A review of ICT status and development strategy plan in Iran

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ABSTRACT

This paper argues that Iran needs to base its national information and communication technology strategy on a much greater consideration of local cultural and social issues. The government has a major role to play if the country wants to stand in the information arena. It is believed that hard technological determinism can only be countered by very real and well thought out national strategies. The national IT strategy will need to address the issues of resistance to change due to cultural, personal and infrastructural factors. These are viewed as culturally sensitive and will need to be constructed as evolving, and learning system. It is important for every developing country to have a national IT strategy as a foundation whereby the great potential of IT can be realized, promote development, exploit technology and alleviate communication problems. The government must play an important role, not only as a major user, but also through its other role as regulator, promoter and diffuser.

Keywords: *Information and Communications Technology (ICT); national IT strategy; socio-economic development; developing countries; Iran*

INTRODUCTION

It is believed that IT is the most important factor for integrating the developing and developed countries. We cannot ignore the effect of World Wide Web in our daily life even in developing countries. The Internet is spreading into almost every part of the world and we face every day emergence of new application and technologies. This trend is transforming societies into e-societies, e-business, e-healthcare, e-government and so forth, have already been substantially developed in many developed countries. Information and Communication Technology (ICT), as a tool of socio-economic development, is a significant issue for developing countries (Odedra 1996).

Through declining hardware costs and increasing benefits, IT has been spreading into developing countries. There is a rapid expansion in the use of IT in many sectors of the economy, particularly in public organizations. However this usually occurs with external 'assistance'. As latecomers to the IT scene, developing countries face enormous difficulties - perhaps the most important being that they are becoming users of IT without building up the necessary infrastructure, planning and manpower to support it (Kirlidog 1996). Countries are being encouraged to attract economic growth by entering the 'information age', and being able to supply or compete at the multinational level. Therefore, there is no wonder that many developing countries are trying to bridge the development gap by means of technology acquisition (Castells 1996). It believes that Information and Communications Technology (ICT) is one of the main factors of economic, social and cultural

growth. Therefore, developing countries, in particular Iran, need to urgently develop a culturally appropriate national strategy if they wish information and communication technology (ICT) to have a positive impact on their overall socio-economic development. Iran needs to decide what they want from the global technology marketplace and then work out how they are going to achieve it.

The paper presented some background information of Iran and discusses the importance of IT discuses. The forth part shows IT infrastructure and use of it in Iran and the fifth part shows the role of government for ICT development and the national policies and strategies that help ICT development. The sixth part explains ICT issues in Iran whilst the seventh part, discusses ICT development trend in Iran and describes the projects which have been finished and ongoing projects.

Background Information of Iran

Islamic Republic of Iran is located in the Middle East with an area of 1,648,043 (sq km). Population of Iran is more than 70 million but almost two third of population is under 25 years old. The rural population of Iran is about 23 million, which consists of 33 percent of total population. Tehran is the capital of Iran and administrative divisions in Iran comprise 28 provinces. Iran is the second most populous country with the second-largest economy in the Middle East (Asemi, 2006). Up to the late 1970s, Iran was a key hub of IT in the Middle East and many foreign suppliers had their own branches in Iran. The Iranian industry was very well developed in the '60s and '70s; for example, early software systems supporting the Farsi language were developed in Iran. After the 1979 revolution, the situation changed significantly (Nicholoson & Sahay 2003).

Iran's entrance into the Internet was then spearheaded by IPM (Institute for studies in theoretical Physics and Mathematics). The link was at first through the BITNET network and Iran's membership in European Academic Research Network (EARN) (which developed later to the Trans-European Research and Educational Networking Association - TERENA). It consisted of a single 9600 baud leased line to the University of Vienna in Austria in January 1993. The first email from Iran was a simple greeting from IPM's director to Vienna University administrators. Primary users of the connection at first were academics and research institutions, all being served through their own connections to IPM. Over the past few years, domestic Internet connections have grown very rapidly, at times placing Iran among the top countries in terms of rate of growth of Internet access (Nicholoson & Sahay 2003). Iran is among the first five countries, which have had a growth rate of over 20 percent and the highest level of development in telecommunication, and is also proud to have been awarded the UNESCO special certificate for providing telecommunication services to rural areas (NETIRAN 1995).

