

Information Technology (IT) has changed the rhythm of developments in a wide spectrum of areas in the modern world. As compared with other technologies, IT has got not only the power, but also the control built into the technology itself. The fantasy of IT can attract all age groups and mobilize them beyond their control. Therefore, the use of IT for a certain endeavor requires careful investigation of the needs, choice of appropriate technologies as per the communities in the society. This article describes the development of IT over the centuries, evolution of developments in mankind, the current state of the use of IT in Sri Lanka and how IT can be effectively used for national development as per the areas of industry, services, education, culture and heritage, and research and developments. The article has also given a particular emphasis on the need for changing attitudes towards IT education so as to produce graduates for the tomorrow's concept economy. The importance of national level research in IT in local language technologies, service integration, legacy systems, theoretical computing, embedded systems, and mobile technologies have also been discussed.

Information Technology for National Development

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Introduction

Information Technology (IT) has been recognized as the fuel for developments in various sectors in the modern world. In this article, the term IT has been used as a synonym for ICT, which refer to Information and Communication Technology. This is because, the terms IT and ICT are intertwined. IT (or ICT) has gone to ordinary persons and to almost all areas in the world at a tremendous speed which had not been the case with any other technology. In many instances, IT has improved not only the productivity, but also other factors such as quality and accuracy of processes, products and services. More importantly, as with other technologies, IT is becoming cheaper and also friendlier day by day. The use of IT has also been a more of a fashion than a requirement in some contexts. There are also instances where people have not used the appropriate IT, which though the latest may be unnecessarily expensive. Furthermore, some people find that legacy systems are better than the modern IT solutions, in terms of development cost and maintenance. It has been claimed that IT had resulted in a negative impact in students' education, attitudes, values, etc. On the other hand, IT has increased the capability to access IT, which has resulted in increasing the gap between persons with and without access to IT. This



is known as the digital-divide. The government needs to ensure equality of opportunities for the general public to use the power of IT. It is not possible to say that the use of IT in all sectors can develop a country, because how one uses IT and which IT has been selected for use are crucial questions. This article concentrates on the importance, danger and affective use of IT, and on its fantasies.

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The article first describes the historical evolution of IT, in relation to specific milestones in the development of

mankind, followed by a review of the current state in the use of IT in terms of significant issues from a national viewpoint. Finally the article identifies various areas, namely, industry, services, education, culture and heritage, research and development, which have a significant role to play in the development of a country.

Among key issues are, how industry and universities should work together for national development, the need for research for promoting theoretical areas of computing, and the use of state of the art software technologies such as Artificial Intelligence techniques for national development.

From a national view point, school children must learn IT as a means of expanding opportunities for learning, but this should not be at the cost of neglecting the respective subjects. It has also been pointed out that undergraduates who study IT should not merely target at code writing for the software industry, but should also learn about theoretical aspects of computing leading to a different computing culture for national development.

Overview: Historical Developments of IT

Ever since civilization of mankind, people have been acquiring knowledge through their experiences relating to information of phenomena around them, and includes inventions of artifacts that make their lives easy. Acquiring knowledge is a fundamental requirement for communicating with the environment and society within which people live. The creation of artifacts itself is a means of communication. People communicate not only formal information and knowledge, but also experiences, feelings, needs, etc. Consequently developments in communication strategies have immensely contributed to the advancements in discovery of knowledge and creation of artifacts to meet the needs of humans. For instance, use of symbols such as letters and numbers

for communications has resulted in developments in all spheres. People gathering knowledge over a period of time, tends to think of preserving and storing what they acquired, with the result that knowledge becomes a kind of wealth of people.



Key technologies such as printing press, abacus, gramophone, telephone, radio, television and modern computers have played a big role in communication technologies. Communication increases the capacity of interaction among different entities, and facilitates the creation of more and more information and knowledge. When the world accumulates more knowledge, there is a natural need for storing, manipulating,

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and interpreting of information and knowledge. This resulted in the birth of a special kind of machine called the computer which was invented by Charles Babbage in 1832. In the early days, computer was developed by analogue technologies. The computer postulated the

idea of programmable machine that can be instructed to work as any machine. As such a computer is a machine of machines.

