CHAPTER VI

COMMENTARY ON THE ANSWERS TO THE QUESTIONNAIRES.

This chapter contains information on subjective opinions expressed by industrial employers, Heads of Departments, Directors of Management Institutes, Graduates and Undergraduates. Information is collected by postal communication, personal interviews on the campus and visits to exhibitions concerned with career planning for management graduates and computer programmers. Secondary information in career-choice made by students in the merit list at X and XII standard examination has also been collected. Question-wise response has been noted.

Coverage of the Questionnaires

In order to collect primary information indicating subjective opinions of the persons involved in the problem under investigation, several questions were asked pertaining to important aspects of the problem. The questionnaires prepared covered important aspects like eligibility conditions for prospective employees, their new orientation for computer education, expectations of the employers, updated knowledge of computer programming, specific job requirements and job prospects, availability of guidance by the employers and educational institutions, terms and conditions of contracts and experiences in the campus interviews. Subjective opinions expressed by academicians and industrial experts were also taken into consideration.
Q.1) What are the eligibility conditions for computer engineers (programmers)?

Ans : Work for computer operators and programmers is needed by employers using computers for scientific or engineering problems. Eligibility conditions (criteria) change according to changes in technology. A graduate with degrees in computer science or computer information service (CIS) mathematics, physical science or engineering faculty (mechanical, civil, electronics, electricals, etc.) and with a degree in related field is eligible for the software job. Employers using computers for business applications prefer to hire people who are equipped with:

a) Knowledge in MIS (Management Information Systems)

b) Programming skills

c) Knowledge of traditional languages like FORTRAN, COBOL or C

d) Knowledge of more advanced object-oriented languages and tools like CASE tools, C++, Visual C++, Ada small talk, Visual Basic Power builder JAVA and 4th and 5th generation languages GUI (Graphic user interface) and systems programming. Power builder JAVA and 4th and 5th generation languages GUI (Graphic user interface) and systems programming.

e) Four year degree in computer science and extensive knowledge of variety of systems and ability to configure the operating system to work with different types of hardware, ability to adopt and adapt the operating system, to meet particular needs of the employer, ability to work with database systems like Db2 Oracle or Sybase are the eligibility conditions for potential employees.

• List of questions in the questionnaires is enclosed at the end of the chapter.
Q.2) What changes in the syllabi and curricula of degree courses are necessary in view of fast changing technology?

Ans: The basic need of the modern age is that a new orientation is required in place of the traditional education approach which was guided before independence only by the aim of providing clerical personnel for facilitating British Administration.

Q.3) What are your expectations about the candidates who aspire for a career as a computer programmer?

Ans: Computer engineer should work for more than 40 Hrs a week. They have to work longer hours with a given technology in order to meet dead lines. They have to visualise critical problems occurring during overtime hours. Telecommunicating is becoming more common for a wide range of computer professionals and computer programmers. Programmers have to get access to a system directly or from remote locations for fixing and correcting problems. While spending more time in front of computer terminal typing at a keyboard they must develop immunity for eyestrain, backbone, discomfort, hand and wrist problems such as carpal tunnel, syndrome or cumulative trauma disorder.

Q.4) Considering frequent advances in technology what kind of computer programmes (software) are awaited for the aspiring computer experts?

Ans. Computer programmers instruct the computer what to do (what is the line of action plan for solving a specific urgent problem) which information to identify, generate and make it accessible from a particular source. A computer programmer also should guide as to how to process information and to update it. Programmes based on complex mathematical formulae are time consuming. Their solutions can be approximated by drawing data from many existing systems. For solving a complicated problem, it is also necessary that several programmers form a team and work together under an expert supervision.

Q.5) Would you give specific suggestions with illustrations?

Ans. Instructions provided by a programmer to computers may be in the form of conventional language such as LISP or PROLOG or in more advanced function oriented or object oriented languages like UML, JAVA, C++, Visual Basic or Ada. According to the language of instruction known to the programmers, they are distinguished from each other such as e.g. distinct categories of programmers like main-frame programmer, object oriented programmer or internet or world-wide-
web (www.com------etc.-). In large organizations, programmers follow descriptions provided by software engineers or systems analyst. These descriptions are useful in:

(a) Listing the input required
(b) Determining computer steps to be followed in processing data and finalizing the desired arrangement of output.

