CHAPTER III

Relationship between Computer Knowledge and Skills and Career Opportunities in Business Administration

1. Modern Business Administration influencing demand and supply of computer experts.

2. The Demand and Supply aspect of employment for the computer careerists

3. Role of Computer in the process of development

4. Personality Development and Computer Experts’ Creativity in Computer Management

5. Orientation programmes for careers in Computer based on Industry-Institute Interaction

6. The Role of HRD Managers

7. A career in Business Administration with computer knowledge and application-skill
1) Modern Business Administration influencing demand and supply of computer experts.

Modern Business Administration is the sum total of planning, organization, control and successful actual performance. As defined by Prof. Louis A. Allen, “Business Administration is the sum total of functions performed to attain business objectives. Success in the performance of business operations is measured by profitability level which enables a business unit to survive and progress in a competitive market. In effective business administration, there is active and fruitful direction and optimum utilization of resources manpower, money, materials and minutes”. In other words, resources are mobilized, organized and controlled in a planned manner in the administration of business. Business administration is thus, a determinative and executive function performed for setting targets, objectives and formulations and execution of policies with maximum proficiency. Human efforts are directed to enable a business unit to survive and expand in the competitive world. Keeping abreast of facing ever growing challenges in different times is the key to successful business administration. Business Administration is not only an economic process but also a social, cultural and educational process based on effective planning and control, implying, the determination of installation and carrying out of procedures and programmes whose revision is necessitated by unforeseen changes.

Business, like man, is the victim of circumstances which constantly creates challenges to be faced by managers of all departments in business viz production, finance, marketing and personnel. These challenges are created by macro economic, political, social and educational factors. In modern times, national and international environment created by globalization, privatization era of restrictive policies on free trade, quality, price responses, technological developments in the 'Computer age' create problematic situations. The demand of the hour is 'new creativity in management' as indicated by the following chart.
INDIAN MANAGEMENT ETHOS
Indicating the 'stuckness' loop, satisfaction block and mechanisms for 'going beyond the obvious'

Systems model of problem-solving
indicating the 'stuckness loop, satisfaction block, and mechanisms for going beyond the obvious'

![Diagram](image-url)
In response to the challenges, managers of various departments and HRD managers in particular have to be active and creative in anticipating these challenges and making suitable changes in and execute their HRD policy and adjust to the changing situation for survival and progress of a business unit in a competitive world.

It would be an interesting study to find out whether the profile of the candidates (Students of educational institutions and of management institutes) fit in the above graph of systems model of problem-solving. If the prospective employees (computer expert-cum-graduates and under graduates) develop ability to 'go beyond obvious', the benefits derived by the employers from such proficient employees have been as follows:-

<table>
<thead>
<tr>
<th>Proficiency level</th>
<th>Benefit from investment in human resources</th>
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<tbody>
<tr>
<td>60% to 100%</td>
<td>20%</td>
</tr>
<tr>
<td>40% to 69%</td>
<td>6%</td>
</tr>
<tr>
<td>Less than 40%</td>
<td>-9%</td>
</tr>
</tbody>
</table>

This suggests that "Quality Revolution" is necessary and the Indian employers' role in the global acceptance of Indian Software is significant. A coordinated effort between the employers' initiative in recruiting 'quality' personnel and consistent efforts made by educational institutions to upgrade student profile is necessary for creating quality revolution in the field of employment.

There have been examples of concrete efforts in this direction made by recruiting employers. The glaring example is that of 'Tata Consultancy Services', who are the best employers in the IT sector and who have been awarded "The Best Employer in India for 2004".
2) The Demand and Supply aspect of employment for computer careerists

Demand for and Supply of the computer experts are influenced by the 'Quality Revolution' during the period 2000-2005. Management executives and computer experts as 'Quality Products' are in demand and are supplied accordingly by the educational institutions (schools, colleges, universities and specialized management institutions) which have dropped the traditional educational approach of producing number of 'graduates' in the various faculties. Mere possession of a 'degree' of any faculty does not qualify a candidate to get a lucrative job opportunity created by the employer. Unless formal education is supplemented by computer knowledge and skill in application, job opportunity is simply not available. 'Quality Product' has become the keyword in the employment market of world, industry, and trade. This term is in vogue also in the field of (public) government administration (bureaucracy). The activities of all the departments in business units and their HRD policy have been oriented towards the 'Quality Revolution'. Quality Management has become a must for managing time, money and manpower. In countries, like Japan and USA prizes and merit certificates are awarded to the companies showing proficiency in 'Quality Management'. (e.g. Tata Consultancy Services getting such an award) complacency and compromise in respect of quality of product and manpower can never be permissible in a competitive global market. Companies continuously introduce different codes for computer skill categories. For example, Tata Consultancy Services which plays a seminal role in the global acceptance of Indian Software for achieving Enterprise-Wide Maturity Level look for Team Members / Team Leaders / Project Leaders / Project Managers for their own delivery and Solution Centres in Pune.

In response to this type of demand, educational institutions also provide computer education for supplying the 'Quality Product'. For example, Maharashtra Knowledge Corporation Ltd has created a NEW educational paradigm for creating a knowledge-lit world. MS-CIT high quality and low cost IT programme has emerged as an important choice of millions of potential students. MS-CIT is a certification course (Maharashtra State Certificate in Information Technology) run by MKCL which has created over 2500 Computer Education centres to over 12 lakhs of students. Such an effort indicating departure from the traditional educational approach is needed in a world characterized by globalization and ever changing technology.

