

Guest Editorial

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Technical Professionals in the 21st Century

Technical professionals are key personnel in any country responsible for its economic progress and prosperity, leading to increased comfort level and satisfaction of its society at large. This is no exception in India as well.

As *BITES* can play a major role in developing a cadre of well educated and trained IT professionals to meet the 21st century challenges in the country, this Guest Editorial for the *BITES News Letter* has been devoted to the topic of *Technical Professionals in the 21st Century*, with a view to strengthen this cadre.

21st Century Challenges:

We are already in the closing years of the first decade of the 21st century, which is regarded as the *Knowledge Age*. In this period, we have been witnessing many challenges before the technical professionals in India, like:

1. Rapid pace of technological change worldwide, with a shrinking time scale for new developments and also for obsolescence, leading to:
 - Increase in investment on R&D in industry and other sectors;
 - Renewed thrust for broadening and deepening of the *knowledge* base;
 - Innovative products and services, based on contemporary technologies;
 - New approaches to protect Intellectual Property Rights(IPR); and,
 - Enhancement of abilities to manage change, so frequent now a days.
2. Globalization of Indian industry, leading to:
 - Rapidly developing global market place,
 - Comprehensive restructuring of industry for enhancing efficiency;
 - Encouraging mergers and acquisitions to increase profitability;
 - Increase in world wide mobility of technical professionals; and,
 - Growth of competitive environment in the country, now so necessary.
3. Emergence of new career opportunities for technical professionals, leading to:
 - Widening diversity in the job market- from research to production/services;
 - Multiple careers, one after another in one's life time, with shortened time cycles;
 - Demand for broad-based, flexible education in multi/inter disciplinary subjects;
 - Emphasis on PG courses, research training and institute-industry interaction; and,
 - Advances in learner-centric programmes and life-long learning, so necessary now.
4. Penetration of IT in all sectors of the technical profession, leading to:
 - Increased demand for IT-based solutions to industrial problems;
 - Expertise in emerging IT developments to solve complex technical problems;
 - Growing need for competency in IT and IT—enabled technologies/services;
 - Adoption of IT, Intra/Internet and related developments in technical education; and,
 - Improved access to world wide information/data bases and *knowledge* centres.
5. Significance of social/environmental concerns in the technical context, leading to:
 - Better understanding and acceptance of social responsibilities;
 - Protection of endangered environment and depleting energy sources;

- Seeking environment- and energy- friendly solutions to technical problems;
- Wealth generation using environmentally benign & energy efficient techniques; and,
- Compulsory Environmental Impact Analysis (EIA) in the global and social context.

These challenges require appropriate reorientation of technical education in the country, so that the technical professionals in the 21st century are equipped to face them with determination and are ready to contribute to national development in a significant way. Some suggestions in this connection are as follows

Some Suggestions:

These include laying of special emphasis on educational and training programmes of technical professionals, for being able to prepare them well to demonstrate abilities like:

- Effective application of *knowledge* of mathematics, science and technical subjects;
- Planning and design to conduct scientific and technical experiments;
- Analysis and interpretation of scientific, technical and economic data collected;
- Design of parts, subsystems, systems and/or processes to meet specific needs;
- Identification, formulation and solving problems using simulation or otherwise;
- Use of techniques/tools including software as required in modern practice;
- Effective communication and leadership/participation in team work;
- Fulfillment of professional and ethical responsibilities;
- Sensitivity to environmental and energy concerns;
- Planning and development for life- long learning.

Prof. R. Natarajan

As the development of above attributes, intellectual skills and knowledge that can equip the technical professionals to contribute to the society through productive and satisfying careers as *innovators, decision makers and leaders* in the global economy of the 21st century is the primary goal of the technical education system, it is necessary that suitable steps are taken to enhance the quality, standard and relevance of its programmes and activities. These call for improvements in:

- (a) Selective admission of students, so that both merit and aptitude for the chosen technical profession are given due consideration;
- (b) Faculty recruitment and training, so that qualified teachers trained in good teaching, technical leadership and motivation of students are available;
- (c) Instructional/laboratory facilities and related physical infrastructure including Computer Centre and Library, so that they are at the contemporary level;
- (d) Curriculum, so that it is well balanced with emphasis on basic subjects, breadth and depth in the chosen subject areas, practical/project work and built-in flexibility;
- (e) Examination system, so that it is capable of proper achievement testing, evaluation and certification in a short time.

