

Prologue

The term “Information Technology (IT)” encompasses the methods and techniques used in information handling and retrieval by automatic process. The processes include computers, telecommunications and office systems or any combination of these essential elements¹. In broader sense, IT encompasses the use of hardware, software and services to create, store, retrieve, transfer, process and present information². In other sense, information technology comprises of all computerized and auxiliary automated information handling, including systems design and analysis, conversion of data, computer programming, information storage and retrieval, voice, video, data communications, requisite systems controls, and simulation³. However, information technology, as defined by the Information Technology Association of America (ITAA) is: “the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware⁴.”

In recent years, the contemporary applications of information technology to support and drive globalization of nations, societies and entrepreneurship have received increased attention. Today information technology provides the ability to coordinate the activities of globally dispersed communities, citizens, clients, employees, consumers and suppliers; increase the efficiency and effectiveness of important organizational functions and processes; and manage data, information, and knowledge across borders. A book containing selected readings develops a valuable literature on how global information technology applications are being utilized and influencing global societies deserves attention from all corners of the readers. It is a multi-faceted window to study their implications, perhaps in the longer-term of development perspectives.

Information technology is an ever-expansive domain that includes not only information and data processing but also voice, video and image applications and multimedia systems. In simple sense, concurrent information technology applications incorporate all aspects of computing and communication, as such the hardware and software for: management information system applications, office support, transaction processing systems, decision support and executive information systems, telecommunication networks, Internet, multimedia applications, databases and data mining. Information technology provides the means for the preparation, collection, transfer, retrieval, archival, access, presentation, and transformation of information in all representative forms (voice, graphics, text, video, and image). Global information technology (GIT) applications can be defined as information technology applications that are used across national borders, in two or more countries or regions of the world. This includes IT applications designed

to provide a global information infrastructure; global inter-organizational information systems; as well as functional intra-organizational systems used on a global (and regional) basis. These are IT applications that make it possible for any business to be efficient, effective, and competitive in this evolving global environment (Boar, 1994; Palvia, Whitworth, Williams & Aasheim, 2004).

In terms of contemporary application of information technology, it is not only about application of new technology, but also about new ways of doing things by applying information technology in innovative ways. These applications can be seen across the dimension of new developments in the technologies themselves; new innovations, developments within organizations, and development in several working/business practices; and researches on how quickly and how widely these developments are being taken up in society. The details of the technology are, therefore, less important than the changes that the technology is bringing to the basic structure of society (Hetemäki & Nilsson, 2005).

Furthermore, information technology has increasingly becoming a powerful tool in the fight against world poverty, providing developing countries with an unprecedented opportunity to meet vital development goals, such as poverty reduction, basic health care, environment protection and education, far more effectively than before. The countries that succeed in bridging the digital divide by harnessing the potential of information technology can look forward to enhance their economic growth, and improving human welfare and good governance practices (ADB, 2001; Qureshi & Vogel, 2007a).

In addition to these, while IT is seen in terms of academic aspects, it encompasses diversified dimensions of computing and technology, and the term is more recognizable than ever before. The information technology enclosure can be quite enormous, by enclaving many emerging fields. Not only academics and researchers, but also IT professionals perform a variety of tasks that range from installing applications to design complex computer networks, information databases, information bank (rather knowledge bank) data management, computer networking, computer science, computer engineering, artificial intelligence, human computer interactions and software design, as well as the management and administration of entire systems. When computer and communications technologies are joined together, the result is information technology. In these contexts, information technology incorporates any technology that assists to produce, manipulate, store, communicate, and/or disseminate information in a holistic manner.

This book comprising of sections on Fundamental Concepts and Theories; Development and Design Methodologies; Tools and Technologies; Application and Utilization; Critical Issues; and Emerging Trends in Global Information Technology incorporates the above mentioned issues and aspects depicting their contemporary applications.

CONTEMPORARY APPLICATIONS

Information technology has affected nations, societies, communities and their surroundings in numerous ways. In many societies, technology has assisted to develop more advanced economies allowing more synchronized application of it. Despite, many technological processes produce unwanted by-products, as such pollution and depletion of natural resources that are detrimental to the Earth and its environment, and various implementations of new technology influence the values of a society that often raises new ethical questions, contemporary applications of information technology, by far are advancing the entire globe for making a better living place.