Such and other concerns have been introducing different skill categories (codes) for the aspiring engineering and management candidates with computer qualifications. The educational institutions on the other hand have been making consistent efforts to improve student profile. There is no limit to career opportunities for quality candidates (graduates and undergraduates with computer aptitude) in the 'Career Inspite Wave'. Coordination between industry (recruiters

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creating demand for the 'product' and educational institutions creating the required 'product' will go a long way in creating 'convergence' between demand and supply aspect of the problem of the career planning and development for the purpose of getting a suitable job improving the prospects and thereby providing good employment opportunities to the quality products. Planned supply of such products on the basis of 'industry-institute-interaction' will enable aspiring candidates to reach at high altitude in their career planning. Such potential candidates would fit in the system model of problem solving created by the envisioned employers who are making pioneering efforts in adoption of flexible Global Business Practice for operating more efficiently and produce more value and thereby solve their business administrative problems in an integrated manner.

3) Role of Computer in the process of development

Political leadership in Maharashtra has been knowledgeable about the importance and role of computer industry in the process of economic and social development. The computer industry has been playing the triple role in the field of Information Technology (IT), compilation of information, storage of information and mutual exchange of information. Capacity of computer has been increasing though size of computer has been getting reduced, a kind of a transition from the big (macro) to the 'small' (tiny or micro). Computers without keyboards and mouse have started working since 2003. (Table PC of Microsoft) Fax, T.V. (Distant visual) cellular photo and telephones note pad and other techniques can be made update and proficient by the computers. By 2010, an integrated computer model performing multifarious functions can come in vogue and will be made available at low cost. This instrument would greatly facilitate such function as inspection of e-mails, hearing the telephonic messages and web surfings. After internet, worldwide web and online services are integrated and global communication would depend on integrated T.V. and internet function by one instrument.

In respect of development of computer industry, Maharashtra stands next to Karnataka, Tamilnadu and Delhi. After the establishment of computer industry at Bombay (e.g. Tata Consultancy Services) since 1985, Bangalore took the leadership in southern state like Kerla by developing the necessary infra-structure for the computer industry. Development of infrastructure is essential for development in the areas of agriculture, power and water management, medicine, defense, pharmacy, aeronautics, etc. Government's policy of encouraging foreign investment in these sectors will play a positive role in the process of computer development.

Maharashtra State has been lagging behind comparatively in spite of availability of knowledgeable technocrafts, infra-structure and facilities like services and security. Administrative and managerial efficiency of governmental
bureaucracy and projects can be increased by facilitating development of computer industry and provision of employment to the youth in the rural and urban area. Accordingly, fiscal, educational and foreign trade policies of the government should be suitably formulated and modified for premier management institutes such as IIMS for formulating and implementing major engineering recruitment proposals. Because of the large number of individuals approaching these organizations they typically respond to all queries and encourage individuals through campus hiring of campus applicants. Large MNCs have continuous drive across the globe.

This kind of orientation to the HRD policies of eminent organizations is consequential to evolution in communication for consultancy which has been taking place during the first five years of 21st century. One of the significant symptoms of this evolution is increased in the number of mobiles which is greater than the landline phones in India. Info-technology, power-generation, pharmacy, biotechnology, communication and consultancy are the areas now thrown open for career development to the educated aspirants in the upper middle class (the elite) who are willing to contribute their power, talent and wealth for their career development in computerization. Population of such people is 29 cores-equal to that in USA. Knowledge Revolution is the important factor contributing to this development.

The contribution made by IIT has been specifically mentioned and appreciated by *NEW SCIENTIST* specially devoted to Scientific & Technological development in 21st century. The contribution of IT industry which was 1.3% of Indian GDP has increased to 3% in 2005. Indian talent and expertise in computer Technology, Medicine, Engineering, Project Management, Event Management, Biotechnology forms a major part of manpower in foreign industrial giants, in UK and USA, manufacturing products in the range from aeronautics to microsoft. More than 100 foreign companies have opened their branches as a part of their campaign for 'talent hunt' in science and technology for which Indian brains have contributed a lot, even more than contributions made by native in foreign countries, (Europe and America). More than 1.5 crores computer experts have been working in the field of Information Technology.

An adverse impact of this development has been relatively less important in the theoretical knowledge of fundamental of science. In other words, application aspect of scientific knowledge is being paid more attention. This has been happening in India against resource- constraints (e.g. power) and high level of illiteracy of 39% of the people, vis- a- vis 39 lakhs of graduates produced every year by the Indian Universities and paradoxically, against 2/3rd of Indian population

* NEW SCIENTIST 19° Feb, 2005

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living below poverty line in cities and villages. The rise in the level of literacy in India is 1.3% per annum. Computer literacy is the basic requirement of time management, project management and event management. The principle of dynamic behavior is that every rabbit is not lazy. Actions are the necessities of modern scientists, technologists, planners and computer programmers i.e.

