans (Management and Planning Organization, 2005; The United Nations Industrial Development Organization, 2003):

- the Constitution of the Islamic Republic of Iran;
- the 4th and 5th National Development Plans;
- the 20-year Vision of Iran toward ICT-based IS;
- the Government's general policies relating to public and private institutions and enterprises;
- Iran's Grand Policies (general policies ratified by The Iran Expediency Council);
- the ICT Development Strategic Document of the Islamic Republic of Iran (Ministry of ICT);
- Iran e-Commerce Development Master Plan (Information Society Vision); and
- Iran Strategic Document for "Security of Information Exchange Environment (SIEE)".

The *Twenty-Year Vision* asserts the national goal of Iran becoming a developed country in 20 years and to be ranked first with respect to selected countries in South West Asia in the areas of economy, science and technology, leading to global interaction as a central pivot of development. The General Policies asserts focus on some key aspects such as developing modern technologies, creating an effective ICT system, using advanced technologies in education and research, and emphasizing private sector development. In the 4th Development Plan, the general trends, directions and pillars are determined in the Twenty-Year Vision and ratified by the Constitution in the national development in specific sectors with emphasis on infrastructure, content and applications. The national documents under the 4th Development Plan (sectorial and trans-sectorial) elaborates on the goals to access ICT services, infrastructure for knowledge-based development, e-Government, e-Business, e-Health and e-Learning. The SIEE document emphasizes on the security requirements and dimension of the IS and protection of national security and governance, supporting infrastructure and valuable assets. The strategic document on ICT affirms the need for a balanced development in all areas of the IS, with particular emphasis on ICT's function in facilitating, enabling and improving of the daily lives of citizens.

The Vision statement is primarily intended to provide a succinct guide to goals and future direction for the society. The Vision for the Information Society 2008-2018 clearly states that:

The Islamic Republic of Iran will build an e-Iran that reinforces the unique culture, creative talent and innovation of the people of Iran, that facilitates the wide access and use of ICT in maximizing the cultural, social and economic progress of the society and that enables flourishing human aspirations based on the universal values of Islam.

In summary, the *ICT services foresight inspired from ICT vision* states that:

ICT services supplement would entail facilitating growth and enhancing productivity for governmental and non-governmental organizations and business enterprise development as an effective factor. This industry will improve public and private interaction to provide economic opportunities for new applicants in the field of ICT.

4.2 Key trends in ICT services and technologies

ICT services are characterized by accelerating global competition, changing added-value chains and introducing new methods and business models which all have a profound impact on competition within the ICT services industry. The new technological cycle of the ICT industry is driven by digital convergence and the complete diffusion of the Internet as the main architectural communication network. It is the backbone through which a new wave of applications under the label of the so-called Web 2.0 or social computing and upcoming Web 3.0 or Web 4.0 technology related to semantic Web and ontologies, respectively, are launched (Cake, 2008).

To respond to customers' needs to deal with ICT complexity and infrastructure optimization, new business paradigms and models are emerging, characterized by greater service content ("software as a service", "service on demand" and "pay per use"). Investments in R&D and service innovation, as well as continuous skills upgrading, are a precondition to these new business models that offer huge opportunities for the ICT service sector.

Among ICT services, voice communications, particularly mobile telephony, has led the way. Although access to these new services such as broadband remains limited in most developing countries, the expansion of broadband networks plays a catalytic role in the development of trade and e-government. In some developing countries, trade in ICT goods and services has sparked export-led growth and job creation. ICT applications are also transforming how governments deliver public services to citizens and businesses. The creative and efficient use of 3G and 4G frequency allocations are providing opportunity to bypass expensive wired solutions to enable mobile and alternative infrastructure providers to reach rural areas with voice and broadband Internet access more easily.

The perception of the universal broadband Internet service is becoming a *user right* is a reality in many developed countries and is now being expressed in national policies with many developing countries following suit. As a result, broadband may be viewed as a general-purpose utility that influences the way people communicate, seek entertainment, conduct business, interact with governments and educate and inform themselves. Building upon the idea of connectivity as a user right, many policymakers have seriously advocated that the next logical step would be to integrate the Internet and broadband connectivity into the existing national universal service programs. Other

national policies have merged digital access (broadband) programs with universal service program objectives.

4.2.1 Technology trend. To respond to developing countries' need for practical, relevant guidance and assistance in an ever-changing environment, *info*Dev, in cooperation with the International Telecommunication Union (ITU), began the development of an ICT Regulation Toolkit (ITU & *info*Dev, 2011). The objective of this Toolkit is to provide regulators, operators, policymakers, sector experts and the general public with the latest information on regulation strategies, best practices and case studies.

According to the toolkit, the technological development within ICT can be illustrated in three phases/levels: "The first wave of Technological Changes", which are the fundamental technological changes that ICT has undergone and it has enabled the second phase called "Second wave of Technological Changes", which are further developments and deployments of the first wave of changes in the ICT industry and market. The "Third wave of Technological changes" goes beyond the ICT industry and covers the broader aspect of application of ICT in the IS services. These technological trends together with other more recent ones are illustrated in Table I.

4.2.2 Trend of ICT services supply and demand. Besides the technological trends shown in Table I, there are five major trends affecting supply and demand in the ICT service industry (Figure 3):

(1) *Globalization:* In terms of international sourcing and supplying of ICT services and support for customers abroad.

(2) *Industrialization*: Where companies are reengineering their business processes to include standardized service modules of which some will work automatically and, which can be tailored to individual customers.

(3) *Defragmentation:* Of the value chain, allowing small- to medium-sized enterprises (SMEs) to specialize as second- or third-level subcontractors to turnkey ICT service solutions.

(4) *Migration:* Of the value, relates to changing market landscape and the value which customers would like to pay for.

(5) *Technology convergence:* Concern with integrating computing, communications and content which enable providing different services in a converged bundle.

4.2.2.1 Globalization. This trend concerns the worldwide ICT support service provision for globally oriented clients, and it is particularly visible in countries or regions where a significant proportion of medium- and large-sized enterprises are operating on a global scale. The service needs of these globalized enterprises are a significant driver of internationalization in ICT services companies. The changes in the world economy and globalization have accelerated the transmission and use of information and knowledge to the point whereby the world is fast turning into a *global village* (Banuls and Salmeron, 2007). One of the many outcomes of increased globalization is the need for greater information about suppliers, markets and consumers, as well as information about distribution, logistics and operations which make better opportunity for ICT service providers to act regardless of national and international boundaries.

Internationalization of ICT services does not only depend upon the ability to offer high quality services. ICT services enterprises that wish to operate in international

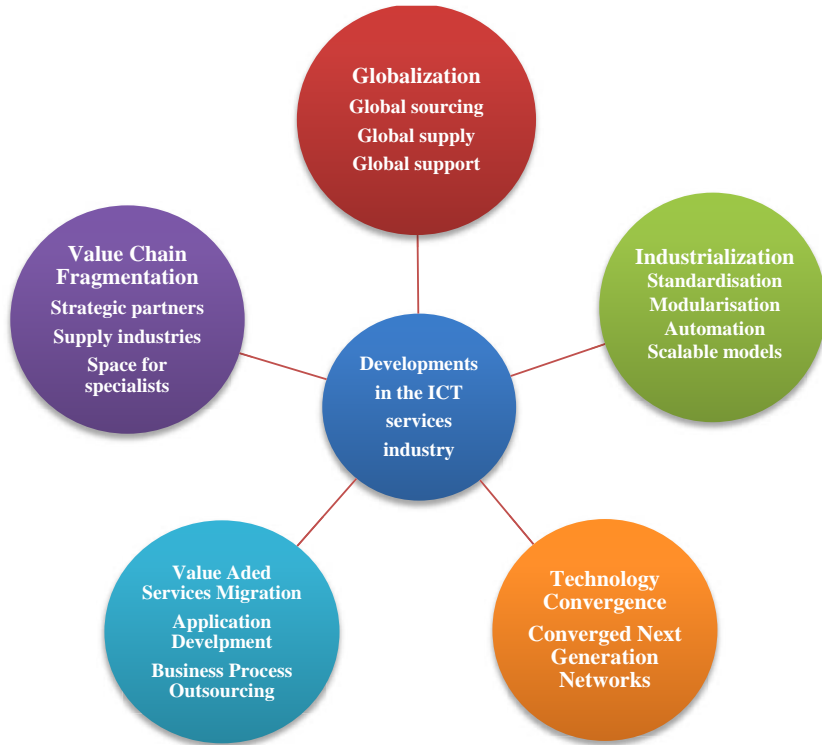| Waves	Main trends	Sub trends	Examples and explanations
First wave (Fundamental technological changes)	Digitalization	Compression	Compression standards for enabling distribution of audio/video services on the IP networks and in digital broadcasting standards. Such as MPEG-4 for the distribution of Digital TV to Handheld devices, and also for broadband IPTV and Video on demand (VoD)
		Modulation	In this relation, a number of other technologies like Software defined radio, Cognitive radio, smart antenna and the technologies which use new spectrums are important
		Forward error correction (FEC)	The FEC overhead information is then used in the decoder to detect and, if possible, correct the errors in the signal
	Computerization		The processing power of computers, the new applications, expensive and complex functions in the network, such as switching and intelligent network services and every function necessary for operation of an ICT network, such as billing and human resource management
	Packet Switching		Internet protocol (IP) and asynchronous transfer mode (ATM) Packet-based network able to provide telecommunications services, making use of multiple broadband, Quality of service-enabled transport technologies, and in which service-related functions are independent from underlying transport technologies
Second wave (further developments and deployments beyond the first wave)	Internet	Internet Protocol (IP)	Connection oriented protocols like TCP and UDP
		Internet design principles	Separation between network technology and services End-to-End architecture and extension of intelligence from the core to the edge of a network Scalability Distributed design and decentralized control
		QoS	Diffserve, ToS, RSVP, etc. Using priority schemes in the IPv6 Using appropriate speech codes Buffer size optimization Packet size optimization