The Importance of Information Technology (IT)

There has been considerable debate over the definition of development over the past few decades. Madon (2000) asserts that 'modernization' was perhaps the earliest theoretical approach to development, which was linked to the idea of economic development. In the early days, development was often perceived as progress, and it was assumed that developing countries were going to be able to participate in this progress if the benefits of scientific advances, technology and urban-industrial development were available to them. In today's world, development is often linked to 'modernization' and for developing countries modernization often represents the 'accessibility to new technology'.

We need to know what role IT can play in the development processes of developing countries. All economic sectors including agriculture, mining, banking, commerce, health-care, education, publishing, environment-management, energy conservation and transportation are becoming fast,

flexible and information intensive (Hanna). If IT is properly used in the developing countries, it can be the main factor in increasing productivity in public administration, communications infrastructure, industry and agriculture (Hanna et al. 1986). It is obvious that not all the problems of underdevelopment can be solved by IT. The majority of the population in developing countries will not benefit directly from it. Computers cannot feed and cure individuals, their power begins and ends with the use of information and their usefulness and success depends on those who are capable of effectively diffusing the knowledge and services acquire via IT (Pradhan 2002).

IT INFRASTRUCTURE AND ACCESS

As a result of heavy investment in the telecommunication system in Iran since 1995, the number of telephone lines, cellular phone, and radio and television stations has grown rapidly. Many villages have been brought into the net; the number of main lines in the urban systems has approximately doubled; and thousands of mobile cellular subscribers are being served. It should be considered that the statistics in this field change every day.

Table 1: Telecommunication infrastructure

Type	Amount (Date of published Data)
Phone Lines	Almost 23 million (2006)
Cellular (Mobile) Phone	28.5 million subscribers (2007 Oct.) from 4.3 million in 2004
Fiber Optic	56,000 km for rural communication (2005) also in the Persian Gulf region with UAE with access to submarine Fiber-Optic Link Around the Globe (FLAG) (Khazai, 2006)
Distance trunks	598,000 (2005)
Satellites and Earth Station	Sinah-1 is the first Iranian artificial satellite, launched at 2005 on board. Also three Intelsat Satellite Earth Stations, one Inmarsat-A land earth station (Indian Ocean Region) and mobile Satellite stations exist. Alcatel Espace of France has been named as the prime for Iran's Zohreh (IMCIT)

In October 2007, The Telecommunications Company of Iran (TCI) announced the country now has more cellular subscribers than fixed line users. The mobile penetration rate has reached 33%, with a total of over 28.5 million subscribers. TCI claims 68% of the mobile market with around 19.5 million customers, with the MTN subsidiary IranCell in second place with 3.5 million subscribers. Another private firm, Taliya, has around a million users, while two other operators – Telecommunications Kish Company and Mobile Telecommunication Company of Esfahan – operate small regional networks with only a few thousand users each (TELEGEOGRAPHY).

Internet

Iran uses the European standards and thus T1, E1 is used. Nowadays, there is a big number of new Internet Service Providers (ISPs) and small Internet cafes and their number is increasing fast every day. ADSL connections at 2 Mbps and for people out of ADSL catchments area, there are wireless links available, running at 5Mbps. Full Internet service is available in all major cities and it is very rapidly increasing. Many small towns and even some villages now have full Internet

access. National Internet Network became operational from September 2006 and domestic users will be able to receive web services at far lower costs. Iran is also the world's fourth largest country of bloggers. More than 94% of government and industrial entities set up networks with outside access to various databanks (2005) (IMCIT).

Table 2: *Internet infrastructure and accessibility*

Type	Amounts (Date)
Internet Users	17 million (2006)
High Speed Ports	250000
National ICPs	31
Local ISPs	653
Private Access Network Providers	11
IDCs	3
National Data Network	High speed ports covering 514 major cities
Total International Internet Gateway bandwidth	800 Mbps

Research is one of the main Internet Usage in Iran. Almost all of the universities and R&D centers and most of schools can use lots of international databanks and also local digital libraries are available for researchers. All of the public organizations and offices use software applications and most of them service people online. Business is another usage of Internet in Iran, most of commercial companies have their sites and service to customers and usually it is possible for customers to buy their products through Internet or by cellular phone's SMS (Short Message Sending) (Abbasi 2007).