Though, philosophical debates have arisen over the present and future use of technology in society, with disagreements over whether technology improves the human condition or worsens it; proponents of ideologies such as transhumanism and techno-progressivism view continued technological progress as beneficial to society and the human condition. In fact, information technology is the bridge that a

society may use to eliminate the barriers of development, adopt to accord the society for controlling its own development environments and as a whole, can bridge the digital divide⁵.

Generally speaking, information technology application refers to utilization of appropriate tools and techniques to solve real-world problems. The applications will vary from applying for the advancement of society development goals (environment, energy and agriculture to health care and biotechnology), service industry (manufacturing and production control to aviation and tourism), entrepreneurship (small scale industries to corporate business houses), government sectors (government services, non-government counterparts to action of development partners), and human skill development (education, learning to knowledge development and knowledge networking) (Carmel & Tjia, 2005; Kurihara, Takaya & Yamori, 2005; Lacity & Willcocks, 2001; Raisinghani, 2007; GITR, 2004; Tan, 2007). A few of the areas of contemporary applications have been cited in this section before running into challenges of these applications.

DIGITAL MEDIA, ARTS AND ENTERTAINMENT

Incorporating texts, graphics, animation, audio, video and multimedia through various applications like Java⁶, php⁷, DHTML⁸, XML⁹ and macromedia, information technology has enclaved activities related to leisure, entertainment, arts, culture and edutainment.

Education and Learning

Technology driven learning has improved not only the educational content but also the way of teaching and learning. Learning process is no longer restricted to a unidirectional form of pushing of knowledge content. It is a bidirectional interactive knowledge enhancing process; unrestricted, flexible and open-ended; independent of age, time, location and subject matter. Learning is no more a time bound sequence; rather it is a life long knowledge acquisition process depending on the mode of learning and technology adopted during the learning.

Environment, Energy and Agriculture

Environment comprises of the complex physical, chemical, and biological factors in which human or community exists; while energy is an important concept in science; and agriculture is the science, art, and business of cultivating the soil, producing crops, and raising livestock and farming. These three parameters of social cohesion are intertwined and interlinked in many respects, and information technologies contribute in a large extent for their improved effect on the society resulting in major uplift of livelihood¹⁰.

Financial Services, Insurance and Real Estate

Among the financial services comprised of programs related to planning, managing and providing banking, investment, financial planning, insurance services, and real estate businesses information technology takes a leading role in managing the entire network of operation more efficiently and manageably.

Healthcare and Biomedical Sciences

Application of information technology importantly applies to the techniques and methods for preservation of mental and physical health of all elements of the society by preventing or treating illness through technology mediated services offered by the health profession and experts. It applies simultaneously for advanced application of the principles of the natural sciences to various branches of medicine.

Manufacturing, Production Control and Logistics

Information technology not only improves the flow of production of goods by the application of labor and capital to raw materials and other intermediate inputs, like agriculture, mining, forestry, fishing, and related services, but also improves the procedure of planning, routing, scheduling, dispatching, and expediting the flow of materials, parts, subassemblies, and assemblies within the entire system. Furthermore, it makes the life of the stakeholders easier by making the process of planning, implementing and controlling more efficient, cost effective flow and managed storage of raw materials, and faster in-process inventory¹¹.

Aviation, Transportation, Tourism, Hospitality and Recreation

Technology has always had important implications for improved tourism (Shultis, 2001), as such interconnectivity among almost all the airlines and tour media (Railway, Bus, Ship and others) through their agents, operators and corporate houses. ICT through utilization of Semantic technologies has advanced the sequences further by incorporating choices of the users to choose among cheap routes, tourist spots, economy hotels, better connection, promotional packages, and other incentives.

Small and Medium Enterprises

The strategic and operational importance of information technology in business sector no longer remains experiments. By the advent of the 21st century, almost all the corporate houses across the world started transforming themselves into global business powerhouses via major investments in global e-business, e-commerce, and other information technology initiatives. Information technology is an essential component of successful entrepreneurship today. At the same time, information technology has created tremendous opportunities for service sector professionals like business managers to understand and manage their organizational functionalities. Thereby, managing the information systems and technologies that support the current business processes in the corporate sector has become a major challenge for both business and information technology managers and professionals (On-line document).