(*continued*)

Table I.
Major technology trends

188

Table I.

Waves	Main trends	Sub trends	Examples and explanations
		Security	Software security and compliance
		Mobility and Nomadicity	Terminal mobility: A mobile terminal can move around the network without disrupting the service
			Personal mobility (nomadicity): A user can move to different terminals and networks and still be connected
			Mobility at link layer, application layer and IP layer
		IPv6	The other issues that are dealt with in IPv6 are the QoS and security issues
		Peer 2 Peer	Some known examples are: Napster; Gnutella; FreeNet and BitTorrent
		Broad-band Internet	Substitution and affordability of broadband internet
			Spreading of Web 2.0 usages and upcoming Web 3.0 or Web 4.0
			Development of enterprise 2.0 and government 2.0
			Secured connectivity
		Web Services	XML (Extensible Mark-up Language)
			SOAP (Simple Object Access Protocol)
			UDDI (universal description, discovery and integration)
			WSDL (Web Services Description Language)
			Standards for Web services
			Microsoft.net–Microsoft's Web services platform
			NET framework
	Mobile communication	Mobile Standards	First generation (1G), second generation (2G), Evolution of 2G (2.5G), third generation (3G) and transition from 3G to 4G
		Mobile Services	Voice Services, location based services, multimedia services, corporate services, mobile Internet access
		Future Technologies	Software defined radio (SDR), cognitive radio
	Next-generation networks (NGN)	Fixed	ADSL
			ADSL2, ADSL2_PLUS & RE-ADSL2
			VDSL & UDSL
			Cable TV
			PLC
			FTTx
		Wireless	Wi-Fi
			WiMAX
			Satellite
			Digital broadcast infrastructures
			Wireless mesh networks

(continued)

Waves	Main trends	Sub trends	Examples and explanations
	Convergence	Mobile Broadcast Convergence	Nomadic usage of digital content including video, TV, games, radio and all other media
			DVB-H, DVB-T, MediaFLO
		Fixed Mobile Convergence	Integration of mobile telephony and VoIP over broadband
		Converged Services	Triple/multi-play services (leveraging VOIP technology and internet as backbone)
			Open source adoption in public/private sector for business/public applications software
			VoIP, IPTV
			Cloud services
Third wave (application of ICT in broader information society services)	IS technologies		e-banking, e-health, e-government, e-learning and a range of other e-based processes/activities
			National e-strategies
			Multi-stakeholder projects involving the private sector in partnership with public bodies
			Infrastructure projects
			Broadening access to ICT
			International and regional cooperation
			Access to information - create online libraries and provide open access to public and research data
			Policy and regulation
			Capacity-building
			Online education, medicine, business, government
			Security
			New content
			Cultural issues
	Disruptive Technologies		VoIP
			IPTV
			Wi-Fi
			WiMAX

Table I.

Figure 3.
Five major trends
effecting ICT services

markets must convince their customers of their ability to support the service locally. This requires not just a local presence but also a careful consideration as to how global sourcing and support activities can drive sales to new markets. Without global infrastructures and networks, enterprises in ICT services have high entry barriers to penetrating international markets.

Consolidation creates opportunities for niche suppliers, operators and end-user service providers. First, the consolidation of ICT services giants creates market opportunities for smaller players, primarily in those markets where the large players can no longer build a satisfactory economy. Second, the new technological developments such as hi-tech, NFC, RFID, e-Mobile banking, mobile computing, cloud computing and social computing are leading to innovations in ICT services both for specialized niche markets, as well as for consumer markets in many sectors and cognate sectors (Danish Technological Institute, 2008).

4.2.2.2 Industrialization. Standardization of ICT services facilitates the development of open and competitive markets for the benefit of both consumers and industry with supporting infrastructures which are fully interoperable (Brocke *et al.*, 2010). A study by Berlecon Research (2008) investigated 133 ICT firms, 58 per cent of responding firms find that the standardization of service is an important or very important strategic activity within their companies. Similarly, 56 per cent indicated that the provision and sales of standardized service offers was an important strategic priority.

As prices for standardized services have decreased, ICT services companies have been forced to reassess the way in which services are produced and delivered. This has resulted in modularization and automation of services, thereby increasing the scalability of the service offers and reducing costs in relation to service sales, marketing and provision. Only via a "one-to-many" shared service paradigm, service providers will be able to operate a cost efficient and yet scalable range of services. Universal computing, coming from cloud computing, is just around the corner!

4.2.2.3 Fragmentation of value chain. As previously described, the standardization of ICT services allows for defragmentation of the value chain. This allows service providers to exploit business opportunities in the second and third level of the chain as subcontractors to larger operators. The model builds on specialization and developing excellence in specific ICT service areas.

Similarly, new players have become subcontractors to larger ICT services providers to develop and sustain their market position in the outsourcing market (Danish Technological Institute, 2008). To exploit business opportunities through subcontracting services, providers must be prepared to focus on core competences in their businesses. This increases a need for transparency of benefits and costs of individual service elements.

There are market opportunities for those SMEs in ICT services that can understand the dynamics of the value chain, where they can add further value in their service provision or contribute to efficiency improvement for their clients.

4.2.2.4 Migration of value-added services. The market of ICT services has greatly changed, which may affect the business performance of each stakeholder. Behind the fast changing market landscape, the value the customer would like to pay for has shifted. Over time, this value chain of ICT services has shifted to professional services. Before, these main services that suppliers provided were to install, maintain, operate the network of laptops, PCs, PBXs, telephones, host, basic networks and maintain the customer's databases and software infrastructures. Currently, they are initiating value-added activities, for example, how to run an entire customer's business process such as his payroll, warehouse, information technology (IT) department and training department.

The demand for always-on, high-capacity Internet services in both developed and developing countries is increasing at a phenomenal rate. Advanced Internet service – i.e. beyond what can be achieved through only dial-up connections – has become more important, as the demand for data and value-added services grows. Smart mobile phones are also leading the way toward accelerated advanced Internet services using GPS.

4.2.2.5 Technology convergence. The marriage of computing, communications, consumer electronics and content – has impacted the structure and services of the ICT industry. Convergence refers to the integration of communications and computing functionalities, in particular, the ability to offer voice, video, data and other multimedia services seamlessly over single or multiple infrastructures, as well as to the capability to access such services at any time, at any place. The fixed mobile convergence has resulted in reconfiguration of value-chains (Yang et al., 2004). The value chains are rapidly evolving into value networks, with multiple entry and exit points, creating enormous complexity for all the players involved. Operators are offering bundled services so that customers can obtain all their communication needs-data and voice, mobile and fixed line- from one provider. Most users have a precise view on what they

are willing to pay for their ICT services. The more services they can get in a converged bundle, the closer they come to this view, or even have spare money to buy other to enhance the one or other service.