G. Madhavan Nyer, President of Indian Astronomical Research Institute said that apart from the basic needs of food, water, education and health, use of modern technology is of utmost importance for the upliftment of the urban and rural economy of India. e.g. 'Edusat' have connected 3000 schools in village projects like Telemedicine, Village Resource Center which go a long way in improving resource management (water, fertile land, forest resources, manpower) in villages. E-life style at any place will involve the use of IT technology.

This process is entering E-Business requiring mastery in E-com, MIS and IT management. Job opportunities are available for such a technologically equipped business manager and administrator in 21st century who shows his managerial and administrative skills in the following areas of management and other administrative areas:

1) Production Management
2) Materials Management
3) Marketing Management (Purchases & Sales)
4) Financial Management
5) Personnel and Manpower Management

All these areas of business management have one implication for management and administration of M's (Money, Material, Man power, Minutes and Methods). Though traditional theory of business administration & business management emphasizes the above mentioned basic areas of planning, decision making, coordination and implementation, many areas are added to business administration by the end of 20th century and will create job opportunities for the 2 lakhs of the unemployed.

Technological phase is all-pervading in the areas of Business Management and Administration. For example, companies requiring managers in their marketing department select the candidate on the basis of possession of knowledge of CRM Technology in the case of candidates chosen as managers by corporate and IT industry. For operations by system, it is expected that the candidates selected should possess knowledge and skill in ERP and supply chain management.
Thus, computer and Technology knowledge and the knowledge of the principles of Business Administration are complementary and not mutually exclusive. In industries connected with IT and others related indirectly with IT have necessitated the requirement of techno- MBA's. IT companies have launched campaigns of choosing suitable management candidates and have selected in their campus interviews candidates possessing expertise in business and computer technology.

4) Personality Development and Computer Experts' Creativity in Computer Management

Creativity in computer management is an important aspect of personality development of computer scientist-engineer. It is a concern of psychologist, educationist and management scientist and consultants. It is basically concerned with the discovery process. Creativity lies in constructive efforts by the computer programmers who are always in search of a new computer language and instructions (commands). This search has enabled development of rational understanding and process in the context of the Indian ethos. Creative achievements are strongly associated with intrinsic motivation for research. Creative efforts may not always be associated with and motivated by monetary rewards but with sense of achievements irrespective of material rewards. Creativity in individual computer experts is also part of stimulating team activity for achieving organizational ends. Intrinsic motivation can be influenced by extrinsic factors like zeal for improving the necessary facilities such as infrastructure and induction training. This would enable an employee to make creative contribution. Efforts by the employer for establishing positive and reinforcing climate for individual's creative bend of mind is congenial for development of creativity in employees. The climate of innovative inputs captures unconventional intelligence. The IQ tests conducted by the employer are oriented towards this objective. A computer programme can discover new scientific laws. Psychologists from UK and America have proposed creativity as individual level innovation which may be directed towards extraordinary ends. A potential employee's mind and intellect should be properly trained for scientific and artistic achievements. The employee-potential can be explored and exploited by consistent efforts for liberating more and more creativity.

A strategy for result-oriented creativity training would be necessary to analyse management of complex problem. This is a day-to-day necessity within a broad system. The complex problem-solving behavior should not be blocked by the complacency at individual or organizational level. Individuals have to escape from personal satisfaction blocks for discovering innovative solution. Creativity is
both a personal and an organizational problem-solving non-routine power. This implies that creativity which may not always solve realistic managerial problems can lead to actions generating unintended consequences giving scope for further creativity.

Creativity Training Programme, assuming a liaison between industry and educational institutions consists of:

(a) Training provided by the employer

(b) Problem-solving exercises in various educational institutions.

Creativity has to be stimulated for solving practical problems, e.g. a brainstorming technique which aims at favouring brain-streaming groups successfully defers a particular "judgement" about a problem. This principle of postponement of judgment is generally accepted by the advocates of creativity. This suggests incorporation of non-verbal material into problem-solving (like previous case studies) which may lead to metaphoric thinking. Training programmes leading to metaphoric explorations of managerial problem create the grip of real problem whose practical and urgent solution is wanted as the need of the hour- first for survival and later for development of organization. Metaphoric explorations (as a part of training programme) of managerial problems in small groups may produce unexpected and relevant new ideas.

Researchers and practitioners, when subjected to Empirical Studies can develop an understanding about creativity. However, while emphasizing the importance of logical analysis the institutional dimension to the training programme should not be ignored. Modern manager can accumulate all the information he needs from his daily work but he can have access to the brain-thinking for digesting his knowledge. Professor Molzberger, Professor of Information Technology, believes that outsourcing (mental) programming has a lot to do with intuition rather than with rational thought. The problem-solving techniques are more biased towards analytical and logical thinking than towards intuition. Brain-calming technique is in contrast with brainstorming technique. Rational and intuitive parts of training are equally important for researchers and practitioners. The intuitive part seeks to eliminate thought process which comments on problem-solving because, too many thoughts may lead to confusion rather than to result oriented conclusion. Mind, which is ever bubbling all the time should be kept at rest and theoretical pursuits avoided Brain stilling process deployed for students and managers is recommended in a wide spectrum of Indian Industry. This process may lead to development of achievement motivation in an individual. In the near future, modern Indian organizations will see the practical merit of brain calming process in their training programmes which start at qualitative level with data collected from those involved in the exercise.
Relevant personality development for a computer careerist can be achieved provided that, the educational institutions imparting computer education make continuous efforts in the new orientation necessary by working out concrete plans and update them according to the needs of the prospective employers. For this purpose, continuous institution-industry interaction is needed.