Government and Non-Government Agencies

Information technology contributes tremendously for managing the government-controlled institutions that are responsible for its internal administration and its relationships with other institutions or countries, and at the same time enhances operation and management of non-profit making, voluntary, service-oriented, development oriented grass roots organizations for the benefit of the citizens.

ICT, Productivity and Globalization

ICT has amplified the productivity of the actual production process through automation. At the same time, it has made the internal handling of business within organizations more efficient. Furthermore, ICT has increased the productivity through proper utilization of raw-material, improved procurement process, increased logistic support, and advanced marketing strategy. Finally, adopting ICT any organizations (or nations) have improved their images ranked as an ICT-intensive organization (or country).

Peace and security

Nowadays, conflicts are not restricted to only military intervention, but also to the scale and depth of information penetration to the society. Depending on the adaptability, information may lead to confrontation. Unless necessary measures being taken to restrict unnecessary or misleading information

Development and Poverty Reduction

Poverty, hunger, development and information technology are intricately interlinked. Many countries have adopted methods and processes to empower communities or societies through information technology to eradicate poverty by enhancing development processes and facing elements of hunger. These processes have been made easier and accessible through use of information technology. Utilizing databases and software to monitor food security chains (production, demand, consumption, surplus, deficit, early forecast, available supply link), information technology enabled countries are in better position to combat hunger and reduce poverty (UN, 2001).

Culture and Heritage

Preservation and use of traditional knowledge, that are essential components of society's resources, are also recognized as important aspects of modern day information technology initiatives. Information technologies are increasingly used to support and encourage cultural diversity, to preserve and promote indigenous languages, distinct identities and traditional knowledge of indigenous people, nations and tribes in a manner which they determine the best for their own advancement. The evolution of information and communication societies is founded on the respect and promotion of the rights of indigenous people, nations and tribes and their distinctive and diverse cultures (UNESCO, 2003a; b).

Apart from these, there are a few information technology applications, worthy to mention in terms of academic perspective. These incorporate learning and skill development in;

- **Data management:** Encompassing all the disciplines related to managing data as a valuable resource as per the full data lifecycle needs of an enterprise (data analysis, database management, data modeling, database administration, data warehousing, data movement, data maintenance, data mining, data quality assurance, data security, Meta-data management (data repositories, and their management), and data architecture)¹².
- **Computer networking:** Incorporating theoretical and practical applications of the scientific and engineering discipline concerned with communication between computer systems or related devices (Networking¹³, routers, switches, routing protocols, and networking over the public Internet via twisted-pair copper wire cable, coaxial cable, optical fiber, Bluetooth, 3G and various wireless technologies) comprised of sub-disciplines like telecommunications, computer science, information technology and computer engineering.
- **Computer engineering:** Encompassing wider aspects of electrical engineering and computer science (firmware development, software development, hardware-(firmware/software) integration, circuit design, and system-level design and integration) with skill development in the areas of software design and hardware-software integration (incorporating algorithms, computer architecture and organization, computer systems engineering, circuits and signals, digital logic, digital signal processing, human-computer interaction, software engineering, and VLSI design and fabrication).
- **Software design:** A process of problem-solving and planning for software solutions that may include low-level component and algorithm implementation issues as well as the architectural view of the software system (software requirements analysis (SRA), software engineering, and automated user interface design) that may be platform-independent or platform-dependent depending on the technology, demand and operating fund.
- **Systems management:** Refers to enterprise-wide administration of distributed computer systems (incorporating network management, hardware inventories, server availability monitoring and metrics, software inventory and installation, anti-virus and anti-malware management, user's

- activities monitoring, capacity monitoring, security management, storage management, network capacity and utilization monitoring), and
- **System administration:** Skill development pertaining to maintenance and operation of a computer system or network (installation, support, maintenance of servers and other components of the computer system, planning for and responding to service outages and other problems like preventive maintenance and/or breakdown maintenance, scripting or light programming, project management, supervising or training computer oriented personnel, and acting to problems beyond the knowledge of technical support staff).