Issues to consider include privacy, security of the systems and transactions over technology convergence (Patel *et al.*, 2013) and also how to regulate combined forms of what were once separate functions, especially when conflicts arise over how the separate forms were regulated in terms of matters such as competition/ monopoly, indecency standards, cybercrime and licensing. As convergent ICT services are subject to rapid technological change, a customer should avoid handing over all its technological know-how to the provider. The role safe computing requires new policies to protect ICT users and providers alike, including legislators and regulators, as well as law enforcement agencies.

4.3 Current state of ICT in Iran compared to other countries
Mobile penetration levels of Iran are starting to change, and the market is seeing high mobile growth, particularly since the launch of a second national operator in late 2006. During 2007, the government announced that it would split up and sell off the state-owned Telecommunications Company of Iran as part of its program to privatize 80 per cent of state-owned enterprises (International World Stats, 2010).

Accessibility to new technology, online applications and network infrastructure is the prerequisite to benefit from opportunities that arise from ICT services. The most relevant indicator in this respect is the Internet growth. According to the last statistics from International World Stats in 2010, Middle East had 68,553,666 Internet users. Meanwhile, Iran gained a share of 33,200,000 Internet users (43.2 per cent of the population) by 2010 as shown in Figure 4. The ITU reports that only 26 per cent of the world's population has Internet access in their homes, which, among most access penetration, is in developed countries (ITU, 2010). Access to ICT is certainly an important starting point, but it is not alone or enough to help bridge the digital divide.

According to Figure 5, in 2011, 76 per cent of the ICT budget was spent in the telecommunication sector, while the ICT services had a lower market share of just 11 per cent. Among this, the private sectors had 11.5 per cent of the market share in ICT trade services by 2009 (The World Bank, 2011).

Based on the latest ICT index measurement from ITU (2009), Iran's ranking for ICT access, use and skills among 154 countries are as follows: 80, 58 and 93, respectively. ITU concluded that Iran progressed considerably, 14 places, to rank 78 in the average
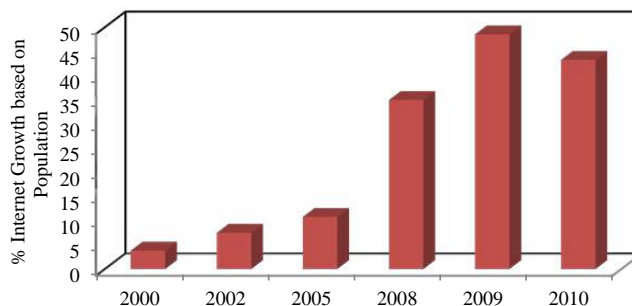
Figure 4.
Internet growth trend in Iran

Source: (International World Stats, 2010)

ICT Development Index (IDI). Mobile penetration reached 42 per 100 inhabitants in 2007, Internet user penetration 32 per cent, and fixed-line penetration increased from 19 per cent to 33 per cent during the five-year period, started from very low levels in 2002. Figure 6 shows Iran as one of the top ten economies in an ICT index change during the period 2002-2007.

Similar to Iran's position, Azerbaijan, Romania and Luxembourg also had 14-place changes in their ranking. Luxembourg increased its IDI value by improving its performance in all of the sub-indices (access, usage and skills). However, Azerbaijan and Romania's improvement in the index were primarily based on increased ICT access, especially in international Internet bandwidth use.

Oil exporting countries had lower-than-expected ICT levels due to different economic development strategies and focus on their natural resources. Azerbaijan took the opportunity of oil exporting to empower other sectorial industries by higher investments in ICT. Also, the Azerbaijani Government prioritized to restructure and modernize the sector by allocating US$170 million in 2007 alone (ITU, 2009).

ICT services cost monitoring is very important because it influences or even determines if people will subscribe to a certain service and use ICT. Countries that have taken steps to create a competitive market environment for ICT generally have a larger share of people using ICT services than those that have not. One important outcome of competition is that it lowers prices for ICT services. But while prices are falling rapidly,
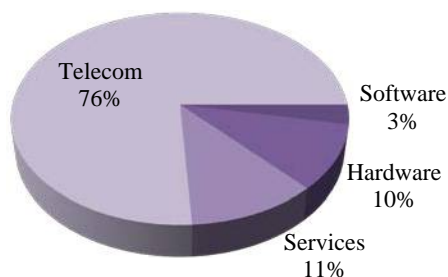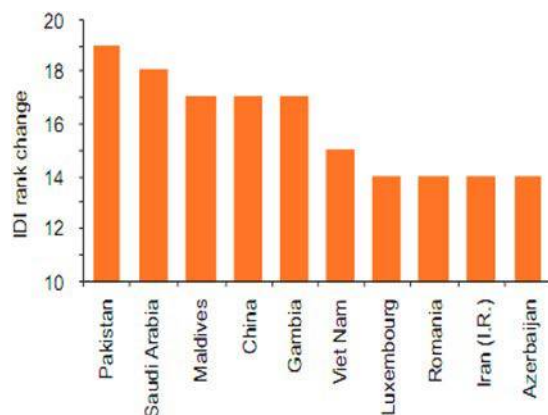

Figure 5.
ICT market share in Iran

Source: ITU 2009

Figure 6.
Top ten economies in IDI rank change 2002-2007

ICT services are still unaffordable for many people in low-income countries. So, a large share of the population in these countries has yet to realize the potential of ICT for economic and social development (Clark and Gomez, 2011).

The World Bank publishes price baskets for mobile, Internet and fixed-line services based on ITU data for all countries. The ICT Price Basket consists of three price sub-baskets representing the cost of fixed line telephony, mobile cellular telephony and broadband Internet services in a given country (ITU, 2009). The choice of the three price sub-baskets used to construct the final ICT Price Basket reflects the importance of these three key services for people to participate in the IS. The ICT Price Basket is meant to help policymakers evaluate the cost of ICTs in their country and to benchmark them against other countries and evaluate its influence in terms of usage, effectiveness and satisfaction.

Iran is ranked 78 out of 150 countries (Table II). It has very low fixed telephone prices placing it in the first rank of the lowest fixed telephone prices among the measured countries at 0.1 per cent of GNI as shown in Tables II and III. Meanwhile, broadband Internet prices index gained a remarkable higher rank (88) which can justify the low rate of Internet access by the slow speed of Internet connection (Table III). In addition, there are only a few ADSL services available for Internet users, and more than 98 per cent of the users use dial-up connection with a speed of 56 KB or less (Telecommunication Company of Iran, 2010). This constitutes Iran's higher position in Internet access, especially in the use of higher bandwidth for international Internet connections. Iran should concentrate in supplying higher Internet bandwidth access to attract Internet users to be online at reasonable prices. In this way, it can close the digital gap faster. Hence, building an IS should not be restricted to providing Internet access alone for commercial activities but also to be extended to individual citizens to support social development. A breakdown of index results by these subcomponents allows government policymakers or service providers to reassess ICT performance and identify those areas which need to be addressed in future planning.

Rank	ICT price Basket[a]	Fixed (% of GNI per capita)	Mobile (% of GNI per capita)	Broadband (% of GNI per capita)	GNI per capita, US$
78	5.4	**0.1**	1.3	14.9	3'470

Note: [a] The final ICT Price Basket is the value computed as the sum of the price of each sub-basket (in US$) as a percentage of a country's monthly GNI per capita (World Bank, US$, Atlas Method), divided by 3
Source: ITU (2009)

Table II.
Iran ICT price basket among 150 countries

Rank of fixed telephone sub-basket	Rank of mobile cellular sub-basket	Rank of fixed broadband Internet sub-basket
1	45	88

Source: ITU (2009)

Table III.
Iran ICT price sub-basket ranking among 150 countries

Nowadays, development in the wireless technology area has reduced the dependence on fixed-line telephones for accessing to ICT services via the Internet. Thus, both Iran and other global universal service/access policies were built around fixed line telephones in the past (Tables IV and V), but now it must be shifted into new communication technologies like HSDPA and WiMax which offer dial connectivity wirelessly. Increasing mobile telephone users are receiving more attention entering the market and creating new demands. These demands can create an opportunity to prepare suitable initiatives of offering modern ICT services. In terms of global trends, mobile usage and Internet browsing grossly expanded in addition to voice communications (Lua *et al.*, 2005). Because there are no 3G services in full deployment yet, its introduction at

	Iran (2000)	Iran (2009)	Upper-middle-income group (2009)	Middle East and North Africa Region (2009)
Telecommunications revenue (% of GDP)	1.1	1.4	3.3	3.1
Mobile cellular and fixed-line subscribers per employee	221	913	576	880
Telecommunications investment (% of revenue)	6.0	74.5	18.0	23.6
ICT goods exports (% of total goods exports)	0.0	0.1	12.2	–
ICT goods imports (% of total goods imports)	5.5	1.9	15.1	–
ICT service exports (% of total service exports)	–	–	5.4	–
E-government Web measure index	–	0.26	0.35	0.22
Secure Internet servers (per 1 million people, December 2010)	0.0	0.7	32.2	2.4