Birth of digital technologies in late 1940s was a breakthrough in design and development of machines, that resulted in the development of what is called the modern digital computer. Subsequently, a huge collection of analogue devices such as radio, television and telephone came up as digital equipment. With the introduction of digital technology, all technologies began to use a common language, thereby introducing a kind of digital convergence in the entire world. In the context of digital convergence, the marriage between communication technologies and the computer technology was significant, and Information Technology (IT) emerged as a new subject area that was used in almost all areas in the world. Since IT cuts across virtually all domains, the developments and needs in other areas

has strengthened the value of IT, and this is why people talk in terms of IT for education, IT for manufacturing, IT for industry automation and IT for even national development at a large scale.

Milestone in development of mankind

In order to understand how IT can be used for national development, first one must have a clear idea about what is meant by 'national development'. This concern is of great importance, since it has been a fashion to use IT in some contexts even when there is no real need to use it. Sometimes, it is apparent that people go for IT, just for the sake of using IT, without considering the appropriateness of the selected IT for the particular task. In fact, inappropriate use of IT for a certain task is more detrimental than not using IT at all. For instance, introduction of calculators for secondary education amounts to killing the students' thinking ability, yet gives training on 'which button to press'.

Agricultural economy

In the early days, people began with the agricultural economy where persons with more lands and manpower were the richest people in the society. Colonization also took place due to the importance of lands in that era. In this era there was no technology to maximize the profit in agriculture, and since agriculture was practiced intensively on an individual basis, know-how constituted knowledge. However, the further development had to await the development of modern science. The agricultural economy was full of natural resources and know-how knowledge. People in this era lived in contentment, and consequently there was no competition to consume environmental resources.

Industrial economy

The agricultural economy was followed by the industrial economy, where capital-intensive large-scale machinery-based productions generated huge financial profits. This era was marked by the development of machinery to do almost everything, including agricultural tasks, making agriculture an industry, and where scale of operation was the feature. This situation discouraged individuals from producing things in favour of buying goods developed in large scale. Although the industrial economy contributed in achieving the development of the modern world, it led to extensive unsustainable exploitation of natural resources depriving future generations of their means

of well-being and livelihood. In fact, modern science emerged during this era.

Information economy

Developments in Science and Technology led to an era of information economy where those with access to information are the richest. This is the era of Information Technology. It can be said that information economy effectively started only after early 1950's, when lands, human and capital were of less importance than access to information. For instance, availability of physical space for a computer table and a chair with connectivity to the Internet, enables one to earn money. The Internet was thus the driving force for the information economy, creating a wide range of job opportunities in information gathering, storing, processing and sharing. Although information technologies such as radio, television, print media have been used for centuries, information economy gives a value to information more than ever before.

Knowledge economy

As time went on, the Internet was flooded with much information, resulting in the emergence of other knowledge sources such as e-books and various means of publication. This led to the need for screening huge reservoirs of electronically available information, where a culture in information was of less importance than knowledge from such reservoirs of information, and this led to what is called knowledge economy. Here one can be rich not by having access to information, but by creating knowledge from information. Information is different from knowledge. For instance, a book which provides the same information to everybody can be expressed in different models of knowledge by different people. As such, knowledge has a personal element, and individuals play a key role in the knowledge economy.



Both industrial economy and information economy tend to reduce the human element, whereas knowledge economy tends to humanize the development.

Concept economy

Mere manipulation of already available information and knowledge does not lead to the discovery of new knowledge. This means that knowledge economy is beginning to fade away in favour of what is called concepts economy, and people with new ideas (concepts) and methods of doing things, will be the richest in tomorrow's world. This does not mean that the concept economy is the ultimate achievement, yet it will continue for at least another decade, and national development must be geared for tomorrow's world. In simple terms, the country must be attuned to new ideas and novel approaches to sustain in an ever changing world. This does not mean that existing needs should be ignored. For instance, it is not necessary for all IT graduates to be software developers to meet today's IT demand.

It is clear that Information Technology has played a key role beyond the information economy. In fact, Information technology has contributed to expand the boundaries of agricultural economy and industrial economy too, though it is not clear whether the contribution from IT in such areas has been fruitful. In some instances, as in the case of bio diesel production, it is clear that the world's food security situation has been endangered. Therefore, the use of IT must be introduced and expanded with great care.

Current state of IT in Sri Lanka

Sri Lanka has already entered into the use of Information Technology at various levels, and is expanding its horizons from all fronts. In fact, the government has declared the year 2009 as the year for IT and English. In order to ensure further expansion it is necessary to explore the current position in the use of IT in Sri Lanka. In this context only four major areas have been taken into consideration; IT education, IT in education, IT industry and IT in industry. It is hoped that matters arising out of

these topics would form a basis for suggestions on how IT can contribute to the development of a country.