The introduction of appropriate structural transformations in the technical education system in the country can be of considerable use in this context. These include: academic autonomy at the institutional level, teaching-learning process on modern lines, continuing education and life-long learning opportunities, dynamic interaction with industry and the world of work and generous use of Information, Communication and related technologies in day-to-day working of the institutions. We expect *BITES* to play a key role here and enable the technical professionals in the country to steer India to become a *Knowledge Society* in a short time, marching forward as a developed nation.

Prof. B.S. Sonde

From Chairman's Desk



Education vs Training

It is generally agreed that Education involves the acquisition of knowledge and attitude, and hence belongs to the cognitive and affective domains, while Training deals with mental and manual skills acquisition, and hence to the psychomotor domain.

Hamish Mc Rae , in his *Book, "The World in 2020 – Power, Culture and Prosperity"*, points out that "being well-trained is not the same thing as being well-educated, and vice-versa", and identifies as one of the crucial competitive issues in service industries "whether it is necessary to have a well-educated workforce, as well as a well-trained one". He contends that "it is perfectly possible to provide high-quality services with poorly-educated people, provided they are well-trained", and points to McDonalds as "the best example of the way a high-quality service can be mass-produced, sometimes using people with very little education, to deliver consistent quality in any country in the world". Similar trends are discernible in other sectors, such as financial services and health care, where increasing use of paramedics and computer diagnostics enables cost reduction.

It has been recognized that the way to increase productivity in manufacturing and to enhance efficiency in services is to increase the general levels of education of the workforce.

In the context of higher education institutions, the faculty members are required to have acquired Education in terms of advanced degree qualifications (for domain knowledge) and to have undergone Training in terms of pedagogical Skills (for effective Teaching).

Prof. R. Natarajan

Faculty Development Workshop on Biologically Inspired Computing

Venue: Dr. Ambedkar Institute of Technology, Bangalore

Date: 9th May, 2009

Host: Dr. Ambedkar Institute of Technology, Bangalore



BITES in association with Dr. AIT conducted a one day Faculty Development Workshop on “Biologically Inspired Computing”. The Speakers were Dr. Wim Hordijk, Wandering scientist, teacher, and consultant from Oxford University, UK who has got extensive knowledge in Genetic Algorithms, Neural Networks, and Cellular Automata and Prof. Narasimha Murthy, Professor at IISc, Bangalore who specializes in AI and clustering techniques in Genetic algorithms.

Biologically inspired computing is a field of study that loosely knits together subfields related to the topics of connectionism, social behaviour and emergence. It is often closely related to the field of artificial intelligence, as many of its pursuits can be linked to machine learning. It relies heavily on the fields of biology, computer science and mathematics. Briefly put, it is the use of computers to model nature, and simultaneously the study of nature to improve the usage of computers. Biologically inspired computing is a major subset of natural computation.

A genetic algorithm (GA) is a search technique used in computing to find exact or approximate solutions to optimization and search problems. Genetic algorithms are categorized as global search heuristics. Genetic algorithms are a particular class of evolutionary algorithms (EA) that use techniques inspired by evolutionary biology such as inheritance, mutation, selection, and crossover (also called recombination).

Dr. Hordijk gave an overview of Evolutionary Computation. He explained that Genetic Algorithm (GA) is a stochastic search method that evolves optimum solutions by maintaining an initial population of candidate solutions and creating new generations by repeatedly applying selection, crossover and mutation. He gave example of how GA can be applied to Traveling salesman problem. He informed that GA techniques have found widespread applications in Scheduling, Coding methods for data transmission, Robotics, stock market prediction and Airplane wing design. Some of the advantages of GA are that they are conceptually easy with little or no mathematics required; easy to implement and parallelize and can be applied to a wide range of problems.

Some of the limitations include difficulty in designing fitness functions; no unique way of implementing operators and set parameters and no guarantee of convergence and requires Trial and error approach on many occasions.

Prof. Narasimha murthy explained how clustering can be used in Genetic Algorithms. He also gave brief description about types, stages, usage of the clusters.

BMSCE is BITES New Institutional Member



On 25th of May, BMS College of Engineering (BMSCE) joined the elite club of BITES institutional members. Prof. Mallikarjuna Babu , Principal, BMSCE handed over the membership cheque to Prof. R. Natarajan, Chairman, BITES. Prof. Guruprasad, HOD, ISE Dept, BMSCE and Prof. Indiramma, HoD, CSE Dept. and Prahlada Rao, Executive Director, BITES, were present on the occasion.