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Applications Of Information Technology For Development

By

B Brahma Reddy
Applications of Information Technology for Development

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Abstract

The impact of the rapid proliferation of information technology is multifaceted. Application of information technology has far-reaching effects. One of these is that information technology has the potential to transform the entire economic, social, and human relationship structure. This article traces the relevance of Information Technology to the development of society and impact of new technologies on IT. This article also describes a few IT applications that can improve the overall quality of the development. National Informatics Centre's role in providing Information Technology solutions in India are described.

Information Technology

Information Technology (IT) embraces the areas of computing, communications and associated technologies to capture, store, retrieve, process and disseminate information in various forms including voice, video, text and data. It includes electronic systems, consumer electronics, telecommunications, neural networks, graphics, multimedia, virtual reality, hardware and software aspects of computing, the design and production of computer based systems.

IT relevance to development

Information Technology has become indispensable in day-to-day activities. This has brought in large-scale social and economic changes in our lives. Information technology has emerged as the most pervasive and strategic technology. The impact of IT on the development of society is so great and dramatic that it will transform society to the same dramatic degree as the industrial revolution did in the past. IT changes working patterns of both individuals and organizations, and directly brings about changes in organizational structure. For typing letter, the secretary moves to a word processor which enables the work to be done twice as fast. Similarly, there will be changes in supervisory
functions also. The fact that employees work can be performed on-line and stored electronically, introduces the possibility of greater electronic supervision.

Computers take the routine aspects of work and leave the people with creative work and a powerful information handling tool to help them with their work. Facilities like dissemination of information within the network, teleconferencing, telecommuting will affect the society and organization. In general, use of IT causes a revised allocation of functions such that the machine does more of the work. The effects of this on the individuals are two fold; firstly, if the work load remains the same there is less to do. Secondly, the nature of the work changes from direct hands on the raw materials to a more indirect role of guiding and controlling the machine which are directly on the raw materials. Thus IT leads to changes in the structure of jobs and other organizational practices, which warrants re-designing of structure and jobs. Unless this vital aspect is dealt with sufficient thought it results often in creating tension and conflict in the social structure and underutilized technical system.

IT can dramatically change the quality and cost of the healthcare. Due to new developments in IT, it is now easier to peer through the skin and skull for diagnosis, brain surgery and training. The images are combined into three dimensional models and manipulated by more powerful graphics computers. For instance, a doctor can now see peculiarities of a person's brain and plan the best route to a tumor, so as to extract it with minimal damage to the nearby tissue.

As mentioned earlier in this article computers will enable things to be done in new and more efficient ways. If companies combine their standard business processes with information technology, then they will be able to establish a far superior position in the market. This will reinforce competitiveness of small and middle-sized organizations and make them more viable. Smaller organizations will be able to produce customized products and redesign products more frequently. This will result in a substantial increase in productivity and reliability, which means producing more competitively and efficiently. Speedy preparation, reproduction and distribution of products with easy access to field information, internal and external communication is possible by introducing word processing, electronic mail, document management system, networking, computer conferencing and multimedia systems etc.
Technology impact on IT

The last decade has seen spectacular progress in information technology (IT). The continuing advances in micro electronics, computing power, large scale networks with steady drop in costs has given the required encouragement for IT growth. At the beginning of the 1980s, the convergence of computing and telecommunications was perceived as one of the most important trends in IT. At the beginning of the 1990s, computer networks are widely used, and are increasingly contributing to the globalization of economic activity. Powerful tools like GIST, LISP, GUI and Multimedia systems are conveniently being used to overcome the problems hitherto with non-English languages for developing IT applications.

CD-ROM (Compact Disc Read-Only Memory) has changed the information centre from a collection of publications to a collection of electronic discs. This small compact disc can accommodate about 20 million A4 size papers. Books, articles from journals, patent specifications etc. on a variety of subjects could be located on these discs and retrieved just by pressing a few keys. Multimedia and virtual reality which creates 3-D cyberspace makes the viewer to believe he is in another world. This can be used for training purposes simulating an aircraft flight desk, or the control of a new instrument. This can also be used to check the human psychology and blood pressure, crime detection and criminal interrogation etc. Marrying virtual reality to artificial intelligence techniques will lead to virtual intelligence.