The orientation programmes for careers in computer based on interaction between industries and Educational Institutions are quite innovative. They point to the subtle relationship between demand for computer careerists based on employers' expectations and the supply of prospective computer candidates in response to employers' demand. An illustrative case in this respect is given below-

5) Orientation programmes for Careers in Computer based on Industry Institute Interaction
(The Plan prepared by TATA MOTORS A Case Study)

Educational institutions have been making consistent efforts in grooming students who are-

(a) academically superior
(b) globally best networked and
(c) having leadership qualities as consultants and research workers

For achieving this objective, they have been engaged in constant industry-institute interaction partnership for having rapport. This process has initiated the process of convergence between the industries demanding candidates with computer brain for business administration. In modern age, the educational institutions are supplying these candidates by introducing new methods of learning and teaching. Industry-Institute-Interaction can bring about equilibrium between demand and supply of employment opportunities for computer programmers.

*Apart from restructuring the various curricula and the systems for diploma and degree and making administrative arrangements for the new education courses, it is necessary to have constant interaction between educational institutes and examination boards and the industries requiring recruitments for their jobs. Such partnering between industries and educational boards is necessary for sustainable and profitable growth of the people and business. The requirements of the institutes about the levels of qualification of the recruiters and their grading spectrum measuring their eligibility for the different jobs to be performed are reflected in their plans of recruitment e.g. The industries in the TATA

*Ref: Paper presented by Mr. B. C. Ogale of Tata Motors indicating requirements of industries to be communicated to educational institutions.
GROUP claim that their business is built on foundation of trust and ethics and success or achievement in material terms is not worthwhile unless it serves the needs and interest of the country and its people. Accordingly, the diverse needs of human excellence are indicated by the employer in their plans and programmes for training people according to the requirement.

The new drives need of human excellence indicated by the Plan prepared by TATA MOTORS include

- Post Graduate Trainees
- Graduate Trainee Engineers
- Officer Trainees
- Diploma Trainees
- Full term apprentice
- Job Trainees
- Service Trainees
- Project Trainees
- Vacation Trainees
- Graduate Sandwich Trainees
- Technical Vocational Apprentices

The H.R. Vision of the plan is-

To enhance & maintain Human Capital, which will make the Organization, a world class player and further the interest of all stockholders.

The H.R. Mission looks after-

Source, Develop and maintain Human capital, which will drive the culture of customer focus, high performance and seamlessness.

Create, Learn and Implement best in class HR practices and processes in pursuit of excellence.

Retain and attract the talent by improving the brand through employee delight and loyalty.

Improve Community friendliness.

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The expectations of the Plan are-

- Man Management Skills
- Communication Skills
- Multi Disciplinary Approach... Taking the holistic picture
- Exposure to World Class Practices
- Readiness to work on Shop
- Functional Specialists with General Management Competencies
- Readiness to work
- Effective Problem Solving
- Ability to form and work with SDT
- Quick adaptability
- Leadership Qualities and the much wanted Patience

How could these expectations be met?

- Interactions between Industry and Institute to complement the syllabus
- Review of syllabus at pace with industrial progress and introducing futuristic rather than legendary technology.
- Case study approach
- Working on live-current Projects rather than stereotype projects
- Encouragement of Vocational courses
- Encouragement of Multidisciplinary Approach
- Focus on a Development of a CEO; not merely an engineer or an MBA.

When interaction between industry and educational institutes constantly take place and the structures and curricula of the educational programmes are revised and made up-to-date by suitable occasional changes, educational institutes and examination boards are enabled -

- To associate with Industry for Self Development
- To convert the faculty into well informed technocrats
- To understand the best practices and share them with students
- To augment books with actual laboratory for developing library habit among teachers and the taught and spend their quality time on applied Knowledge rather than outdated information.
**Action plans indicated by the employers**

The expectations of the educational institutes and industries can be fulfilled by the following action-plan indicated by the employers.

The employers' personnel or HRD policy can consequently attract good or quality staff. The premier Engineering and Management Institutes, on the other hand can prepare future employee base made up of-

(a) Vocational trainees  
(b) Sandwich Trainees  
(c) Project Trainees  
(d) Summer trainees

The shares in the - graduate - trainee intake from the educational institutes like IIT, NIIT, Premier institutes and others are -

<table>
<thead>
<tr>
<th>Institute</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIT</td>
<td>16%</td>
</tr>
<tr>
<td>NIIT</td>
<td>37%</td>
</tr>
<tr>
<td>Premier Industry</td>
<td>37%</td>
</tr>
<tr>
<td>Others</td>
<td>10%</td>
</tr>
</tbody>
</table>

The break up of the graduate trainee intake during 2000-2005 in the various faculties of engineering and management has been as follows-