IT Education

Initially let us review how manpower creation for the field of IT has been practiced in Sri Lanka. Here the term IT refers to areas such as Computing, Computer Science, Computer Engineering, Information Technology, and Information and Communication Technology. In tertiary education, these areas have been established over the last 25 years, and almost all universities offer such subjects for undergraduate and postgraduate degree programmes. Majority of our graduates join the software industry and begin as software developers and proceed to managerial levels. Since most software companies in Sri Lanka have their parent companies abroad, they are bound by instructions of the principals in terms of what designs and technologies to be used. In almost all such companies, technologies are limited to databases, web, multi media, .NET, etc. To meet such industry needs, local students are compelled to learn such technologies over the other areas in computing. For example, very few university students have shown interest in areas such as Operating Systems, Automata Theory, Compilers, and Theory of Computing and Intelligent Software technologies. This situation imposes limits on postgraduate studies as well. Such students are ignorant about the value of theoretical computing areas on which all new technologies have been developed. Those who develop new technologies are the ones who are knowledgeable about theoretical computing, and also who are able to control the future of software development.

This situation applies also to students following degrees offered by private institutions in collaboration with foreign universities. As a result, majority of graduates employed as software application developers rely on the products of developed countries. A partial danger in this practice has been exemplified by the lack of IT jobs and sustainability in IT positions, due to the recent global financial crisis.

If there was competence in areas such as compilers and operating systems, Sri Lanka would have been in a more stable situation in the world of IT. Netherlands would be a good example of such success and despite being a small country in Europe, they are so strong in theoretical computing areas, and dominate world-wide education in those areas. A country need not to be physically large to achieve development in this manner.

IT in Education

In secondary education, Sri Lanka has just commenced offering ICT as a common subject at GCE (A/L), although not been finalized at the time of writing this article. Obviously, at this level, objectives must be different from those at the university level. If it is to be a common ICT subject to all streams at GCE (A/L), the ICT subject must focus on the theme “IT in Education” and not on “IT Education”. Further, to a common ICT subject for GCE (A/L), it is appropriate to have IT itself as a subject for the Science stream. Those who follow the proposed common ICT subject must be able to use IT for enhancing opportunities to learn other subjects in the respective streams.

This knowledge may be useful for IT applications in home and office. It should also provide a basis for those who wish to obtain IT education at the university level. Some may opt for technical education in various areas, which is important for the development of a country.

IT at secondary education must be introduced with caution, because over the last few years there was a tendency for school children to over estimate the power of IT, and consequently neglect the learning of other subjects. Some students tended to follow certificate and

diploma courses in IT, ignoring university education, and consequently failed to improve career prospects. Such ignorance on the significance of IT in students’ life has narrowed down their expectations in life, and also led to under estimation of the value of subjects like mathematics and science.

Today’s world is highly commercialized and has neglected aspects pertaining to quality of life. Parents

and teachers must be aware that modern IT with business minded opportunists can easily lead school children into directions which can cause dissatisfaction, stress, depression and other negative aspects of life. It is well known that the entertainment industry including games has been a major application area of IT. Since school children are not mature enough to understand the world, they can be easily duped by unscrupulous people to participate in scurrilous business by showing a fantasy of the world through modern IT.

Therefore at the school level, IT must be a means of expanding opportunities to learn other subjects, as well as to learn more about the environment and open out the world more fully. Secondary level students

should be made aware that one cannot survive with IT knowledge alone, and students should learn other subjects too. As an analogy, knowing English without an ability to communicate in English will not be the qualification to live in London. IT knowledge becomes useful only if one knows how to apply it to other subject areas.

IT Industry

As an industry, IT established itself world-wide at a tremendous speed. No other technology could establish



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so quickly. If companies in Sri Lanka produce software according to specifications given by parent companies, then they do not have a choice in technology and development approaches. Until the recent global financial crisis, these companies had no concern for software development for local needs. Although Sri Lanka can earn foreign currency immediately through this avenue, in the long run the country may not be benefited by this strategy, because it prevents development of individual capabilities and the country at large. There are a few software companies that cater to the local market. This must be encouraged.