Information technology can be used to access widely distributed financial, credit, market research, legal, news, library reference, travel information as well as specialized systems like computerized reservation services. Thus the boundaries of IT applications are only restricted by human ingenuity and creativity. It is difficult to give the full scope of all applications within the constraints of a single article. However, a few examples which can directly reflect in the orderly development of society are described below.

1. IT applications for Rural development

1.1 Agriculture

In an agriculturally predominant economy, planning at grassroot level will be dependent on basic details of the nature and structure of
agriculture and allied sectors. Lack of adequate and accurate data from this particular sector alone may result in failure to proper plan for the needs of the area. For the decentralized planning a detailed and reliable information reflecting the real scenario of agriculture and its potentialities and deficiencies is required. An information system can be developed with data regarding gross cropped area, net area sown, crop wise area, area irrigated, fertilizer, insecticides consumption etc. for effective monitoring of the agricultural economy. Another important area IT can be applied is management of agriculture inputs like fertilizers, pesticides availability, seeds distribution, credit, storage, water resources.

1.2 Land records computerization

The total geographical area of the village or block is available from the records prepared by survey and settlement operations. In normal ways they are updated at irregular intervals, sometime more than 10 years interval. In the long intervals between settlement operations, the ownership of the lands undergoes changes. The local revenue officials like the Patwari, Revenue Inspector and Thahasildar keep this information but often it is not incorporated in the basic land records of the village. With the information technology all these can be maintained up to date and easily made available for various users.

2. IT applications for Education

2.1 Distance education

The advent of satellite has revolutionised the communication scene. The satellite based system has the advantages of wide reach, accessibility by large numbers, distance shrinking providing apparent immediate delivery. A satellite based interactive network system with one-way video and two-way audio would provide distance education. This can be used to improve the literacy rate, scientific education, primary education, family welfare programmes etc. in rural areas.

2.2 Computer Aided Paperless Examination Centre (CAPES)

Unemployment is one of the serious concerns in developing countries. With the limited number of available employment fierce competition is existing for employment/higher education. This makes imperative to adopt a scientific methods for candidate selection procedure. CAPES is an attempt in this direction to appropriately
complement and supplement the traditional process of conducting examinations. This ensures scientific and rational method for conducting examination in addition to requisite confidentiality and security features. For this a comprehensive set of question banks prepared by subject specialists are stored on non-erasable, highly secured media CD-ROM. Questions may be selected through stratified random sampling and provided to the examinee on computer terminal. After completion of the examination score can be displayed for the examinee and the file would be transmitted to the apex examining body for consolidation. This eliminates malpractices like paper leakage, copying etc.

3. Weather prediction and disaster warning systems

The enhanced meteorological data provided by satellites benefits agriculture, aviation, ports and shipping, hydro-meteorological and flood-forecasting services/sectors. Compared to pre-satellite methods, some 12-24 hours advance identification of cyclones and consequently early warning would be possible. The VHRR (Very High Radio Resolution) data converted into pictures called satellite derived cloud imageries, on a round the clock basis are very useful for precise tracking of different weather systems which is important in day-to-day forecasting of weather.

The imageries are particularly useful in identifying cloud systems over the ocean where no other observational data is available for cyclone tracking, intensity assessment and prediction of storm surge etc. These imageries are also used to estimate the aerial precipitation produced by the clouds. Such precipitation estimates are accurate when they are averaged over large areas over a period of 5/10 days or more. Collection of these precipitation estimates are particularly required over oceanic regions as conventional precipitation measures are not available, for problems connected with atmospheric modelling. From the imageries another important product OLR (Outgoing Longwave Radiation) required for numerical weather prediction modelling can be derived.