Source: The World Bank (2011)

Table IV.
ICT investment

Service/facility	2000	2006	2007	2009
Fixed-line subscriber activation	9,486,260	22,626,944	23,585,125	24,988,183
Connected villages	28,062	51,058	52,563	53,850
Fixed-line penetration rate	14,9	32,57	33,06	34.09
Mobile subscriber activation	962,595	15,385,289	21,545,510	32,292,513
Mobile subscriber penetration rate	1,51	22,20	30/10	44
Transmission channels (mobile or fixed)?	405,997	1,371,712	1,758,142	2,792,316
International channels (incoming)	8,483	11,226	12,970	15,485
Public phone booths local	84,971	167,366	177,753	227,456
Long-distance public phone booths	11,813	89,460	113,499	175,401
Cities under the mobile network coverage	337	1,016	1,016	1076
Areas with long-distance connection	2,962	6,280	6,280	6,280
Data transmission network (cities)	129	942	1,086	1,223
International band width (mbps)	–	3,726	9,626	26,728
Optical fiber network (km)	7,205	75,000	77,500	127,000
Rural ICT Offices/community e-centers	–	2,287	3,668	8,958

**Source:** Telecommunication company of IRAN (2010)

Table V.
ICT infrastructure
statistics

196

affordable prices is considered to improve the quality and the volume of mobile telephone usage for data and multimedia services purposes.

The ICT services industry has sub-sectors that differ regarding market shares and behaviors, products, distribution channels and patterns of innovation. Despite the migration of the value chain into global ICT services demand trends, ICT service providers prefer to invest on maintenance services rather than on the professional and value-added services, as they believe that the latter have more potential risks (Figure 7). As such, maintenance services alone is considered as a profitable business that is diverting attention to other areas and sectors of professional capabilities to grow the ICT economy. Consequently, service demand plays a significant role in supplying such services, and suppliers prefer to invest on the services that guarantee a tangible Return on Investment. The lower demand for professional services is also evident from the lack of a senior manager's awareness about the influence of these services on other activities of the organization compared to maintenance services. However, according to our study in ICT services trends in Iran, the value chain of ICT services has been shifting slowly to professional services and customers are willing to pay for value-added services.

Our survey results show that the government is the biggest customer of ICT services, spending approximately 75 per cent of the ICT services budget. It is also a big customer in service outsourcing. Considering the low rate of outsourcing ICT services, the government as a large customer should adjust the public organizations' demands under its tenure to drive them to outsource their ICT-based activities to encourage rapid ICT take-up and growth. They can grasp this opportunity to contribute to sustainability by making them more resource efficient supply-chains and through positively leveraging the best use of ICT services. This approach will have an effect on the growth and survival of ICT services providers, and will help to increase competition in the industry.

At present, more than half of the outsourced projects do not proceed, while the other half that have signed the contract are far below-average performance. This proves the existence
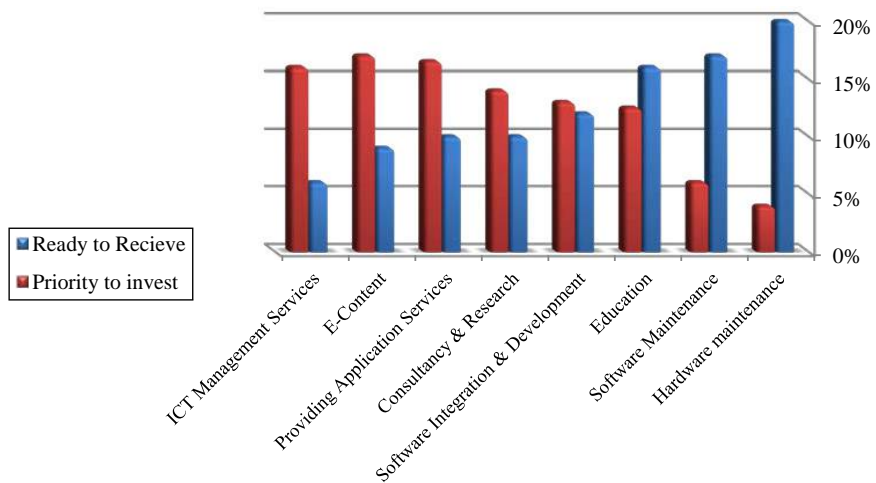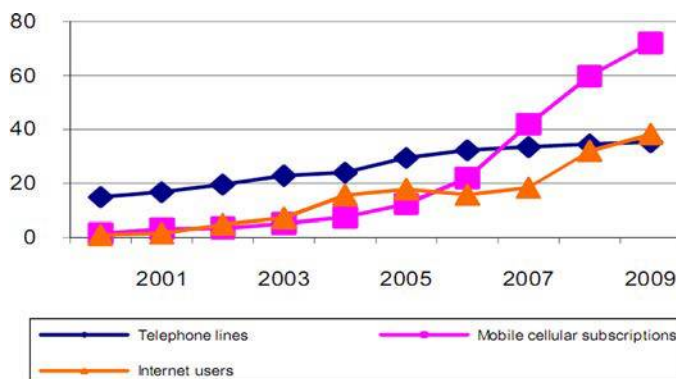

Figure 7.
Readiness and priority of ICT services in different sub-sectors

of inappropriate interactions between the private and governmental organizations leading to inconsistency between supply and demand. According to our survey results, successful outsourced services average rate is less than 50 per cent. As shown in Figure 8, respondents ranked the factors that have negative influence on outsourced projects. The most critical ones are lack of knowledge by senior managers, ineffective consultation services and insufficient and low quality services. Obviously, inappropriate interaction of the suppliers, customers and service providers has a major share in driving most of the issues listed in Figure 8. As Gorla *et al.* (2010) discussed, this challenge can be mitigated by adopting international norms IT Service Management protocols and standards such as Information Technology Infrastructure Library (ITIL). ITIL is the most popular process framework for managing IT services which consists of a set of best practices for aligning IT management with business needs and facilitating interactions and agreements. The most important components of ITIL are service delivery, application management, service support and IT infrastructure management (Braun and Winter, 2007). For example, Proctor & Gamble saved $125 million by implementing ITIL-based service management processes (Galup *et al.*, 2009).

From the above analysis in Table IV, and as shown in Figures 9 and 10, Iran, compared to other countries of similar economies, is rapidly closing the digital gap
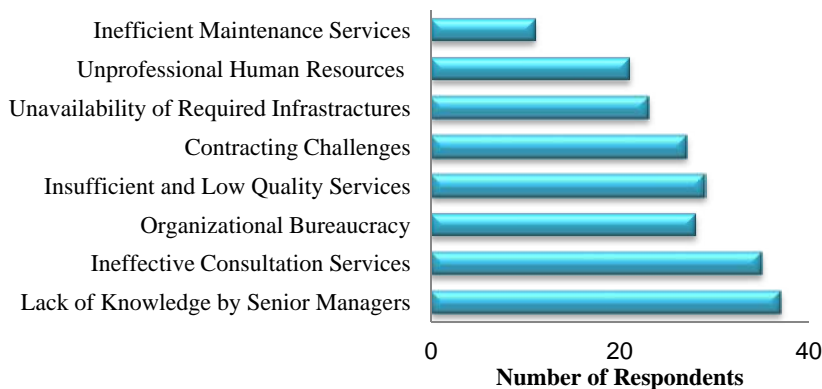
Figure 8.
Negative influences
effecting outsourcing of
ICT services projects

Source: The World Bank (2011)

Figure 9.
ICT Indicators, 2000-2009

through rapid deployment and usage of ICT. Various initiatives have been put in place to accelerate the deployment of ICT services and systems and their usage. One such usage which stands out is the rural ICT offices, telecenters or Community e-Centers (CeCs) (Table V). CeCs are public-access facilities providing electronic communication services, especially in marginalized or remote areas where ICT is not prevalent. They serve as avenues for providing universal access communications and multimedia services to rural communities since they provide access to telephones, faxes, computers, the Internet, photocopiers and other equipment and services as a one-stop shop. Thus, they serve several functions to access new knowledge and information that can be incorporated into their local knowledge and context, such as provisions of information on employment opportunities, educational resources, government services and technical information on agriculture for their daily lives, like information on new varieties, planting techniques and disease prevention. It can also be used as a facility to allow entrepreneurs to plan and prepare their business arrangements and to communicate with partners and potential clients from a distance (e-Commerce), or telemedicine. CeCs serve as "virtual roads and kiosks" along the communication highways that can benefit the society.