Nowadays the main use of Internet for adults and the youths is to read and follow news through websites. By using multimedia, they also enjoy moving pictures, playing games online, or other attractive aspects of the Internet. Playing online games is not as popular as the other countries in Iran but chatting in messengers and blogging is the main entertainment for youth through Internet. In terms of Art and Culture to introduce Iran to people all over the world, the government and many Iranian individuals publish books, posters, and similar materials. But advertising on the Internet would be the most efficient way to communicate. As stated previously, there is an academic network in Iran. Also lots of online resources exist for learning arts and literatures and so on.

Broadcasting

Islamic Republic of Iran Broadcasting (IRIB) has branches in 17 countries, including the United States, and broadcasts in more than 25 languages. IRIB broadcasts 6 national channels, one international news channel, three satellite channels for international viewers, and one provincial channel per province. The IRIB provides 8 major radio stations as well (Sadri 2005).

Hardware and Software Industry

The hardware and software industry evaluation is one of the main factors for assessing IT development in each country so the current situation of Computer and Telecommunication Hardware Industry and software and service industry in Iran is found as follows:

Computer and Telecommunication Hardware Industry

The Iran Electronics Industries (IEI) was established in Iran in 1972. It is a state-owned company, a subsidiary of the Defense Industries Organization. It provides products and services for both the Iranian government and the public. The six subsidiaries of IEI and their fields of activities are shown in Table 3 (IEI).

Table 3: Subsidiaries of IEI and their fields of activities

Company Name	Activity
Shiraz Electronics Industries	Electronic Technology
Iran Communications Industries	Communications Technology
Information System of Iran	Information Technology
Electronic Components Industries	Microelectronics Technology
Isfahan Optics Industries	Optics Technology
Iran Electronics Research Center	Research & Development

The first cell phone handset production line in Iran was launched in Madiran Industrial Factory (Feb 2007) (IEI). Iran Interbank Information Transfer Network, Shetab, was introduced in 2002, with the intention of creating a uniform backbone for the Iranian banking system to handle ATM, POS and other card-based transactions. Iran linked their banking systems with China, Bahrain, United Arab Emirates and Qatar (Khazai, 2006).

Software and Services Industry

Policymakers and software companies are keen to explore the development potential of engaging in global software exports and at the same time develop their domestic industry. The key current challenge for the Iranian software industry can be summarized as follows:
1. The Policy level, which concerns the efforts of various policy makers to compile data on the state of the industry and to provide enabling conditions within which the industry can develop.
2. The Industry level, which includes the industry trade associations and software firms involved in managing the production and marketing of software products and services in both the domestic and international arenas.
3. The International level, which concerns the domain to which the industry seeks to develop linkages in the future. This level includes Iranian expatriates, software providers and users globally, and the mechanisms by which the linkages can be developed (Nicholoson & Sahay 2003). By the way nowadays, Iran is producing specialized customized software for export to several East European as well as few neighboring countries (Khazai, 2006).

Human Capital and IT

Human capital is "the stock of productive skills and technical knowledge, many early economic theories refers to it simply as labor is one of three factors of production, and they consider it to be a fungibleresource, homogeneous and easily interchangeable" (Wikipedia, 2008). It is one of the most important factors in ICT development.   Literacy is essential for any training and literacy rate in Iran is almost 90 percent (Gupte). The government spent many years trying to increase literacy rate as much as possible. And nowadays there are even some special programs for teaching computer skills in TV channels for public.

Nowadays almost all universities offer sophisticated engineering and computer science education. As part of the Second Five Year Development Plan government has set out many programs at the primary education level to inspire students to use computers, with more than 4000 schools equipped with PC and 70% of teachers being IT-educated (2006) (TCI). On the other hand emigration and immigration of computer professionals was a big problem in Iran while in recent years, government has made it easier for the generation who left the country to return to Iran. This group received their training and education abroad. Many who have return are now teaching at the universities in Iran.