Disaster warning systems can help in warning the local authorities to take action on preventive measure during cyclones. Ships, motor boats and fishing vessels equipped with Inmarsat receivers can send distress signal for its rescue operation.
4. IT in courts

4.1 Computerization of court cases

Information of common interest to legal community, litigant public can be developed and made available through a computer network. This can provide on-line court information to the litigant community across the country within the shortest possible time. This enhances the litigant public confidence in the judicial process of the country. This can also help registry of the court in executing of its functions by providing easy flow of information.

5. Finance and trading

5.1 Banking Services

The convergence of computers and communications technologies has had a profound effect on the banking and other financial services. It has changed the basic nature of the financial services, marketplace radically, altering what services are provided, how, when, by whom, to whom, and how those services are priced and used. Development of sophisticated financial services based upon advanced communications technologies has created worldwide capital and financial markets. Automated Teller Machines (ATMs) have helped control the cost of banking while transforming it into a 7 day, 24 hours business.

5.2 Trading

Another important application coming up because of communication advances is the EDI (Electronic Data Interchange). The documents can flow across the globe with authenticity attached. Many agencies are coming forward to acknowledge the EDI-based documents. EDI is defined as the direct, inter-organisational, computer-to-computer exchange of formatted documents, usually business forms such as purchase orders, invoices etc. Services like E-mail, EDI, EFT (Electronic Fund Transfer) and POS (Point Of Sales) have enormous room for expansion, first in the business market and perhaps later as consumer services. Stock trading through computer network is common in developed countries.
6. Industry decentralization

Concentration of industries in selected places is causing serious civic problems to the people living there. Expensive accommodation and lack of civic facilities putting pressure especially on the families migrated from rural areas in search of employment. All these factors have made the decentralization of industries inevitable. IT can be judiciously used to decentralize the industries without loosing the benefits of integrated industry. Information systems designed using geographical details like, type of land, coverage of forests, water resources, minerals can be used to identify the type of industry suitable/required at a given place. Similarly IT systems can be used to select location for an industry such that it would minimize the raw material transportation, distribution of finished goods etc. while maintaining ecological balance. E-mail may be used for communication with its branch offices, suppliers, distributors etc. Tenders, invoices can be sent using EDI. EFT is an effective way of transferring payments.

Global paging systems, mobile telephones, mobile satellite terminals and Inmarsat terminals would be useful for integrating the dispersed industry. Supermarkets or distribution centres can be located in each village and using the latest IT systems mentioned above shortage/availability of items can be easily broadcasted and immediate response may be obtained. This would arrest the migration of people to cities and thereby reducing the problems in cities. An industry in the vicinity of rural area will enhance the chances of improved literacy rate. With a good computer-communication networks movement of goods can be monitored and efficient delivery can maintained on road as well as trains. Data entry, data validation jobs can be given to house-wives, students who can do during their leisure time. This will improve their financial position. Thus industries can be located close to the consumers without loosing present advantages of integrated industry.

7. Travel

7.1 Computer Aided travel System

Computer based Passenger Reservation System (PRS) is a classic example where computing and communication capabilities can be used for public convenience and public welfare. Reservation centres
networked to central reservation system can be opened at different places convenient to the public and people can go to the nearest centre and reserve ticket. Similarly IT systems can be used for Airlines booking, Hotel reservation, Transport arrangements etc. Information regarding schedules, status, vacancy status can be broadcast using teletext. People can see this information at their homes and plan accordingly before going to reservation centre. It can result in enormous savings in peoples' time and travel costs.

8. Arts and culture

IT systems are useful for preserving arts and paintings from decaying. Paintings are made using chemicals. These chemicals decay over the time and loose the actual colour, contrast, textures, shadows, gradients etc. Duplicating these paints in traditional methods do not give good replica. However using the digital techniques paintings can be scanned at ultra high resolution and with the stored digital data copies can be generated at economical cost almost with no degradation from original. Raytracing is another method used to produce lifelike images. Similarly old songs and music loose its fidelity with time unless it is stored in a digital methods. Another area where Information technology can be applied is making high quality animated films and storing on CD-ROMs. Graphics techniques like animation, morphing can be used for making video-books for the school children. Video-books improve the child's understanding. Even difficult experiments can be demonstrated in class rooms with these new technologies.