4.4 International learning models of ICT policy-making
The effective methodologies of evaluating, benchmarking and analysis can promote policy creation pattern and share the best practices with one's contemporaries. Methodology of developing and measuring policies by comparing with other countries is nowadays a common worldwide practice – and typically termed *benchmarking*. Benchmarking is often a *snapshot* in time that can become quickly out of date. It is best used as a guide to indulge in dialogue and examination of critical issues; not as the definitive frozen picture.

Some principles and successful practices in policy evaluation, and comparative analysis have been reviewed to extract more significant policies. According to the experts' survey and based on the leading position of the countries in ICT policy area, three countries, namely, Canada (Industry Canada, 2008), Germany (Federal Ministry of Economics and Technology, 2010a, 2010b), and South Korea (Ministry of Information
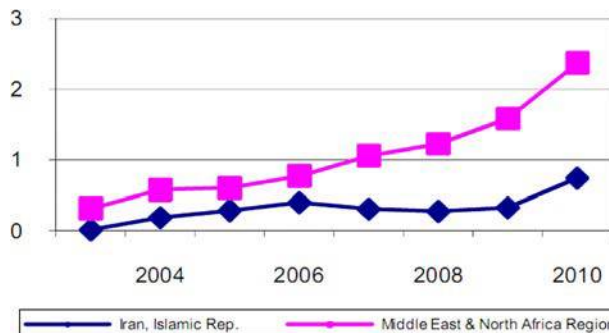
Figure 10.
Secure Internet servers-number per 1 million people

Source: The World Bank (2011)

and Communication, 2007a, 2007b), were chosen for ICT services investigation. Moreover, these countries were mentioned in the ICT Master Plan as practical pattern models. In summary, the review of the full hierarchy of constitutional and policy documents of these countries in ICT arouses attention for the following proposed policies:

- to facilitate allocating of public resources to the private sector to provide ICT services;
- to ensure the legal and regulatory environment exists to encourage the private sector to invest;
- to promote and reward the professional service providers;
- to decrease the bureaucracy associated with contracts and facilitates interactions between private and public organizations;
- to improve budget allocation system by separating different ICT sectors with emphasis on market liberalization/privatization;
- to ensure connection of urban and rural communities with reliable voice, data and broadband services;
- service providers should be committed about their delivered services and supervising regulators;
- body or organization should take responsibilities in measuring their commitments with authority to suspend licenses;
- to ensure convergence of networks for the competitive delivery of telecommunications and multimedia;
- to improve quality of the services according to international standards and to build trust in the digital economy;
- to expand ICT services for import and export of all goods and services and clarify marketplace rules to be obeyed and applied, both domestically and internationally;
- to improve security of delivered services with good levels of trust and audit;
- to employ local consultants to interact with international companies to capture the achieved knowledge;
- to identify new and creative areas in ICT services and content by developing R&D projects for domestic and international consumption;
- to evaluate, control and supervise delivered products and services through a responsible regulatory organization or outsourced to a third-party operator;
- to employ domestic professional experts to supervise outsourced projects and measure their performance;
- to support the development and storage of electronic content within the country;
- to ensure the establishment and provision of ICT training resources, including courses, centers and expertise, are provided and accessible;
- to run awareness programs to engage the community and society;
- to provide knowledge transfer through all communication means;

200

- to establish work attachment programs with other institutions to enhance human resource development and exposure to international best practices in ICT services; and
- to train all government office employees with ICT basic courses to ensure they are proficient in the use of ICT.

As Kaigo (2005) discussed, inequalities in access or *digital divide* are not only caused by digital exclusion but income, language, technological and socio-cultural issues are also influencing the dynamics of the digital divide. Therefore, if we select Korea as a country with the similar issues of language, culture and policy making level, we can extract two relevant strategic policy issues as follow:

(1) content development in their own language according to their culture; and

(2) empower the private sector to increase the competitiveness of the market.

Reviewing these policies allow stakeholders to visualize the improvement which can be achieved through the planning of realistic and achievable targets, as well as strong implementation to motivate them for making changes. Moreover, it creates a sense of urgency for improvement through comparison regarding some aspects of performance with the aim of learning from good/best practices.

5. Strategic outlook of using ICT services

The deployment of ICTs creates various opportunities, drives the economy and uplifts society across all sectors and areas such as:

- healthcare;
- construction industries;
- public services;
- provision of social services;
- democratic governance using electronic-based systems;
- establishing not only a new set of ICT-based skilled workers but also helping to close the digital divide by creating an advanced information-based society;
- attempting to alleviate poverty through new education, training and employment opportunities;
- transfer of technology from research to development of products and services;
- transfer of industry and services to remote areas of the country where once there was high unemployment, low morale and disintegration of society;
- development of human resources; and
- creation of all kinds of jobs, not only in ICT but also in other associated or cognate areas.

The negative aspects of this drive are those who lack education and cannot cope with the use and deployment of ICT and its pace. Many ongoing efforts to ease this difficulty and how best to provide a host of new support services to help the less well off in every way possible is investigated. Providing favorable policies for the holistic development of the ICT service industry will enable the government to promote sustainable economic growth, help create new jobs and bring about social benefits for all members of the society.

5.1 Strengths, Weaknesses, Opportunities and Threats analysis

This section contains a strategic outlook for the ICT services industry based on an in-depth assessment of underlying trends, national policies, statistics analysis, workshops, brainstorming and the survey results.

Strengths, Weaknesses, Opportunities and Threats (SWOT) provides a framework for this structured analysis of the current state of ICT services industry, the input data are derived from the above in-depth assessment. SWOT is described in Table VI.

As a whole, the SWOT analysis indicates that the society has the potential and is ready to receive services. However, there are some barriers which mostly originate from inappropriate interactions, unplanned and unsupervised ICT services supplement.

Strengths
High potential ICT services market
Trained and young human resources
Young and broad-minded managers in ICT area
Readiness of the public society with infrastructure to expand ICT services
Positive attitude to ICT services among the society *public and business*

Weaknesses
Inappropriate interactions between public and private sectors
Lack of senior manager's knowledge about ICT service capabilities
Organizational bureaucracy
Lack of serious rules for supervising the ICT service suppliers
Providing non-standard services
Challenge in making a contract between public and private sectors
Uncompetitive ICT market share
High cost of broadband Internet and low bandwidth
Limited ICT services import and export
Lack of organization's intention to outsource their ICT based processes
More attention of service providers to maintenance services than to value added services
Inefficient supplement of professional services specially in ICT management, content creation, and application service providing context
Lack of a consistent structured organization to lead ICT services Industry
Insufficient local and trustable security systems
Lack of national Operating System

Opportunities
High Investment capacity in ICT
Global attitude to use of ICT services for the development of an IS
Conceptual alignment between ICT services and the objectives and policies of the National Development Plans
Legislation approach to decrease government incumbency and promote outsourcing
Promoting enabling factors in national policy plans such as investment support in content creation and publication, increase of International market share

Threats
Public organizations intention to purchase products due to legal conditions
Challenge of making a contract between public and private
Responding to a large part of ICT service demands within the public organizations rather than outsource them to private service providers

Table VI.
SWOT of ICT services

Although government regulations and control can mitigate most of the threats, but one question remains, "who is responsible for supervising and directing the ICT industry in a *laissez-faire* economy"?

SWOT analysis highlights the major issues and challenges in the ICT services industry and allows us to project ourselves to overcome these stumbling blocks which are discussed in the next Section.