THE ROLE OF GOVERNMENT

IT application in developing countries is not a recent phenomenon. The role of government in relation to IT use and development dates back to 1960s when most of the developing from Asia, Africa and Caribbean adopted the computerization as their national strategy (Han, 1991). With the increased application and diffusion of IT in developing countries, problems associated with its use also increased such as lack of appropriate technology, qualified professionals, absence of economic incentives and infrastructures and lack of explicit IT policy. This policy envisages promotion of IT development, promotion of software development and acquisition and promotion of education and training, promotion of database establishment and development of complete information providing services, and international cooperation. Governments can play a catalytic role in developing this infrastructure and stimulating the effective use of these infrastructures in support of nation-wide competitiveness (Pradhan 2002).

It is envisaged that IT use, if planned, developed and managed properly, can bring about greater efficiency in organizational operations, a better working environment, an effective decision-making process, better product quality and better quality of life for people generally. It is therefore important for developing countries to put more effort into finding out where they might have gone wrong in applying this technology (Pradhan 2002). The formulation of an IT policy is a positive step towards the development of a robust IT sector in Iran, however the failure to fully implement that policy has been a serious concern.

National Policies and Strategies

In Iran, Ministry of ICT is responsible for national development of ICT in whole country and Information Technology Council Excellence (ITCE) is responsible for national level strategic decision making and IT policies. Also, Iran Telecom Research Center (ITRC) is responsible for research, knowledge creation and high level consultancy in IT development in Iran. The High Council of Data Processing has been vested with the task of classifying and categorizing the computer firms. National approach on IT could be viewed at two aspects: IT as an enabler for national development; Prompt local IT industry (Asemi, 2006).
Nowadays government IT strategic focus is on the Telecom Development, Information and Data Restructuring, Infrastructural Development of Datacomm networks, Research, Deregulation and Privatization, Human Resource Development and International Presence (TCI). The Government has long-term plans and programs of development for IT sector as shown in the following section.

National IT Strategy and Development Plan

In the 4th 5-Year National Develop Plan (2005-2009), IT has a major role. The main goals of this plan have included increasing Internet users, telephone subscribers and mobile subscribers. The value of ICT projects in this plan is $25 billion dollars, $19 billion dollars for Telecommunication development and $6 billion dollars for IT platform and its infrastructure (Khazai, 2006). In Iran, national IT strategy comprised the following strategies:

- National ICT development and IT policy strategy document;
- National IT strategy for e-Services such as e-Government, e-Commerce, e-Learning and e-Health;
- Telecom revolution (de-regulation) plan;
- Telecom Liberalization plan;
- Migration from traditional telecom to Next Generation Network (NGN);
- Migration from monopoly to competition in telecom industry;
- Promotion foreign investment.

The quantitative goals in this plan have contained 40 million telephone lines, 30 million mobile lines, and 20 million Internet access account. The qualitative goals of government have included developing e-enabled national services such as e-commerce, e-learning, e-health, and e-government (Motohashi 1986). We can mention First-Step IT infrastructure implementation projects that have included some initiation projects for developing IT infrastructure in the country. These projects mostly have contained e-services in fields of commerce, learning, health, and government. These projects need cooperation between related Ministries and Ministry of ICT.

Promoting Innovation and Research in IT

Government has allocated 2% of national budget for Research and Innovation in IT. Iran Telecom Research Center (ITRC) proceeds as a national-level organization for research management in IT fields such as: Developing National Strategy in IT, Developing Migration Plan to NGN, and Supporting Innovation in IT Industries.

Also, government has created several ICT parks and Incubators such as: Tehran Software & Information Technology Park, IT Park and proceeding to the Regional Center of Excellence of ICT (RCEICT) and other provinces technology parks. These parks offer: A tool for knowledge based development; a tool for regional development; appropriate, high-quality infrastructures for technology-intensive enterprises; Services with high added value (Expert, communication and support); Synergism among universities, research centers and private companies; expanded international linkage; and Attractive investment opportunities in technology (Shafiee 2005).

ICT ISSUES

Nowadays, there are two different points of view about IT, optimists who consider IT as a solution way for all the problems and the IT pessimists who would argue for penicillin and not Pentium first (Asemi, 2006). Both the pessimists and the optimists have a number of stories to tell in support of their arguments. Such debates, based mainly on casual observations and common sense are not going to take us too far. Here, for informed debates and policy making there is the need for more in-depth studies on the IT pilot projects which should provide answers to a number of issues as cited in (Bhatnagar 2002). Landes (1998) point out that research and development efforts in information technologies have been concentrated in only a few developed countries. In these countries again, a handful of key IT companies control an overwhelming proportion of world's IT resources. The following issues are important to consider about IT development in Iran.