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Area</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Electrical</td>
<td>6%</td>
</tr>
<tr>
<td>2.</td>
<td>Industrial &amp; Production Engg.</td>
<td>34%</td>
</tr>
<tr>
<td>3.</td>
<td>Mechanical</td>
<td>7%</td>
</tr>
<tr>
<td>4.</td>
<td>Mining Machinery</td>
<td>10%</td>
</tr>
<tr>
<td>5.</td>
<td>Production</td>
<td>35%</td>
</tr>
<tr>
<td>6.</td>
<td>Electricals &amp; Electronics</td>
<td>8%</td>
</tr>
<tr>
<td>7.</td>
<td>Manufacturing</td>
<td>1%</td>
</tr>
<tr>
<td>8.</td>
<td>Metallurgy</td>
<td>1%</td>
</tr>
<tr>
<td>9.</td>
<td>Polymer</td>
<td>1%</td>
</tr>
<tr>
<td>10.</td>
<td>Electronics &amp; Communication</td>
<td>8%</td>
</tr>
</tbody>
</table>
The Recruitment policy for HRD is based on multi-disciplinary approach characterized by structured training, mentoring and industry-institute interaction. The HRD plans also aim at providing working knowledge of world class concepts like-

"The ISO... The 5'S'... Gr1 ... CSR, QS... Lean Manufacturing..., TPM... SQDCM Parameters, Kaizen, Kanban, JIT... Poka Yoke..."

Working knowledge of World Class Concepts can be imparted as a result of industry-institute interaction through seminars, students' visits to industries and campus-interviews.

On the other hand, educational institutions have also created Training and Placement Cells for Global Career.

(6) THE ROLE OF HRD MANAGERS

HRD managers, playing their role in the interaction between industry and the educational institutes can work as ambassadors to identify the areas where the company could contribute to the campus interviews at the premises of the educational institutes along with the Heads of the various departments in educational institutions. H.O.D's in turn can communicate with the ambassadors as to the number of courses offered by the educational institutes, as required by industries, the duration of different courses, definite patterns of examination and certification and the type of support to the training centers and the nature of administrative arrangements.

In the meetings of ambassadors and H.O.D's discussions are made regarding-

(a) Assignments of industrial projects to the teaching staff and communication of the recruitment plans to enrich the teaching staff by the knowledge of staff requirements of the company

(b) Arrangements of need-based plant visits

(c) Arrangements of guest lectures by experts

(d) Study of manufacturing and assembly processes

(e) Organizing seminars for students with participation by company executives

(f) Delivering presentations of papers on topics of interest

(g) Seminars on instrumentation with representation by seminar leaders in panel discussions providing logistical help and assistance in students' learning and observations.
These efforts expand the exposure of the teaching faculty to the applied theory. MOU's can be signed in this respect by the ambassadors of companies and H.O.D's of the faculty of Management Research Institutes. Interaction between professors and ambassadors (functional heads of company) go a long way in designing the modules and framing the case studies in the various problem areas. Different contests can be conceptualized to provide a common platform to explore and exploit talent for creating an innovative side which is equipped with the knowledge of the benefits of networking with Institutes and the knowledge of collaborations.

This leads to weakening of the increasing divide between 'what is taught' and 'what is practiced'. The industry institute interaction is thus instrumental in the following ways:

(a) For ensuring the relevance of curriculum
(b) For fostering collaborative research effort
(c) For advancing current status of technologies and methodologies
(d) For trying, exploring and testing novel concepts in a low risk environment
(e) For continuing collective learning
(f) For developing consultancy from institute experts for specific projects
(g) For providing feedback and evaluation in learning and development and determining performance linked rewards.

Thus, industry-institution interaction is an important factor in the process of achieving equilibrium between demand and supply.

学术编程：新教育模式

学术-programmes of the Universities and Management institutions prepare students to take up positions in industries in the capacity of system analysts, system designers, programmers and managers in any area of computer software. These programs impart comprehensive knowledge in the diverse areas of programming and problem-solving and implementation for results by adopting a balanced and objective approach to solutions in the combination of theory and practice. The teaching faculty consisting of research scholars and practitioners go a long way in achieving this objective. The visiting faculty consisting of specialists and experts (working for executive jobs,) in the leading software companies in Pune and Professors from other universities and colleges bringing about the most essential interaction between students, the educational work and competitive
atmosphere outside. The efforts of the teachers and experts towards this are characterized by exploring and exploiting research interests of teachers, students and executives in the following areas:-

(a) Programming Paradigms  
(b) Computer Architecture  
(c) Artificial Intelligence  
(d) Signal Processing (VLSI)  
(e) Hermetical Semantics Semiotics  
(f) Paradigms in Education  
(g) Computer Science-Algorithms, Computer Graphics  
(h) Data Numbering, Software Engineer  
(i) Machine Learning  
(j) Neural Networks Systems Processing

The visiting faculty provides instruction in:

(a) Science of programming  
(b) Computer Design & Development (CDD)  
(c) Operating Systems  
(d) Software Engineering  
(e) Operations Research  
(f) Programme Analysis  
(g) Graphics  
(h) Geometric Software  
(i) Genetic Algorithms  
(j) Advanced Networks  
(k) Computer Construction  
(l) Distributed Systems

Undoubtedly, the aspiring students not only possessing a formal degree but also having developed their personality by adopting multidisciplinary approach to the process of teaching and learning are selected to grab various career opportunities in industries with a further promise given to them to enable them to rise to higher executive positions in industrial management with lucrative remuneration.
If student's overall personality development has taken place in the following direction sky is the limit for building extra ordinary careers in business administration by

(a) imbedding qualities of smartness, business acumen, brilliance, versatility, and making them ecclesiastic