On the other hand, IT companies with foreign principals do not have autonomy in the use of technologies, and hence have restricted themselves to traditional uses such as databases, web, .NET, multi media, etc. There are hardly any foreign-based Sri Lankan software companies that use modern technologies such as Artificial Intelligence, Agent Technology and Ontology for the development of software. It is a fact that persons in foreign countries write layers of intelligent software for the base systems developed by traditional technologies, in countries like Sri Lanka, which makes our people work like intellectual labourers. What happens here is that foreign-based software development companies keep local developers out of new software technologies, and confine them to traditional techniques. In order to counter this trend before it is too late, local software companies should use their autonomy in the choice and development of technologies.

Sri Lanka's present IT industry has also not ventured adequately into software development areas such as operating systems, compilers, game programming and simulations that embed physical laws of gravity, electricity, different kinds of motions, etc. It has to be noted that games are no longer played for fun, but can be promoted as intellectual exercises for making strategic decisions. Game programming comprises a nice blend of Artificial Intelligence techniques and 3D graphics.

IT industry should not be limited to software development, but must lead to designing and development of various hardware solutions including computer networks on a large scale. Human resources development in IT has also been a major concern of the IT industry. While there are many institutes that offer certificates and diplomas in IT, only a few institutions offer IT degrees in collaboration with foreign universities. In the recent past, IT training industry has been growing at a much higher speed than the software development industry. Even where the software industry could become unstable, the IT training industry could still survive. It is evident that foreign education has become one of the largest businesses in the world, and IT education has been one of the areas with the highest demand. Unfortunately, most of these programmes produce IT graduates who can write software codes with only a minimal knowledge in mathematics, statistics, science and theory of computing. This situation has already blocked the career development of many IT professionals.

IT in industry

Thousands of companies world wide especially in developed countries have used IT extensively in industries from document processing to industry automation, as it has led to significant increases in productivity. In Sri Lanka majority of industries are at their infancy in the use of IT in industries. The progress of a country has a strong bearing on the development of industries. Hence the use of appropriate IT in industries must be promoted in the context of national development. For instance, energy saving at home and office, ensuring security systems, as well as monitoring and controlling systems through mobile devices are common mechanisms that can be achieved by modern IT, while traditional industries such as agriculture and small scale productions can also be strengthened through various experimental set-ups and systems for monitoring and control using modern IT. It should be noted that industries require infrastructure development at a cost. Sri Lanka has a natural infrastructure set out for expanding agriculture which has not been exploited, but which could have used IT towards national development.



Use of IT is not limited to the manufacturing industry, but plays a key role in provision of services in areas such as health, security, education, transport, etc. In fact some services have already been reasonably computerized, and solutions are in use. However, one problem about these solutions is the lack of IT literacy among the general public on the use of such systems. But it must be emphasized that the IT literacy issue can also be addressed by the use of appropriate technologies because, such technologies are available for use in IT services by those with little or no knowledge in IT.

The training industry (education) can also be strengthened through the power of modern IT. This goes beyond the use of multimedia systems or allowing access to documents loaded into Moodle like learning environments. Use of IT for education should not be considered as a way out for the teachers to skip the normal teaching job by merely concentrating on power point displays, video, audio and some CDs. Instead, IT itself should be applied to use the teacher effectively. There are now intelligent technologies to emulate the role of a good teacher even in an on-line environment.

IT for National Development

In previous sections, the background for discussing on how Information Technology can be used for national development was set out, perhaps without a particular emphasis on how that can lead to national development. Some IT initiatives may not contribute to national development, while in some instances, the most appropriate IT may not have been used, instead some fashionable IT just for the sake of using it.

What is National Development?

It would be apposite to highlight what is meant by national development in a global sense. Obviously, it is more than the economic development of a country, since financial stability does not imply development in all aspects. National development of a country must ensure better quality of life of the citizens both from short term and long term perspectives. As it is doubtful whether people have identified all dimensions of development, it would be necessary to discuss the use of IT for national development through the following paragraphs.

Increasing productivity in industries

Countries are expected to provide consumer products for the citizens. Some of these may be imported, while others may be locally developed and also exported to other countries. The production process involves many aspects that include humans, materials, machines, products and also waste products. There are also procedures to describe operations. IT can be used in industries to handle a series of tasks ranging from document processing to autonomous control of machines. The country can develop small appliances for household and office use, and these can be produced as students' projects at the university level through sponsorship from the industry. These include IT based security systems, safety systems, energy saving devices, etc., which are produced even now by various companies.