9. Oil and natural gas explorations

Large volume of data collected from the oil rigs can be processed to analyse the presence of oil and natural gas and approximate depth, volumes etc. Similarly seismic data analysis is helpful in predicting natural calamities like earthquakes. IT is extensively used in these fields.

10. Planning and monitoring

In traditional methods planning is arduous and slow process, as opportunities to compare alternative plans were extremely limited. Due to this the evaluation of plans became largely subjective and the
subjective nature of the evaluation led to many difficulties in achieving a consensus. With introduction of computer communication networks the feasibility of generating large numbers of alternatives of low cost has been established. This giant step has made comparisons and evaluations of plans more objective and on the basis of more complete information.

The agricultural department may collect information about classification of land and compute the production capability of different crops. Along with this, details like irrigation status etc can also be recorded. For agricultural planning, micro level information on rain fall, total number of rainy days, the highest and lowest temperatures and other details relating to climatic features would be required. Using the new technologies a system can be developed to maintain this data and analyze the information. Another system can collect data relating to retention of soil moisture, texture and depth of the top soil, area under saline inundation etc which would be required for soil conservation activities. Another system which may be useful to the planners is mineral deposits or quarries, large water resources, including underground water resources etc. Information technology can also be used to monitor rural health centres and subcentres for health cover, family welfare services etc. Further, like education, drinking water facility, transport and communication facilities, power availability, housing can be monitored effectively using information technologies.

11. Broadcast applications

11.1 Global newspaper

Less than 20 years ago global newspapers were printed at one central place with light weight paper. And this would take a week to reach the reader in some cases. This was followed by printing the news in one or two or may be even three centres around the world but flying the film by courier. Then it moved to satellite transmission of film, and now satellite networks digital transfer takes straight to the print site, including colour, editorial and advertising.

The advantages of this are (i) Cheaper cost and much time saving in preparing to print. (ii) Easy to print shorter runs, smaller number of copies, in more places, which in turn means more immediate delivery i.e. shorter time span between writing and reading.
11.2 Teletext

Teletext is a form of databroadcast. Teletext transmission technology makes use of television network for one-way data communication by piggy-backing data onto the broadcast TV signal without disturbing the on-going television programme. The teletext one-way facility can be used to broadcast general information regarding trains schedule, status, vacancy status, airlines information, weather information, stock prices, news, invalid credit card numbers, public engagements, commodity prices, buy & sell information etc. which is often required by many people. This information is arranged in predefined page format convenient for display and transmitted. Using a simple and economical decoder user can extract the desired page of information on his/her Television set.

11.3 Faxcast

Faxcast is a system using TV or satellite signals to broadcast faxes or data files. The system enables a sender to transmit a document only once to be received simultaneously by any number of subscribers. Tenders, Public notices can be broadcast using faxcast.

National Informatics Centre

National Informatics Centre is India’s premier organisation in the field of Information Technology. NIC provides state-of-the art solutions to the information management and decision-support requirements of Government and the corporate sector. NIC amply demonstrated its experience and expertise in integrating and implementing IT based systems in agriculture, rural health, commerce & excise, industry, passport, transport etc. In order to provide information technology services nation-wide scale, NIC has set up a satellite based computer-communication network, NICNET. With 670 nodes installed NICNET is connecting all district, state and central Government offices spread all over the country. This is also providing back-bone network services to many semi-Government and corporate offices. This network has been connected to more that 150 countries directly or indirectly. The
following is a brief summary of the IT services offered by NIC for the development of the nation as well as society.

* NICNET is being used for monitoring vital socio-economic projects in agriculture, rural health, rural electrification, drinking water supply, housing, immunisation, family welfare programmes etc., in India. This is providing communication for widely spread fertilizer factories, Hydel projects, for laying border roads in mountanous and icy regions where there are no other means of communication. Food corporation of India uses this network for monitoring the food grains movement in the country. Many State Government administrations are utilising this network for collecting and disseminating commodity price rates regularly.