CHALLENGES

Diversified use of information technologies in all spheres of life, including government and entrepreneurship has long been at the center of discussions about the relationships between advances in technologies and the social, business and political significance of communication and information in a particular society (Innis, 1950; Dutton, 1990; Heeks, 2002). However, apart from the aspirations there are a few other schools of thoughts. Among them, lack of in-depth analysis ignoring the real situation, providing mere simple solution to a complex social and political problem, copying solutions from others without looking into the real scenario, confusion in the application of the technology in appropriate form, pushing a new technology without making any pilot experimentation, introducing the new technology without mapping the capability and adaptability of the stakeholders, and dominance of technology rather than the exact solution remain as challenges among many (Bryan, Tsagarousianou & Tambini, 1998; Seneviratne, 1999; Tehranian, 1990; Lievrouw, 1994; Anderson & Danziger, 1995; Khosrow-Pour, 2000).

While separating the issues of practical application and academic analysis, it would be misleading to regard them as clearly demarcated areas during implementation. There are cases where practical applicability defers from empirical studies depending on diverse ground reality. Moreover, as the technology advances, there arises adaptability and managerial issues, especially in public administration sector, and specifically they affect the patterns of organizational change that are being misled in many cases hampering the real development.

In terms of information technology applications in developing countries, several common factors becomes challenging; as such controlling position of governments, total reliance on only the technology transfer, lack of competency at the policy level, not opening up for the private entrepreneurs, and discouraging investment at the grass roots. Despite computers made their first appearance in developing countries in the 60s; in Bangladesh in 1964, Brazil in 1958, China 1958, Egypt in 1962, India 1960, Indonesia 1962, Kenya 1961, and Malaysia 1965; most of the developing countries are yet to come at the forefront of information technology applications (Pendit, 2003)

Henceforth several questions arise. Should we afford to abandon societies lagging in information infrastructures and logistics they require to sustain themselves? Should they been pulled up further through collaboration? Should they be bypassed while initiating decisions related to majority of the population? Should we take this as challenge to reduce the digital gap between the information rich and the information poor?

The increasing globalization of the world economies is being fueled by a number of information technology infrastructure based initiatives and applications. The challenge facing policy makers, practitioners, academics and researchers is how to achieve significant and measurable improvements in addressing development goals through information and communication technology. (Rametsteiner, Vähänen, & Braatz, 2005) According to Duncombe & Heeks (2003) the role of information technology

in enabling information and knowledge should cover social and economic development aspects of the society. Furthermore, Qureshi (2005)'s model of information technology for development suggests that the effects of information and communication technology are recurring and, therefore, deserves explicit attention.

Apart from providing better access to information and expertise; ensuring increased competitiveness and access to new markets including global markets; acquiring administrative efficiencies from low transaction costs; increase in labor productivity through skill development; and activities related to direct reduction of poverty (World Bank 2003, UNDP 2003) the following string of questions should also be attended. Should the effects of information technology implementations bring positive results, the cycle of development involves an increase in human development and gross domestic product through the use of better tools and techniques? Should the process lead to an increase in per capita income and perpetuate a positive spiral for social and economic development? (Qureshi & Davis, 2007; Qureshi, & Vogel, 2007a)

In many cases, it has been observed that while information technology implementations were not focused to feed the local needs, digital divides increase, and the reverse can occur and perpetuate a downward spiral. For example, lack of access to information due to lack of access to information reduces the ability of a farmer or merchant to sell goods at the most favorable price, thus reducing income generated by their efforts. Similarly the implementation of information systems that intend to provide better access to government services to citizens can bring about administrative inefficiencies by locking out them without providing any means or ability to use the information system (Giddens, 2003; Qureshi, & Vogel, 2007b).