Political Issues

Technology acquisition raises a number of political questions. The first relates to the dependence of the receiving nation on the supplying one. It is clear that a technological dependence could become a political one. It is the responsibility of the government to select carefully the country from which acquisition could be made without any political problems in future. The second question relates to the possible transfer of political power from political elites to the technical specialists. This problem is more prominent in computer-based technologies because these technologies are directly related with retrieval and processing of data and information. Those at

the management level are mainly from non-technical backgrounds, as a result of which there is always tension between these two groups. The third question concerns the selection of countries to which certain technology could be transferred (Pradhan 2002).

Economic Issues

Two economic aspects of technology acquisition are important to consider: funds for initial investment and return on this investment. In Iran the funds available are approximately sufficient to buy expensive technology. Actually the problems are often encountered after the attraction of technologies (Asemi, 2006).

Social Issues

Probably the most important social impact of IT is on the labor market. There is no agreement about whether the number of jobs increases or decreases when IT is adopted, but there is a great deal of pessimism about it. It is clear that the characteristic of the workplace, and the required qualification and skills, will change (Amstrong 1988). Some jobs require retraining, others, many of them unskilled, would disappear or would be replaced, often by skilled or highly qualified jobs. The question of introducing IT in countries where the unemployment rate is increasing each year becomes important. On top of that, the migration of highly qualified people from developing countries has created a big gap in skilled human resources. Those with university degrees in computer science and IT are even more prone to the brain drain than others (Asemi, 2006).

Cultural Issues

IT, particularly the computer, often reflects the nature of the country that developed or manufactured it. One of the most distinct problems of the country in fostering IT is their cultural difference from Western. Implementation of a new technology does not end with installation of the machinery and explanation of how to use it. It should be accompanied, therefore, by transfers in education, organization, administration, employment strategy, research and so forth. The new technology must be accepted by the receiving society (Asemi, 2006).

ICT DEVELOPMENT TREND

The ICT development trend in Iran can be separated as the projects that has been done till now and the projects which are running now and the plan and policy that mostly government should consider as a future plan to reach to have a developed ICT sector.

Completed Projects

Iran's National ICT Agenda (INICTA) was initiated by the government. Its aim is to develop and maintain an advanced technological environment in order to support and enhance the education, research, and learning, service, and administrative activities all over the country. INICTA mission is to foster the development of economic, social and cultural situation in Iran by achieving the following objectives: Creation of infrastructure of Iran's information and communication technology (network, law and security); Compilation and application of comprehensive system of information and communication technology; Development of productive and beneficial employment; Promotion of average level of skills in information and communication technology (individual and institutional); Implementing of flagship projects; Increase in the economic and financial capabilities; Promotion of private sector's participation in ICT market; and Groundwork for entry into the international market of ICT (Kirlidog 1996).
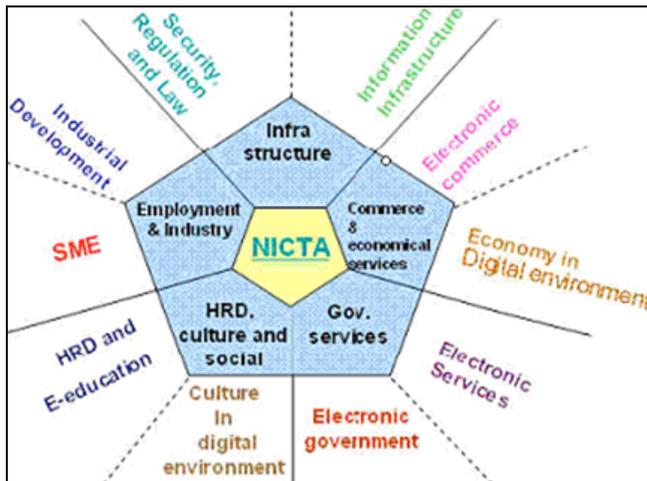
Figure 1: *Structure of NICTA*

According to the plan, all ICT related projects should be implemented through the private sectors with state organizations responsible for supervision of the operations (Kousha & Abdoli 2004). Government prioritized the plans and started the first phase with a plan for electronic government (system, virtual network, law and security), promotion of ICT application in education, health, treatment, economy, commerce and trade, culture and art, strengthening Persian script and language in the digital environment, development of social services and expanding active SME (Small and Medium size Enterprise) in ICT by creating growth centers and ICT parks.