* NICNET is used for emergency communication. NIC was the first to setup communication in Earthquake ravages in Lathur in 1993.

* NICNET was used in 1991 General election and 1993 Assembly elections for collecting election results from widely dispersed counting centres and transporting to a central place for analysis and broadcast purpose.

* NICNET supports database retrieval and updation facilities, optimum utilisation of expensive computer resources and dissemination of information.

* Data in many sectors has been compiled and made available in the form of databases on this network(GISTNIC). The sectors covered are as wide ranging as a Tourist Guide, Hotel and Travel Guide, Schedules of trains, a detailed All India University Education Guide for students, A hospital guide giving the hospital and medical facilities available. This database also gives general economic information related to district profiles, district level economic indicators etc.

* NIC has designed an information system to provide information on the Apex Court to a wide range of users. And this information is accessible from any node of the NICNET at nominal charges. The information is useful for Judges of the Lower Courts, Advocates, Litigant Public.
* Exchange of messages and information among Central, State and
District administrations is done using Electronic Mail service on this
network. Population census information is collected and compiled
through this network.

* NIC has set up CD-ROM production facilities, computers and all
the necessary infrastructure at each state and district centre and
these centres are connected through NICNET. This facilitates
smooth and cost effective implementation of CAPES.

* NIC has brought the biomedical information to the door steps of
Medical professionals in India. In keeping with ever increasing need
for biomedical information in India, NIC entered into an agreement
with National Library of Medicine, USA. This agreement was
aimed at obtaining an easy and ready access to the facilities of the
Medical Literature Analysis and Retrieval System of the NLM. This
is one of the world's largest computer based bibliographic systems
comprising over 28 databases covering Nursing, Dentistry,
Veterinary Medicine and the Preclinical Sciences. NIC provides
access to this database through its country-wide Medical
professionals at a very economical cost through NICNET.

* In India, the teletext service is called intext. This was
implemented by NIC in coordination with Doordarshan. This covers
railway timings, airline timings, National and International affairs,
sports news, financial news, share prices of Over the counter
exchange of India, bullian and silver rates, foreign exchange
forward rates, weather forecast, tourism information etc.

* NIC has launched a National technology development mission to
give a nation wide thrust for development of multimedia solutions.
NIC has already developed a low cost multimedia workstation,
VHS-VCR controller card and multimedia systems for museums,
science centres, training etc. NIC is developing multimedia add-on
cards, multimedia conferencing, hypermedia and multimedia mail
over NICNET. NIC is also developing CD-ROM based interactive
applications for promoting art, culture and tourism.

NICNET is being used for many more IT applications. To meet
the future needs and present demands NIC has planned an Info
Highway over NICNET. This Info Highway with it's nodes
configurable upto 2 Mbps speeds, supports Electronic Data
Interchange, Databroadcast, Video conference, Multimedia applications. This introduces electronic trading to the Indian corporates.

The Video conference introduced on this Info Highway removes hurdles hitherto with travelling of participants. NIC is planning to extend networking facilities to block level, block being the smallest administrative unit in India.

Conclusion

Application of Information Technology has far-reaching effects. One of these is that information technology has the potential to transform the entire economic, social and human relationship structure. Thus the impacts of the information technology are profound and multifaceted, and many of them have a spatial or regional dimension. The successful nations and societies in future will be those that can make the best use of information technology and those who see the information where others see data.

References:


2. Information technology development and implications for national policies, International Journal of Computer Applications in Technology

3. Information technology in developing countries, International Journal of Computer applications in Technology

4. Indian National Satellite system June, 1988
Mr. B. Brahma Reddy is Principal Systems Engineer, in National Informatics Centre, Government of India. He did his M.Tech from Indian Institute of Technology, Madras. Before joining NIC he was associated with the development of stored program controlled type digital telephone exchange. He joined NIC in 1987 and since then he is closely associated with setting up of NICNET, India's Government VSAT network and running it. His interested fields are communication networks, communication protocols and value added services.