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Industry should collaborate with universities to develop IT based solutions for their products, where relevant R & D can be done at the

university, with financial assistance from the relevant industry. Such university/industry collaboration will also help the industry to get what it wants. On the other hand, such collaboration will help companies to create job opportunities. Universities are well equipped with knowledge of the latest technologies that can be applied through the industry partnership. Unlike foreign-based software companies, the decision in the type of technologies to be used should be with the universities, because when necessary, universities can do research and find the best IT to for a certain task. Otherwise, developed countries will try to dictate terms for their survival at our cost.

Expansion to access to services

Apart from industries, countries need other services such as health, education, defense, transport, etc., some of which are already computerized world-wide. In general, providing IT solutions for services is less complicated than those for the industry, because services generally need only software solutions, while industry may need both hardware and software solutions. In fact, office automation IT solutions can be used not only as a service

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application, but also as an integral part in the industry. IT solutions for services can also be done as students' projects, where university services can be solicited by- passing the industry. Obviously, this kind of services can be provided by locally established software companies too. However, an individual or small industry need not go through a software development company; instead they can approach a university to get an IT solution done through students' projects.



It should be pointed out that university students are well equipped with modern IT that can be used to provide IT solutions for dynamically changing systems which require evolving solutions. Applications such as fault diagnosis and inventory control can be modeled by these techniques at very low costs. These intelligent techniques are not used by the local IT industry, although university students are capable of using those for the development of IT solutions. These technologies can also be used for other requirements such as industry automation.

Educating the public in required IT

IT for national development has a strong relationship with how society is educated about IT, ensuring high IT literacy. The need for IT education at the secondary and tertiary education level has already been stressed. In tertiary education various vocational, degree programs and postgraduate degrees pertaining to IT are on offer, while at secondary education ITC is available as a subject at GCE (A/L) as well as at GCE (O/L). There

are also various certificate and diploma courses to increase the IT literacy of the general public. Yet surveys show that IT literacy in rural communities is extremely low.

It must be pointed out that IT is not limited to personal computer applications, but include television, radio and mobile phones, which are means of Information Technology. In fact, mobile phones have penetrated into all segments of the society at a higher speed than personal computers, making mobile applications to be of a higher utility value in the use of IT by rural communities. The ability to use appropriate IT by different communities is an important consideration in using IT for national

development, and this depends on the nature of the job and kind of the task. While, a cashier of a small vegetable shop would prefer a calculator, a medium scale shop requires a computer based billing system. People in remote areas who wish to benefit from computers, may go to an Internet café in the area. This may not be a simplistic solution, because

in remote areas, people may prefer to read newspapers, which has been the traditional practice for generations. No modern technology can replace books, newspapers, etc., as sources of information.

Therefore, from a national development perspective, IT education/literacy must be provided on the basis of requirements at different levels.

Protecting culture and heritage

All countries value and protect cultural traditions and heritage regardless of other changes in the world for the greater benefit of future generations.

From the definition itself, the primary objective of IT is to preserve information. As such, modern IT can be used to preserve information on culture and heritage enshrined in scriptures, photos, text, expert systems, videos, sounds, etc. More importantly virtual reality technologies can be used to do 3D simulations

of archeological sites. These are likely to have a high tourist attraction, because cultural traditions and heritage are valued by tourists and could be pictorially depicted using modern IT.

However, modern IT can also misrepresent cultural traditions with disastrous consequences on attitudinal and value systems, and its use here therefore must be through proper education

It is true that if the power of IT is to be used by all communities in a country, relevant technologies must be available in national languages with facilities to access the world knowledge in any language. Although Sri Lanka is behind time, many European and Asian countries have done research to introduce computer based language translations from English to other languages.

Promoting research and development

National Development must be based on the outcome of relevant research and development (R&D), and vice versa. Hence a comprehensive national policy on Science and Technology encompassing all major aspects that need research and development must be set out. Unfortunately as of now Sri Lanka does not have such a national policy. This paper identifies some major areas where R&D in relation to IT should be emphasized for national development.

Local Language technologies

It is true that if the power of IT is to be used by all communities in a country, relevant technologies must be available in national languages with facilities to access the world knowledge in any language. Although Sri Lanka is behind time, many European and Asian countries have done research to introduce computer based language translations from English to other languages. However, there are now some initiatives taken by the Universities of Moratuwa, Colombo, Sri Jaywardenapura, as well as by the Information and Communication Technology Agency in Sri Lanka. Nevertheless, there is a need for promoting this line of research at the national level, while noting that IT itself can provide technologies (e.g. Natural Language Processing, and Agent technology) to address the language barrier for accessing the world knowledge.