Historically, development partners comprising of international agencies had to fund information infrastructures and build information hubs during early 90s due to lower motivation from the business community. Even after 20 years of information technology based revolutions, many countries are lagging behind in terms of globally accepted information infrastructure, especially countries with remote and dispersed communities. There remain barriers of social inclusion, telecommunications regulation, government protectionism, huge capital investment, difference of opinion and difference of technology transfer, illiteracy and cultural difference among many (Keen, 2004; Rahman, 2005; Rahman, 2006)

FUTURE RESEARCH

ICT has enhanced the realm of innovation in all spheres of life. Innovation is the creation, development and implementation of a new product, process or service, with the aim of improving efficiency, effectiveness or competitive advantage¹⁴. Innovation is the process that translates knowledge into economic growth and social well-being. It encompasses a series of scientific, technological, organizational, financial and commercial activities¹⁵, and ICT has perceived as an enabler of innovation, and facilitator of adaptation. In terms of open, incremental, radical, induced or general purpose innovation (Center for Innovation Studies, 2004), ICT has a distinct role as the facilitator. In the very recent years, global information technology has seen the paradigm shift through diversified researches and their applications for the development of communities, societies and nations. At the same time, technological innovation and diffusion are considered as significant component of a country's development platform that includes the advances of information technology applications (Pendit, 2003; Wyun, Whitley, Myers & DeGross, 2002; Palvia, Palvia & Roche, 1996; Khosrow-Pour, 2001a).

Society and culture are the driving factors of adoption window for any new technologies, and information technology can open the possibilities of adoption by transforming the societal benefits to economic

benefits. In this context, perhaps the greatest social driver of information technology use is the wish of individuals to upgrade the lifestyle and enhance security for themselves and their families. This drive will result in reallocation of personal time and resources to allow participation in the information society in spite of numerous problems like illiteracy, innumeracy, indebtedness, and lack of basic amenities of day-to-day survival (Roztocki & Weistroffer, 2007; Thomson & Colfer, 2005)

However, there are socio-cultural differences in people's receptiveness to information technology that will affect its future adoption and usage. Specifically, in the third-world nations, economic aspects of relative change are the most important factor, but at the same time social approval is not ignored. Therefore, adoption of information technology remains an opportunity or means to many depending on their culture, society, politics, geography and many other seen or unforeseen factors (Pendit, 2003; Hunter & Tan, 2004). While information technology is perceived as an enabler of development (UNDP, 2001), but, their adoption in the society by majority of its elements are yet to be established. It needs to be attended appropriately, and deserves further research, study and evaluation.

This has been observed that most of the government agencies, especially in the developing and transitional economies are lagging in effective utilization of information technology in their processes and attain measurable advancement. Not only government processes need to be transformed to fit in this new technology arena, but also other innovative technologies can adopted into their systems. They can introduce geographic information system (GIS) based land management, computerized mapping, records management systems for the collection, maintenance, use and storage of huge data; and the emerging citizen public access technologies which cater for both increasing public demand for more information and the eagerness of public offices to promote access to relevant information.

Comprehensive research approaches are needed to be develop in different parts of the world when information systems applications are being implemented looking at the global perspective. Where applicable, traditional research methods may be applied coping with the dynamic changes in this technology, or may not necessarily be applied to other parts of the world if situation at the ground dictates so. The best possible scenario in this aspect is to learn from changes in emerging economies and develop research methods in such ways to enable issues in these economies so that they can be effectively addressed through information technology and more traditional information systems practices can be strengthened. Furthermore, research community in the development sector comprising information technology initiatives should be able to framework and explore new lines of study so that academia can be engaged to respond in finding better opportunities and able to deploy technologies for better accomplishments.

It is natural that new technologies should be drivers of the future. However, just by looking at the new technologies, predicting the future is difficult, and forecasting their impact on the society is more difficult. The interface among nano-science, nano-technology, bio-technology, and information technology may escalate recognizable changes in the society. Nevertheless, without being adopted in successive ways, the rapid introduction of newly evolved technologies could lead to unsettlement and disruption to the common elements of the society. Moreover, it is extremely difficult for both social and political systems to keep track of the positive changes and quantify their ripple effect on the society in a shorter term (Christensen, 2000; Williams & Kuekes, 2001).

Software agents will play a major role in future accompanying information technology based development systems. Time zone and geographic boundaries have already been overcome to serve the communities with specialized software driven solutions. Customized software development, on-line skill development, call centers, VoIP are among them.