(b) utilizing enthusiasm for active participation in the brain storming debates, discussions and paper presentations in the seminars and conferences along with or doing away with class-room conversations

(c) providing consultancy services to managements of educational institutes and industries

(d) developing ability to think independently and speak about the novel ideas to solve problems

(e) nourishing inquisitive and creative side of personality by keeping abreast of latest advances in industries

(f) developing spirit to work independently as well as a member of a team in the areas of research interest

(g) maintaining the zeal to work in an atmosphere of healthy competition conducive to learning as well as teaching

(h) undertaking practical assignments and projects which encourage students to get 'on the job' experience of observation, interpretation and analysis and drawing logical inference and developing strategic implementation by follow up and feed back about system analysis, system design and systems administration and programming at higher and lower levels. The practical assignments and projects are supported by industrial training (induction).

Following is the illustrative list of assignments and projects given to computer students by industrial employers and academicians.

**Sample Projects for graduates in science and management:**

- Rapid software development for DSP chips (Cirrus Logic)
- Enhancing the codes of ext2fs to store usage data that can be used for utilities like backup and de fragmentation
- Developing system software for the Universal Multiprocessor System (UMS chip (Cradle Technologies))
• Complexity of edge listing based data flow analysis (TIL)
• Comprehensive Geo model for GRAM++ (UNDP)
• Design and implementation of a machine-independent optimizer for LCC
• Data management system for the GIS application GRAM (UNDP)
• Development of information structures for efficient retrieval of GIS data (IIT Bombay)
• Modeling of musical intelligence
• Intelligent pictorial Image database query system (DRDO)

Sample of MCA Industrial Training Projects:

Object-oriented reverse engineering: development of a tool for reverse engineering of C++ Source code and generation of UML-specific design diagrams

Creation of a web-based application to automate leave-applying and leave-procuring procedures for an organization

Replacement of TCS C++ library by Standard Template Library (STL) for their internal tools

Development of a GUI-based tool for the maintenance of two of HP's Open View products

Implementation of a "design by contract" tool for C++, C# and Java to help users to explicitly specify the constraints that should hold before and after a software component executes

Static liveness analysis of heap objects to improve garbage collection (a technology development project undertaken by IIT Bombay and Tata Infotech Ltd.)

Porting of the MRS (Modular Parsing System) library from Windows to Solaris (MPS converts Postscript files to an intermediate object format)

Securing WLAN (Wireless LAN), especially IEEE 802.11 protocols

Development of a data extractor engine (used to connect to various data sources) and a data analyzer (used to analyze this data)

Porting and implementing the "community climate system model" on a PARAM-10000 cluster

Building an EAI tool that integrates source and target data, and carries out
functional, load and volume testing
Upgrading the "SuperX X server" (X server ported to MS Windows) from X11 R6.3 to X11R6.6
Implementing the session initiation protocol using the proxy server model in VOIP
Development of gef add info and get name info modules for a DNS client
Development of the Simple Network Management Protocol (SNMP) for Ipv6

7) A career in Business Administration with computer knowledge and application-skill

The IT industry in India is having big time. Jobs are ready and raining. The academia is ensuring students passing out. "With an estimated 1.5 lakh jobs in the year 2005-2006 the IT sector continues to surf the wave of popularity "7. Remarks R. Raghavendra "Chances of bright career are available to those aspiring students who are keen to communicate their thoughts and details about their 'quality' and 'qualifications' (eligibility) and their choice of the stream of their career to such sources as indicated in Education Times.

The following bare fact has been pointed out by Mr. R. Raghavendra about the floodgates of the job market in the Indian IT industry

In the area of software exports Tata Consultancy Services (TCS) has been on the front. During the year 2005-2007 the software expert sector IT has shown tremendous progress as indicated by the following statistics in the DATA QUEST SURVEY.

(1) Income from the software sector (IT) is Rs. 78,134 crore
(2) Indian software experts (IT) - Increase by 86% -
(3) Addition of 7,41,000 employees in the S/W (IT) sector
(4) 168% increase in the laptop sales
(5) 37% increase in exports by BPO Companies
(6) Income from IT sector is Rs. 1,08,511 crores
(7) 7% increase in hardware experts
(8) 21% increase in computer sales

*(Vide his article: 'Get Right' - Education Times dated: - 9th October 2006.)*

(41)
The employer-companies' personnel policies (HRD) have also undergone a radical change. They require expertise from management consultants possessing MBA qualification. In the curricula for management studies Master's Degree in Business Administration has the top priority - MBA has been on par with MMS. Services of MBA's are required in the various areas of Business Administration viz. manpower, public relations, computer services, marketing and advertising. 'Quality Education' would enable 'management executives' to face ever increasing challenges and get money, status and honour. Management Career is a 'fast career' for the youth having potential in reusing ability with technological knowledge base.

"Career is a 'fast career' for youth having potential in developing ability with technological knowledge base" - As shown in the following chart, there are various areas in Business Administration which invite aspirants to make a good career.