6. Discussion and recommendations

The results of all the processes that this study performed are summarized as key policy issues and items stated in Table VII. The most important issues and items grasped from evaluating of existing policies in the National Development Plans, investigating the current state of ICT services, SWOT analysis, and studying the statistics, international learning models and experiences and addressing technology trends is provided in this Table VIII in summary form. Some of the extracted items and practices from the National Development Plans, technology trends and international learning models overlap each other, which conforming their aligned direction toward a developed modern knowledge-based country. But, the current state of ICT services issues is showing the opposite direction of the ICT services implementation. Despite international emphasis on strengthening broadband Internet, Iran still cannot provide high Internet bandwidth at affordable cost for all members of the society. Following the global trends in bringing attention to import and export of ICT services and its capability in advancing the knowledge and economy, the country does not have any reliable program to achieve this. Although Iran is attempting to develop its private sector and facilitate entry into domestic and global markets, it still has not succeeded to bring this to fruition (Taghavi *et al.*, 2011). Meantime, in other countries, there are many rules and regulatory instruments to assist the private sector to penetrate the marketplace. Moreover, value-added services are still largely neglected between the service providers. Although the National Development Plans define the importance of safety and security in services and systems, and promote their use, it has still not managed to decrease the ICT risks and develop its own national security systems. Also, decisions of using ICT services in organizations are heavily dependent on top managers' awareness about ICT services' capabilities in smoothing the business processes and to grow the economy. The country needs to do more to expose enterprises and management concerning ICT from these points of views. We conclude that there is no one *correct/right* plan and road map to direct this industry precisely.

With the aforementioned issues and points, it is obvious that the country needs to refine the current policies of ICT services to achieve an IS status by closing the gap of the digital divide and realizing the target objectives of the 20-year Vision towards an ICT based Information Society. Becasuse these policies have to cover many interrelated subjects across various boundaries, we consider three crucial levels to be addressed:

(1) *Policy level*: This concerns the effort of various policymakers to compile the data on the state of the industry and to provide enabling condition to develop the ICT services industry.

(2) *Industry level*: This includes ICT services trade associations and master service providers involved in managing and directing the market at national and international level.

Key policy issues and points

National development plans
Emphasizing private sector development
Improve access to ICT & provide infrastructure for knowledge-based development
Focus on security dimension of the Information Society in order to protect national governance
infrastructure and values
Develop efficient content and application

Technology trend
Provide global infrastructure and network to penetrate international markets
Investing on R&D in ICT area and service innovation
Enrich service content (such as, "software as a service" and "service on demand")
Expansion of broadband networks, improve Internet and broadband connectivity on to the existing
national universal service programs
Efficient use of 3G and 4G frequency allocations and modern wireless communications
Standardization, modularization and automation of services
Providing the professional value added services
Converging more services over single or multiple infrastructures
Developing NGN as an infrastructure for information society
Expansion of mobile services and applications (apps) to increase popularity and accessibility of ICT
services
Developing e-based processes/activities such as e-banking, e-health, e-government, e-learning or
e-government
Develop social networking and encourage its use

Current state of ICT services
High cost of broadband Internet and low bandwidth
Neglecting the high capability of professional ICT services
Lack of attention to ICT services performance, security and quality
Insufficient investment in ICT services industry
Unawareness of senior managers about ICT services capabilities
Inappropriate interactions between public and private organizations
Limited ICT services import and export
Neglected abilities of private sector
Insufficient trustable security systems
Lack of national OS

International learning models
Facilitate allocating of public resources to private sector in order to provide ICT services
Ensure the legal and regulatory environment exists to encourage the private sector to invest
Promote and reward the professional service providers
Improve budget allocation system with separating different ICT sectors with emphasis on market
liberalization/privatization
Service providers should be committed about their delivered services and supervision organizations
should supervise their responsibilities
Improve quality of the services according to international standards and building trust in the Digital
Economy
Expand ICT services import and export and clarify marketplace rules, both domestically and
internationally

Table VII.
Major issues and points of
ICT services

Key policy issues and points
Improve security of delivered services
Employ local consultants in interacting with international companies in order to capture the achieved knowledge
Identify new and creative area in ICT services by developing R&D projects
Employ domestic professional experts to supervise and outsourced projects and measure its performance
Support the development and storage of content in local language
Establish work attachment programs with other institutions to enhance human resource development and exposure to international best practice in ICT services

Table VII.

(3) *International level*: It relates to the domains of not only ICT usage but also creating ICT products to develop its market in the future, and this is addressed by service providers and users alike in the global context.

From the above three levels and the discussion based on Table VII, there are many issues and points which should be taken into account when proposing new policies, and defining strategic objectives. These should be aligned with IS targets to achieve a fully industrialized national status based on ICT. The following policies are recommended to achieve these goals:

- Financial support from the government by providing loans and assigning some part of the public fund to private sector to increase their investment on ICT services.
- To motivate ICT services providers to supply more advanced and convergent services by facilitating and smoothing their business procedure.
- To control the ICT budget of public organizations to ensure correct expenditure.
- To facilitate contractual procedures and decrease the limitations to receive high quality and effective services from private ICT services providers.
- To increase the public organizations middle and top managers' knowledge of ICT services capabilities.
- To follow outline commitment obligations and rules for ICT providers against the contract's terms of references and guarantee to deliver high quality services.
- To increase the quality level of the services against the international defined standards.
- To assess, verify and certify the permitted service providers and rank based on their abilities against the qualified measurement criteria.
- To extend ICT services import and export market to increase capabilities to have a market share in developed countries offshore market.
- Gathering local experts to develop a national operating system.
- To assess and analyze ICT services risks to clarifying importance of performance, security and quality issues, improve budget allocation and building trust.
- To motivate and financially support the private sector to develop local security systems using buy-in international security professionals.

- To safeguard and increase security of all critical application and infrastructure ICT systems and services.
- To assign qualified local consultants besides international consultants in each national project with clarified responsibilities.
- To develop R&D projects in area of development and implementation of new innovative ICT services.
- To inform the public organizations about private section abilities and facilitate their cooperation in using outsourced services by updating the regulatory rules.
- To make a synergized effort to provide and distribute national, local and Islamic electronic contents in Persian languages.
- To assign a public organization in charge of supervising and directing of ICT supplement.
- To develop social networking and encourage the society – especially public and private sectors – to use.
- To expand mobile services and applications (apps) to increase popularity and accessibility of ICT services.
- To promote using new wireless communication technologies like HSDPA and WiMax and enhance development of Next-Generation Networks.
- To ratify new regulations to force public organizations to automate their business processes and develop e-based activities.
- To encourage service providers and consumers to adopt international norms IT service management protocols and standards.
- To provide high Internet bandwidth with affordable cost for all members of society as a primary infrastructure for the IS.

Flagship projects can be proposed after doing further detailed study based on the recommended policies. These recommendations should be investigated in terms of feasibility and available infrastructures, and prioritized to be implemented based on the provided condition.

6.2 Pertinent strategic questions
Finally, the following strategic question is important:

How will the country be able to participate in the ICT activities that will be valued in 2020?

To find some answers to the question, one has to consider which ICT activities – goods and services – would be valued. Except of the global trend, this implies consideration of what the society will be like in 2020 and what its values and aspirations will be.
The two aspects of the question which come into focus are:

(1) How can the society participate as *consumers/users* of these goods and services?
(2) How can the society participate as *producers* of these goods and services?

Because uncertainties in the environment prevent these questions from being answered in a concrete way – and the rapid pace of technological development alone makes it very difficult to be precise – it is best to consider that national positioning – in terms of social

206

policies, educational policies, industrial policies, cultural policies and so on – can be strengthened so that it can succeed in any case.

Identifying the development of human capital at all levels as the priority in preparing for the future is perceived to be of paramount importance. As emphasized in the previous sections, indigenous firms should compete on a world stage to grow the country's economy and benefit from international knowledge. To achieve this, they need to move up the value chain and produce goods and services with a higher intellectual content. This depends on their ability to create new technologies and to work at the state-of-the-art. Similarly, if the county needs to encourage the multinational companies to deepen and strengthen their presence by offering to facilitate them to carry out the higher value-added functions, including basic research and new product development. Again, this depends on the availability of world-class expertise, which can easily be produced by the country. Given that the market for production activities is a global one, the country has the ability to self-fund investment through the sale of its natural resources and other products. It can also invite direct foreign investment by offering something different to attract multinational companies who can provide access to scarce expertise is almost irresistible from that point of view.

Expertise is needed at four levels, following a *pyramid* model (Figure 11).

The pyramid model illustrates a number of important considerations. First, it highlights the fact that the country cannot grow a cadre of world-class experts in isolation; such expertise depends crucially on, and grows out of, the levels below and ultimately from the broad population. It also shows that the relative numbers required at each level is different: a small number of world-class experts can create opportunities for a much greater number of competent professionals. And it shows that development is not exclusive to the people at the apex; growth in the absolute size of the pyramid which has positive benefits for the whole society, reflecting the distribution of abilities in the society.