Service Integration

The world today is full of sources of knowledge and services that are easily accessible through Internet. Nevertheless, information overloading resulting in people not being able to find effectively what they want, and having to spend time surfing the Internet can be a constraint. As such, there is a need for integration of related services and knowledge in order to facilitate a search even for those who may not know how and where

to look for information. For example, there are many systems providing agricultural information in Sri Lanka. However, a person unaware of these sources will spend time to browse the Internet with no guidance. This problem applies even in the field of higher education and in career guidance.

Modern technologies such as Ontologies can be used to develop sharable comprehensive knowledge structures for service integration. Such ontologies are now available in some areas like medicine and automobile industry. Sri Lanka must also develop ontology for integrating services such as health, security, transports, etc. There are open source software (e.g Protégé) available for the construction of ontology. Nowadays, IT such as Multi Agent Systems is available for people to access the world even if a person does not know much about a certain field and available source of knowledge. These systems can also be developed locally. Our graduates are equipped with such technologies.

Expanding on legacy systems

A company which may have a transaction system that had been developed using old technologies, could if they so desire, expand the systems to do some more work. Development on the legacy systems without touching the existing set up is no longer an issue for modern IT. At present there are technologies to develop software layers on legacy systems to improve the performance. For this purpose, a series of Artificial Intelligence techniques including Expert Systems, Artificial Neural Networks, Genetic Algorithms, Fuzzy Logic and Agent are available, in which university students are knowledgeable, and have completed undergraduate projects.

Initiatives to improve existing IT systems without developing new systems from scratch should be a national concern, and adoption of new technologies

blindly by ignoring how far the old system could be used as it exists, is a must.

Embedded systems

Sri Lanka has been developing various electronics equipments and circuits for some years, and it is time to go one step ahead and develop computerized devices, which may be called embedded systems. Some of these may be embedded in house hold appliances, like energy saving devices, security systems, and other monitoring and control devices. Technologies for such systems are relatively cheap, and one solution can be reproduced for use by many clients. In fact, through self learning experiences some school children have produced hardware solutions that can be improved to develop useful embedded systems. These improvements can be done not only by IT persons, but also by persons in physics, electronics engineering, electrical engineering and mechanical engineering. The research in embedded system can set up an environment for automating small and medium scale industries in the country. At present, in Sri Lanka, small and medium scale industries do not use the power of IT for computerizing their processors.

Theoretical Computing

At present IT has become an applied technology in Sri Lanka, and consequently many use the software developed tools and techniques produced in foreign countries without developing such software locally. It is time that local IT personnel get into theoretical side of computing and start developing programming environments, compilers, specific purpose operating systems, system integration applications, game programming, software verification systems, etc. Although such developments may not give immediate large scale financial benefits it ensures the long term sustainability, continuous flow of income, and certain authority in the field of IT. It is likely that only a limited number of local graduates will be interested in such work, yet they must be encouraged. There is historical evidence that people in countries like India, Sri Lanka and China are naturally gifted in mathematics-based algorithmic thinking. Although modern science was introduced in the West, key developments in mathematics took place in Asia. For instance, although the numerical symbols (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) used by the entire world belong to Hindus and Arabians, the concept of zero introduced to the world by Indians can be likened

to the concepts of empty-set in Set theory and empty-string in Compiler theory. Therefore the Asian talents in mathematical thinking must be resuscitated in students to enhance their intellectual power for theoretical areas of computing.

Mobile computing

With the ever increasing use of mobile devices, especially mobile phones, research and development in this field would be necessary because this would be a potential approach to disseminate the power of IT to every citizen of the country. In this context, mobile applications targeting rural communities should be in local languages. Hence language technology development must target mobile devices as well. Already, there are some applications developed through student projects, but a national level encouragement is needed for further development of such work.

Summary

This article reports development of Information Technologies over centuries, with a particular emphasis on how the digital convergence took place in bringing all technologies under one umbrella. The evolution of economic developments has also been discussed in the context of producing graduates for tomorrow's concept economy. The current state of the use of IT in the country has been reviewed and the limitations and needs for changes have been identified. Finally, the article has shown the directions along which IT can contribute to national development. Among other issues, the need for research and development in IT at national level has been highlighted. The need for industry-academia collaboration for promoting the use of IT for national development has also been discussed. In particular, research in local language technologies, service integration, legacy systems, theoretical computing, embedded systems and mobile technologies have been identified as issues of national interest.



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