**Areas of Business Administration for a lucrative career.**

- Finance
  - Portfolio Management
  - Working Capital Management
  - Investment Management

- Production
  - Materials Management
  - Project Management

- Personnel
  - HRD
  - Union Relations

- Marketing
  - Sales
  - Purchases
  - Consumer Behavior
  - Market Research

- International Marketing
  - Import Export Management

- Finance
- Production
- Personnel
- Marketing
- International Marketing

- Portfolio Management
- Project Management
- HRD
- Sales
- Purchases
- Import Export Management

- Materials Management
- Project Management
- Union Relations
- Consumer Behavior
- Market Research

- Working Capital Management
- Costing
- Organizational Behavior
- Operations Research

- Investment Management
- Production Methodology
- Employee Training
- Management of change time Invts.

**Note:** Students obtaining Engineering Degree Qualification in Mechanical and Production line have prospects in Computer-Aided Design because there has been a boom in the Production Engineering Sector.
The basic theme of orientation programmes organized by industries and educational institutes is:

“Graduation is no longer an end in itself. Today it requires value addition to make an impact on the job market.” - In this connection: Miss Geeta Rao remarks*

“The following tabular information regarding faculty wise qualified students, their areas of specialization, their placements are suggestive to the scenario of future prospects for computer careerists. The interaction between computer industry and the educational institutions point to the glaring facts about employment opportunities available to the aspirants”.

In the computer sector employment opportunities have been gradually increasing in the IT sector, financial management, engineering, manufacturing, sales, business process outsourcing, advertising and marketing, HRD research, consultancy, health and medicine. The employment opportunities have increased as follows:

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Sector</th>
<th>Percentage Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Engineering &amp; manufacturing</td>
<td>465</td>
</tr>
<tr>
<td>2.</td>
<td>Finance</td>
<td>403</td>
</tr>
<tr>
<td>3.</td>
<td>Consultancy</td>
<td>269</td>
</tr>
<tr>
<td>4.</td>
<td>Advertising &amp; Marketing</td>
<td>238</td>
</tr>
<tr>
<td>5.</td>
<td>IT &amp; Computers</td>
<td>229</td>
</tr>
<tr>
<td>6.</td>
<td>BPO’s</td>
<td>223</td>
</tr>
<tr>
<td>7.</td>
<td>HRD Research</td>
<td>195</td>
</tr>
<tr>
<td>8.</td>
<td>Medical Service</td>
<td>132</td>
</tr>
</tbody>
</table>

It is necessary that supportive government policy is the need of the hour and would enable 9.3 lakhs job opportunities to the prospective aspirants.

Ref: - Report prepared by Monster India.com.
Press note published by ‘SAKAL’ 5/12/07.

* Vide her article on: To a higher degree “Education Times.”
In case of employment generation for software engineers we used to talk about 'Brain-drain' from India to United States (U.S.A.). However, this trend of brain drain has changed into brain gain. It is reported that 60,000 software engineers have returned to India from USA. Historically Silicon Valley was dominated by Indians. Presently 15% of the Indians are dominating the field of software engineering. However, in the field of science and technology 53% of the employees are foreigners and there are 25% of Indian employees in the companies established by foreign engineers. It should be noted that the trend is reversing during the last 10 years. The implication is that jobs will have to be provided to the software engineers returning to India. As against this a welcome phenomenon in the IT sector in the Indian economy has been growing and lucrative jobs can be made available to the Indian software engineers. Thus, demand for more jobs can be met by increasing supply of job opportunities and the attitude of software engineers to go abroad for highly remunerative jobs will change accordingly. Thus, Indian economy is posed to welcome Indian software engineers coming to India for lucrative jobs in the computer industry.

**Scenario of future prospects.**

Eligibility for computer job and software development centers is the strategic development which has been accepted and granted recognition at the global level. People in foreign countries who were getting carried away by mythological misconceptions and illusions about Jungles, elephants (elephantine) serpents and magical rope tricks in India are now under the impact of IT and Beauty developments. The next step in this direction may be bio-technology (BIO-TECH), GE (General Electrics), Banking and Credit Card and visa, City Bank (finance sector), Microsoft (the leading software manufacturing company in the world). The leading organization has established development centers in India. The Indian computer industry has been making fantastic progress and the new avenues for project management are now available and accessible. In these areas of development, computer programmers could previously get only contractual assignments. Now E-testing technologies' role being assigned to the computer programmers. For the complete project management assignments, software technology life-style is being used. E-testing technology inspection, quality management, analysis supervision and maintenance are the new horizons emerging. Seattle development center for software development uses 15% of manpower in E-Tech inspection and quality control and 5% manpower for E-programming. These areas of software development are comparatively neglected in India so that the young generations wishing and aspiring for new careers can explore and exploit new job opportunities. Instead of contractual assignments

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*Article: from dated 15/05/07 SAKAL newspaper.*

(44)
Indian software expertise can develop their own software development centers for accurate E-Tech inspection, supervision processes in absence of which even contractual assignments can be cancelled entailing tremendous losses. For such a welcome development, it is necessary for the software experts to equip themselves with the expertise at the post graduate level for which curricula are being formulated by the Indian universities. Such separate innovative courses can provide knowledge and experience for 1 to 2 years in the promotion of new development concepts and programmers. E-inspection and quality control programmes are above the traditional software developments which are rendered obsolete and out of use. If courses in E-inspection and quality control are completed the new software generation can attain recognition at the international level. Information about these innovative courses is made available by the computer society of India. When global recognition is obtained, ample job opportunities in CIS area of software development will become available.