6.3 Creation of centers of expertise

The critical new aspect of the pyramid model of skills is the apex; it is absolutely essential to develop a highly visible critical mass of world-class expertise in ICT. It is essential for the survival and growth of the indigenous sector to embed the
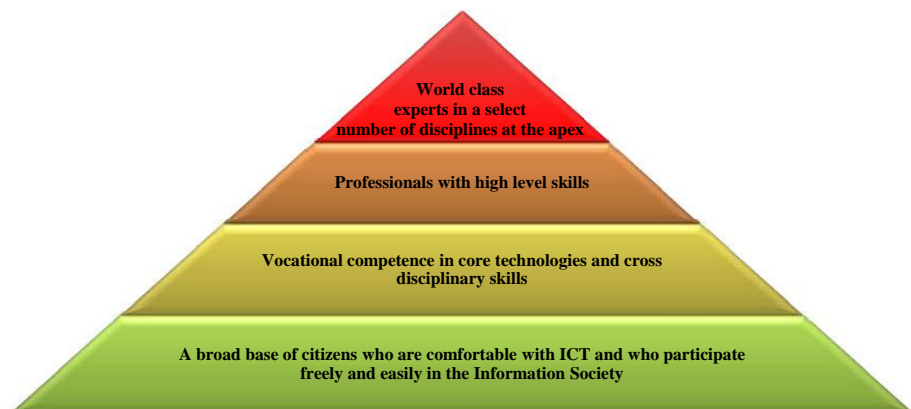
Figure 11.
Expertise levels in
Information Society

multinationals in this country; and it is essential to attract further foreign direct investment. The required development is different in kind and in scale from anything currently in the country.

It is strongly advocated that a *Center for Advanced Informatics in ICT*, led by a small number of world-renowned experts, staffed by professional postdoctoral researchers, carrying out leading edge research at a level where they can make an impact should be considered. If such professionals are employed, they will, in turn, attract the best young researchers to work with them, and this will have a catalytic effect throughout the skills/knowledge pyramid and into industry.

The centers' mission will be to conduct ICT research and development that will be recognized internationally as world-class and will be relevant to industry. It is almost immaterial what precise technology areas are addressed in the center: what matters is the quality of the work. The country should therefore start by identifying the key people, rather than by defining the technology remit.

The center should operate under a board of directors, which will include representatives of the industry, the universities and the State. Special effort must be made to engage international experts of the highest caliber on this board, as it is critical for the credibility and continuing relevance of the centers' work. The board will also enable the center to develop and foster clusters of actions, networks of contacts and relationships with other institutions and companies, in the same way as happens in similar institutions elsewhere.

The centers' international status should be established as quickly and as forcibly as possible. This can best be achieved by seeking formal partnership arrangements with established centers in other countries. The global role of collaboration is vital for the center to be successful.

7. Conclusion

With rapidly increasing trends of globalization spearheaded by the political and economic institutions of the advanced industrialized nations, the grossly uneven spread of ICTs around the world is seen as a digital divide at a global scale. Meanwhile, developing countries like Iran are trying to close the digital gap by being part of the digital revolution and accelerating toward becoming a fully capable, responsible industrialized country. Because it can be safely stated that ICT is not only creating sustainable ICT systems and public services but also alleviating poverty and sowing the seeds for economic growth and its self-sustainability. Hence, access to ICT now paves a way into information and knowledge, which, in turn, determines wealth creation and affluence. Moreover, the ability to use ICT is a key skill that increasingly determines the employability and standard of living of many citizens. To this effect, it might be worthwhile to further investigate where ICT deployment can help and also what programs should be created, planned and made available to accelerate ICT take-up as just another phenomenon for the advancement of the Iranian IS. It can be indirectly confirmed that ICT is now a significant instrument used in the working of government and public services to create a fair and just society, although the politics is grotty.

This paper was to inform policymakers of developing countries about the benchmarking of Iran's IS developments in ICT services industry and to monitor its progress that has been made to close the digital divide as a sample of a developing country.

208

A study on structured policy-making processes was carried out through the directions and evaluation of existing policies, investigation of the current state of the ICT services, SWOT analysis by doing a survey, workshop, brainstorming and studying the statistics, international learning models and experiences and addressing technology trends using Iran as the basis of the study. Although, the this research study was based on Iran, the framework and policy-making processes are applicable to any other country, which is moving toward achieving the IS targets, especially developing countries. Finally, based on the findings pertaining to the issues raised, some policies and best practices were recommended that can benefit Iran specifically and other countries, generally.

In conclusion, it should be mentioned that the IS policy was essentially an ongoing process that had to be worked on continuously with overarching focus on the results. This process required agreed responsibilities, organizational structures and both vertical and horizontal cooperation between private and public organizations across different departments and joint working of responsible players.

References

Atashak, M. and Mahzadeh, P. (2008), "E-government status in Iran: TAKFA plan case study", *World Applied Sciences Journal*, Vol. 4 No. 2, pp. 12-20.

Audenhove, L.V., Burgelman, J.-C., Nulens, G. and Cammaerts, B. (1999), "Information society policy in the developing world: a critical assessment", *Third World Quarterly*, Vol. 20 No. 2, pp. 387-440.

Banuls, V.A. and Salmeron, J.L. (2007), "Benchmarking the information society in the long range", *Futures*, Vol. 39 No. 1, pp. 83-95.

Berlecon Research (2008), "Market analyse IT services", available at: www.berlecon.de/research/en/reports.php (accessed 1 October 2011).

Braun, C. and Winter, R. (2007), "Integration of IT service management into enterprise architecture", *Proceedings of the 2007 ACM symposium on Applied computing SAC 07*, ACM Press, pp. 1215-1219.

Brocke, H., Uebernickel, F. and Brenner, W. (2010), "Mass customizing IT service agreements: towards individualized on-demand services", in Alexander, T., Turpin, M. and van Deventer, J.P. (Eds), *18th European Conference on Information Systems*, *Department of Informatics, Pretoria*, pp. 864-876.

Cake, M. (2008), "Web 1.0, Web 2.0, Web 3.0 and Web 4.0 explained", available at: www.marcuscake.com/key-concepts/internet-evolution (accessed 24 October 2011).

Clark, M. and Gomez, R. (2011), "The negligible role of fees as a barrier to public access computing in developing countries", *Electronic Journal of Information System in Developing Countries*, Vol. 46 No. 1, pp. 1-14.

Danish Technological Institute (2008), "Global Sourcing of ICT services", Danish Technological Institute, available at: http://ec.europa.eu/enterprise/ict/policy/ictskills/reports_en.htm (accessed 1 October 2011).

Federal Ministry of Economics and Technology (2010a), "iD2010 - Information Society Germany 2010", available at: www.bmwi.de/English/Navigation/Service/publications,did=192754.html (accessed 1 October 2011).

Federal Ministry of Economics and Technology (2010b), "ICT strategy of the German federal government: digital Germany 2015", available at: www.bmwi.de/English/Navigation/Service/publications,did=384382.html (accessed 1 October 2011).

Galup, S.D., Dattero, R., Quan, J.J. and Conger, S. (2009), "An overview of IT service management", *Communications of the ACM*, Vol. 52 No. 5, pp. 124-127.

Gorla, N., Somers, T.M. and Wong, B. (2010), "Organizational impact of system quality, information quality, and service quality", *Journal of Strategic Information Systems*, Vol. 19 No. 3, pp. 207-228.

Industry Canada (2008), "Canadian ICT sector profile", available at: www.ic.gc.ca/epic/ site/icttic.nsf/en/h_it07229e.html (accessed 1 October 2011).

International Telecommunication Union (ITU) (2009), "Measuring the information society: the ICT development index", available at: www.itu.int/ITU-D/ict/publications/idi/2009/ material/IDI2009_w5.pdf (accessed 1 October 2011).

International Telecommunication Union (ITU) (2010), *Measuring the Information Society 2010*, ITU, Geneva, available at: www.itu.int/ITU-D/ict/publications/idi/2010/Material/MIS_ 2010_without%20annex%204-e.pdf (accessed 1 October 2011).

International Telecommunication Union (ITU) (2011), "*info*Dev", available at: www. ictregulationtoolkit.org/en/Section.1319.html (accessed 2 October 2011).

Iranian Supreme Council of ICT (2005), "Key projects brief report: national ICT agenda", TAKFA Report, Iranian Information and Documentation Center (IranDoc), available at: www.irandoc.ac.ir (accessed 1 October 2011).

Iranian Supreme Council of ICT (2009), "Policy intelligence source book of Iran", Iranian Information and Documentation Center (IranDoc), available at: www.irandoc.ac.ir (accessed 1 October 2011).