World has seen many revolutions in terms of societal development and contemporary application of information technology. If a nation would like to focus on grass root development through utilization of information technology, success of telecenter movement in that country has no alternative. Sustained

Figure 1. Probable components of e-applications (Adopted from Brücher & Gisler, 2002)

Degree of interactions	E-learning	E-government E	-commerce	E-democracy
	Online enrolment, examination, evaluation	Online tax declaration, govt. services	Online bidding, transaction	Online opinion poll, voting
	Online content, courses, schedule	Online E-mail contacts, forms, FAQ,	Online marketing, electronic data interchange	Online discussion on voting system
	Information on education system	Information on legislation, judiciary, administration	Information on entrepreneurship	Information on political and legal structures

Degree of applications

growth and existence of organized telecenter is another precondition of information technology based society development, and needs intensive observation, attention and research.

There is general conformity that information technology affects all sectors of society and economy. Along this perspective, governments have a major role to play through their investments in information technology research and development. They will also be influential in shaping the future of information technology developments through their national and international policies. However, policies aimed at creating an enabling environment for the development and deployment of information technology at the grass roots need to address issues of trade, investment, industry development, and e-business (Rametsteiner, Vähänen & Braatz, 2005; Khosrow-Pour, 2001b; Elliott, 2004). The following figure gives an overall picture (though not exhausted) of e-Application platform in a nation or society. As the degree of interaction increases, and degree of application enclaves more features of the society, a comprehensive e-Application platform will emerge.

CONCLUSION

In recent years, several indicators have been developed that can measure relative presence, use and accomplishment of information technology in their countries. However, mere indicators of availability of information technology through access could be a misleading indicator, unless it is not meant to empower the end users (Sciadas, 2002). Moreover, apart from being just familiar with the information technology, skills of the people and individual have to be elevated. In this perspective, adoption of technologies will have to be in such forms that their livelihood could be amalgamated and they could feel from within that the benefits of the technologies are intrinsic. Furthermore, as Hetemäki, & Nilsson

(2005) indicated that, the new technologies offer new capabilities and opportunities for participation. Nevertheless, during the process, ownership of the process and delivery of products are key elements of acceptance of the process outcome.

Contemporary application of information technologies in society is characterized by high level of information interaction in the everyday life of most citizens in most institutions and workplaces. This can be achieved through use of common or compatible technology for a wide range of personal, social, educational and business activities, and via ability to transmit, receive and exchange digital data rapidly between places irrespective of distance. The current trend is to emphasize that intensity of using the e-prefix for everything from shopping to governance, but that distinction may disappear in future as the use of information technology in business, government and daily lives is destined to terminate at a common point (Thomson & Colfer, 2005). In a holistic view, information technology will not spare a single activity of the future society.

On the contrary, tremendous groundwork needs to be performed at the grass roots, especially in transitional or developing economies, where majority of the World population reside. Ignoring social, economic, cultural, political and ethical considerations can result in a high probability of failure of development projects in general and information technology based projects in particular. In developing countries, the communication component of information technology may be the most significant aspect in the short run, but in the longer run, new technologies require new social norms, new legislation and policy, and new institutions. However, to see the impact of information technology at the level of individual element of the society is not a time bound phenomenon. Incrementally, with the availability of positive atmosphere (win-win situation), the new social forces will gradually develop. Future successful information technology dependent development projects will have to be well integrated into communities, planned for optimal use of existing infrastructure, and focused to adequate human intermediaries for longer-term sustainability (Thomson & Colfer, 2005; Pendit, 2003; Qureshi & Vogel, 2007a).

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ENDNOTES

¹ www.nao.org.uk/intosai/edp/directory/misc/glossary.html

² www.finance.gov.au/gateway/guidance_glossary.html

³ sam.dgs.ca.gov/TOC/4800/4819.2.htm

⁴ en.wikipedia.org/wiki/Information_technology

- 5 <http://en.wikipedia.org/wiki/Technology>
- 6 A programming software developed by Sun Microsystems, Inc.
- 7 A server-side HTML embedded scripting language
- 8 Dynamic Hyper Text Markup language
- 9 Extensible Markup Language
- 10 Google definitions
- 11 Google definitions
- 12 http://en.wikipedia.org/wiki/Data_management
- 13 local area network (LAN), wide area network (WAN), wireless LANs and WANs (WLAN & WWAN)
- 14 www.digitalstrategy.govt.nz/templates/Page_60.aspx
- 15 www.arc.gov.au/general/glossary.htm