This trend is in response to the job market which favours computer science professionals. The students are influenced by the better pay and opportunity trend. There has been also a switch from mechanical and electrical engineering to CIS in the case of students entering graduate school. In case of graduation in CIS students are not given much of the choice i.e. what ‘Classes’ to pick in College career and emphasis on a maths and science gives students basic training in all the fields irrespective of what major career they pick. This really works to students’ benefit. The computer growth and efficiency in maths and science has aroused students’ curiosity to learn and acquire a professional skill.

An important landmark in the development of computer management and fundamental scientific research has been established and also has increased the availability of National Super (PARAMA) computing facility (NPSF) at Pune. The C-DAC centre at Bangalore has the super computer with a facility of Teraflop facilitating mathematical computations equivalent to 10^9 or 12^9 Degree (5 to 7 teraflop in Pune) enabling super computer usage in 17 cities and super computer facility for 1.5 teraflops in bio technological research. (Approximately 1/3 rd of 37 teraflop in U.S.A.)

*The IT industry in India is having big time jobs are ready and raining. The academia is ensuring students passing out. “With an estimated 1.5 lakh jobs offered in 2005-06, the IT sector continues to surf the wave of popularity”- remarks R Raghavendra* Chances of Brighter career are available to those aspiring students who are keen to communicate their thoughts and details about their ‘quality’ and ‘qualifications’ (eligibility), the stream of their career, their dream, career to such sources as Education Times refers.

The following bare fact have been pointed out by Mr. R Raghavendra about the floodgates of the job market in the Indian IT industry and he expressed in an optimistic tone that going by conservative estimates the pace with which Indian IT industry is hiring, is only likely to multiply in future. With an estimated 1.5 lakh jobs offering in 2005-06 the IT sector continues to surf the wave of popularity.

* Vide his article- Get Right – Education Times dated 9” October 2006
Computer industries in Pune have created an organization name Pune International Trade and Commerce Office (PITCO)

There are about 1 lakh computer Technologists. However, it is necessary to make marketing effort by organizing consists of international delegations and internationally known personalities in the computer world i.e. Bill Gates, Larry Ellison, Crage Barret, and seminars and conferences with international identity. Similarly, website companies should come together to provide latest information as global computer developments. It is necessary to have continuous contacts with internationally reputed computer organizations and have continuous dialogue by the following industrial-cum-computer units.

(1) PTC Pvt. Ltd.
(2) Zensor
(3) Infosys,Wipro & Satyam
(4) Cognizant
(5) KPIT
(6) Cummins
(7) Mahindra
(8) Tata Consultancy Services
(9) Tata
(10) Patni Computers Software Experts Department.
(11) Cerus Logic S/W India
(12) Persistent Systems Pvt. Ltd.
(13) Veritaz S/w
(14) Canbay and other
The Cluster Image

The Cluster Concept is applicable for areas like infrastructure aesthetics, transport & tourism, medicine, construction, agriculture & fisheries etc. and is not continued only to areas like Banglore, Kanpur, Madras, Satara, Kolhapur. Such Cluster is necessary for getting international level credentials.

The supporting aspects of the Cluster are standard of living, professional managers and business managements, skilled manpower, cost minimization efforts, educational institutions, developmental projects launched by Government meteorology and moderate taxation.

The prospects for the potential computer knowledgeables in the computer movement are the outcome of the various innovations in the computer movement e.g. E- Life Style, Multi Media, MAX, movies, mobile phones, wireless & mobile internet by mobile phones, SMS mobile phones for microsoft, videos, digital instruments, personal computers, E-vision for the blind, vehicles, watches, airports, offices, microbiology, jewellery, music, education, advertising, marketing, storage, CAD-CAM, repairs and maintenance, Cyber centers, Call Cafes, Drafting, enterprise resource planning, fuel cell, network expansion-administrative, E-government, E-services, security and offshore developments in computer technology (Dot net, J2EE XML). This computer movement covers both the rural and urban areas creating employment for the educated and uneducated. Its growth dimensions are basically Hardware, S/W, Networking and IT enabled services of the computers.
Computer Oriented Government Policy should be highly oriented towards making Maharashtra State a Cyber State, exporting s/w to the world. This policy has important implication in the long run for HRD-nature of Government intervention in s/w industry and construction industry. Because of the development of internet system (Optical Fiber), (Cable Network), a long term service policy 2003-2010 should be formulated for-

1. Supply of quality s/w engineers.
2. Increase of s/w exports from Rs. 12000 crores to Rs. 50,000 crores.
3. Development of infrastructure.
4. Reducing Governmental intervention in the development.
5. Development of Private IT Parks.
7. Modification in the labour laws.
8. Suitable Changes in the educational policy.
9. Encouragement to IT industry development in -
   - IT software
   - IT hardware
   - IT Services
   - IT enabled services.

By providing infrastructure, for IT services in cities and colleges, IT Parks, Network help to the Computer Management Schools and Institutes, involving local Municipal Corporation and Zilla Parishad in the process.

Such a policy was suggested by Marattha Chamber of Commerce in their Integrated Development Plans for computer industry. As an administrative measure to facilitate this process of development, empowered committee has been established. Simplification of tax and labour laws and their implementation by a separate administrative machinery (hierarchy) for urban and village development is the need of hour.