Jahangard, N. (2004), "Development of a national IT strategy focusing on indigenous content development", Iranian Information and Documentation Center, Ministry of Science Research and Technology, available at: http://unpan1.un.org/intradoc/groups/public/ documents/APCITY/UNPAN021357.pdf (accessed 1 October 2011).

Kaigo, M. (2005), "Can the WSIS declaration principle and plan of action work in Japan?", *Digital Stratification of Japanese Society, Telematics and Informatics*, Vol. 22 No. 4, pp. 333-347.

Lua, J., Yaob, J.E. and Yu, C.S. (2005), "Personal innovativeness, social influences and adoption of wireless Internet services via mobile technology", *Journal of Strategic Information Systems*, Vol. 14 No. 3, pp. 245-268.

Management and Planning Organization (2005), *Law of the Fourth Economic, Social and Cultural Development Plan of Republic Islamic Iran*, Center for Documentation, Museum and Publication, Management and Planning Organization.

Mariscal, J. (2005), "Digital divide in a developing country", *Telecommunications Policy*, Vol. 29 Nos 5/6, pp. 409-428.

Ministry of Information and Communication (2007a), "E Korea master plan", available at: www.ipc.go.kr/ipceng/policy/enews_view.jsp?num=2140&fn=&req=&pgno=1 (accessed 1 October 2011).

Ministry of Information and Communication (2007b), "Broadband IT Korea vision 2007", available at: www.ipc.go.kr/ipceng/policy/vision_2007.jsp (accessed 1 October 2011).

Ministry of Science Research and Technology (2004a), "Development of a national IT strategy focusing on indigenous content development", Iranian Information & Documentation Centre (IranDoc), available at: www.irandoc.ac.ir (accessed 1 October 2011).

Ministry of Science Research and Technology (2004b), "ICT application in Iran: the vision for E-Society and E-Government", Iranian Information and Documentation Center (IranDoc), available at: www.irandoc.ac.ir (accessed 1 October 2011).

Pamlin, D. (2005), "Eco-friendly actions", *i4d (Information For Development) Print and Online Magazine*, Vol. 3 No. 8, available at: www.i4donline.net/aug05/strategicarea.pdf (accessed 1 October 2011).

Patel, A., Taghavi, M., Bakhtiyari, K. and Celestino, J. Jr (2013), "An intrusion detection and prevention system in cloud computing: a systematic review", *Journal of Network and Computer Applications*, Vol. 36 No. 1, pp. 25-41.

Taghavi, M., Bakhtiyari, K. and Scavino, E. (2013), "Agent-based computational investing recommender system", *Proceedings of the 7th ACM Conference on Recommender Systems (RecSys '13)*, *Hong Kong*, ACM, New York, NY, pp. 455-458.

Taghavi, M., Patel, A. and Taghavi, H. (2011), "Design of an integrated project management information system for large scale public projects: Iranian case study", *Journal of Information Technology Research*, Vol. 4 No. 3, pp. 14-28.

Telecommunication Company of IRAN (2010), "IRAN telecommunication statistical indexes", available at: http://tci.ir/s40/p_3.aspx?lang=Fa (accessed 27 October 2011).

The United Nations Industrial Development Organization (2003), *Strategy_Document_to_Enhance_Contribution_of_Efficient_and_Competitive_SME_Sector_in_Iran*, UNIDO, Vienna, available at: www.unido.org/fileadmin/user_media/Publications/Pub_free/Strategy_document_to_enhance_contribution_of_efficient_and_competitive_SME_sector%20_in_Iran.pdf (accessed 1 June 2014).

The World Bank (2011), "Iran Islamic rep. stats", available at: http://data.worldbank.org/country/iran-islamic-republic (accessed 2 October 2011).

Venturelli, S. (2002), "Inventing E-regulation in the US, EU and East Asia: conflicting social visions of the information society", *Telematics and Informatics*, Vol. 19 No. 2, pp. 69-90.

Watson, R.T., Boudreau, M. and Chen, A.J. (2010), "Information systems and environmentally sustainable development: energy informatics and new directions for the IS community", *MIS Quarterly*, Vol. 34 No. 1, pp. 23-38.

Yang, D., Kim, S., Nam, C. and Moon, J. (2004), "Fixed and mobile service convergence and reconfiguration of telecommunications value chains", *IEEE Wireless Communications*, Vol. 11 No. 5, pp. 42-47.

Further reading

Johnston, P.D. (2001), "Sustainability and jobs in the knowledge economy", *Journal of Universal Computer Science*, Vol. 7 No. 6, pp. 498-506.

Kettinger, W.J. and Lee, C.C. (2005), "Zones of tolerance: alternative scales for measuring information systems service quality", *MIS Quarterly*, Vol. 29 No. 4, pp. 607-623.

Leidner, D.E. (2010), "Globalization culture and information: towards global knowledge transparency", *Journal of Strategic Information Systems*, Vol. 19 No. 2, pp. 69-77.

Silberglitt, R., Antón, P.S., Howell, D.R., Wong, A., Gassman, N., Jackson, B.A., Landree, E., Pfleeger, S.L., Newton, E.M. and Wu, F. (2006), *The Global Technology Revolution 2020, In-Depth Analyses: Bio/Nano/Materials/Information Trends, Drivers, Barriers, and Social Implications*, RAND Corporation, Santa Monica, CA, TR-303-NIC.

Telecommunication Company of IRAN (2009), "IRAN telecommunication statistical indexes", available at: http://tci.ir/s40/p_1.aspx?lang=En (accessed 27 October 2011).

The World Bank (2009), "Data and statistics", available at: http://web.worldbank.org/wbsite/external/countries/menaext/iranextn/0,menuPK:3129 82~pagePK:141132~piPK:141109~theSitePK:312943,00.html (accessed 2 October 2011).

About the authors

Mona Taghavi received her BSc in Information Technology from Parand Islamic Azad University of Iran in 2007, and her MSc in Management Information Systems from Universiti Kebangsaan Malaysia in 2012. Besides her involvement in several Iranian national ICT research projects, she had worked for an IT consulting and project managing company which was responsible for overseeing the Supreme Council of Information and Communication Technology (SCICT) of Iran programme. She has published several papers, and she is a reviewer for the Computer Standards and Interfaces and Information Science Journals. Mona Taghavi is the corresponding author and can be contacted at: Mona@siswa.ukm.edu.my

Kaveh Bakhtiyari is currently a PhD student and researcher in Computer and Electronic Engineering in National University of Malaysia (UKM) and University of Duisburg-Essen (UDE). His research interests are mainly, but not limited to, Artificial Intelligence, Computational Intelligence, Big Data and Network Security. He obtained his Master of IT – Artificial Intelligence from UKM, Malaysia, and his BSc Computer Engineering from Islamic Azad University, Tafresh Branch, Iran. He is also an active reviewer in many scholarly scientific journals. He also founded MUSINGWAY in 2005 as a hi-tech service provider in computational intelligence applications.

Hamed Taghavi received his BSc in Computer Engineering and his MSc in Information Technology Management (Advanced Information Systems) from Science and Research Branch, Islamic Azad University of Tehran, Iran. He is a senior lecturer in Parand Azad Islamic University. His research interests topics are in the area of Strategic management, risk assessment of IS/IT, and Knowledge management. He worked as a Knowledge Management System developer in an IT consulting company and he is currently CEO of ISISCo (Iranian Strategic Information Solutions Company) in Tehran.

Vahhab Olyaee Attar received his BSc in Computer Science and MSc in Computer architecture from Science and Research Branch, Islamic Azad University of Tehran, Iran. He is the Chairman of young scientific committee and the Lecturer of Islamic Azad University of Parand. He has conducted several Iranian national ICT research projects for the Supreme Council of Information and Communication Technology (SCICT) of Iran. He is currently CIO of Information Technology and statistics center of Judiciary of Iran. He has published several papers.

Aini Hussain was born in Malaysia in 1963, she received the BSc in electrical engineering from the Louisiana State University, Baton Rouge, USA in 1984; MSc in control engineering from UMIST, Manchester, England, in 1989; and PhD in electrical engineering from the Universiti Kebangsaan Malaysia (UKM) in 1997. She has been with the Department of Electrical, Electronic and Systems Engineering, UKM, since 1987, where she is currently a Professor. She was the Head of Department, Deputy Director of Center for Research and Instrumentation Management, UKM and Director of Center for Postgraduate Management, UKM from 2007-2013. Her main areas of research interest are intelligent engineering systems which covers pattern recognition, signal and image processing.