Ongoing Projects

The Iranian Ministry of ICT is, on the basis of national development plan and the 20 Years Vision Plan, determined to develop strategies and action plans aimed at ensuring provision of services to all segments of the society and in particular those marginalized, towards creation of a knowledge-based society on the basis of justice, love and compassion. Moreover, the creation of six virtual networks is ongoing projects to reach the aims: State Network (government bodies); Science Network (universities and research institutes) (Karimian & Husseini 2004); Growth Network (Ministry of Education's schools); Trade and banking network (banks, guilds and economic users; Health, treatment and medical education network (hospitals, pharmacies, and medical universities); and Police network (IMCIT).

CONCLUSION

It seems that the successful use of IT in Iran depends mainly on changing the existing vision about the concept of IT in society. Information technologies are the product of developed countries, and to make that technology suitable for developing countries, there should be an effort to build a capacity to recognize the importance of implementing IT according to national development needs. Iran needs policies that stimulate diversification, technological upgrading, innovation, and mechanisms for building technological and innovation capacity. Thus, one of the most important tasks of government is to measure the performance and impacts of IT projects in the near future to weight up the advantages and disadvantages of the plans for the forthcoming

phases. It is precisely at such moments that the research can make a valuable contribution to a particular nation by bringing to the fore the relevant issues to assist in such strategies.

The increasing demands on the telecommunications network cannot be easily met, and especially not in the short term. Only in the medium-term is a larger capacity increase achievable. Iran has already started to carve out areas in which it has competitive advantage in IT-base services, a process that will continue to evolve. Moreover, liberalization is not only about expanding exports; even more important is its role in helping domestic producers gain access to more efficient and diversified services in the world market. In almost all cases most of Iran's neighbors received assistance from the outside world in the development and maintenance of their Internet. The fact that after Israel, Iran was the second country in the Middle East to link up to the Internet and do so relying solely on its own brainpower should not go unnoticed. It is true that there are still many problems to be addressed regarding Internet's expansion in Iran. It is also true that mistakes have been made. However by all accounts, the future of Internet access in Iran is bright (Arabshahi 1996).

The next period will see competition between the manufacturer and supplier of software. At first the survival of these firms will depend on their recognition of the demand and requirements of the consumers, consideration of special application of the software and, quality of service thus leading to huge financial gains in the medium term.

FUTURE PLANS

To meet future needs, Iran's universities have to increase the diversity and capacity of computer educational programs to train the needed. The governments should increase accessibility to the international market by the Iranian firms. As a result, one can expect developments in this field in two ways: First, the tendency of the firms to use domestic and international software markets, and second, to place this know-how at the service of domestic data networks and to earn revenues from abroad. The following are proposed strategies to improve and develop the use of IT: Develop and promulgate details of national strategies and plans for attraction and transformation IT in the country; Investing more in telecommunication infrastructure; Boosting productivity in administrative support; Train specialist principles to develop IT teaching; Improving educational system (selection process, student placement and evaluation, availability of resources); Introduce principals to the use of IT and help them develop a supporting society school culture; Develop a vision for education of using IT based on lifelong learning; Increasing training seminars to introduce families to the use of IT; To investigate and explore national indexes of ICT development in the country; Encouraging foreign investment: the higher foreign currency content , the less technology gap; Stabilizing the foreign exchange; To bridge the IT gap of all the related organizations and user groups from industries & social institutes should liaise in development activities and supporting projects; Harmonization of regulatory practices among trading partners for an effective liberalization; Promotion of factors advancing resource sharing; Prevention of redundant activities and duplication of efforts; Determination of national information standards; and Easing of sanctions imposed on Iran.

There are many issues to be considered. The government should invest in the infrastructure development, by providing the necessary resources and training to the population. Despite the obstacles, internet is expanding in Iran. The government in its Forth Five Year Development Plan should show its support by allocating resources to this growing sector.

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