Q. 6) What are the specific job requirements for the graduate and under graduate entrants?

Ans:  
(a) Updating, repairing, modifying and expanding existing programmes.
(b) Making changes to code the 'routine" and making teammates aware of the task to be performed by 'routine:' (BY INSERTING COMMENTS IN THE CODED INSTRUCTIONS.)
(c) Discovering the unique parts of the programme by using innovations such as CASE (Computer Aided Software Engineering) tools. This is necessary for increasing reliability, consistency and programmer's productivity in terms of 'results' through short cuts.
(d) On the occurrence of error, programmers must ensure correctness of instructions and make appropriate changes and recheck the programmes till obtainment of correct results. This process is called 'debugging'.
(e) As 'application' programmers they are expected to write software to handle specific jobs e.g. Programmes used in inventory control system.
(f) As 'system' programmers they should maintain and control the use of computer systems software. For this purpose, they should make changes in sets of instructions to determine how the network, workstation and central processing unit of the system handle various jobs by communicating with peripheral equipment like terminals, printers and disk drives. This helps discovery of the origin (source) of the problem.
Q.7) What is the relation between functions and job availability for computer operators?

Ans:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Designation</th>
<th>Nature of job requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Programmer Analyst</td>
<td>Systems Analysis and actual programming needed by small organizations</td>
</tr>
<tr>
<td>2)</td>
<td>Adept Users (Owing to transition from main-frame environment)</td>
<td>Tasks of the programmes using packaged software (spread sheets and data based software packages) To write simple programmes to access data and to perform calculations.</td>
</tr>
<tr>
<td>3)</td>
<td>Programmers in software Development companies packaged software programmers in computer service industry</td>
<td>Directly working with experts from various fields to create software programmes designed for clients or packaged software for desktop publishing, financial planning and spread sheets.</td>
</tr>
<tr>
<td>4)</td>
<td>The work of computer operator</td>
<td>As Above</td>
</tr>
<tr>
<td>5)</td>
<td>The work of computer programmer</td>
<td>As Above</td>
</tr>
</tbody>
</table>
Q.8) What is your approach and guidance to write while meeting candidates for campus interviews?

Ans: While hiring programmers we (employers) look for people with necessary programming skills. We select those candidates who have the ability to think logically and who are attentive (vigilant) to detail. While giving them assignments we observe their patience, loyalty, persistence for exacting analytical work especially under pressure (emergency) conditions requiring designing of instant solutions. They must also have the ability to follow-up mistakes, and find out curatives for potential failures. They must show their potential in working with abstract concept and conduct technical analysis. They must continuously work with the software that controls computer operations. They should 'on the spot' interact directly with their teammates and procrastination in this respect cannot be tolerated. Employers' expects communicative skills from the computers (technical) personnel with the non technical personnel.

Initially computer operators and computer analysts may work independently on simple assignments. But after initial instructions they should communicate with senior experienced programmers and get guidance from them. In view of frequent changes in computer technology, employers as software vendors would like to (as a matter of rational HRD Policy) sponsor training courses wherein a sincere participation by the would-be computer experts or by the trainee candidates is materialized and they have better chances for advancement (promotion). Large organizations promote trained and experienced candidates as lead programmers. More and more supervisory responsibilities are given to the experienced loyal candidates. Application programmers can move later into system program after gaining experience and training, in the training courses designed by the employers.

There is scope for working in R & D when programmers acquire specialized knowledge and experience with a language or an operating system. Multimedia or Internet technology are the areas for R & D. When the employers contract out to perform programming jobs, where more opportunities are created for experience programmers with expertise in specific areas to work as consultants. These areas are for example, medicine, educational and technical services in (airways), biotechnology, management of professional and related service (consultancy), sales administrative job, farming and related jobs, constructions, installation, production, transportation, jobs in Armed Forces (Military and Military Engineering), information services.
Q.9) What are the eligibility conditions in terms of formal education for computer operators and programmes?

**Computer Operators' and programmers' Functions in IT organization and required educational qualifications**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars</th>
<th>Eligibility Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Management of projects</td>
<td>Graduate</td>
</tr>
<tr>
<td>2.</td>
<td>Technical Specialist</td>
<td>Graduate</td>
</tr>
<tr>
<td>3.</td>
<td>Architect</td>
<td>Engg. Graduate</td>
</tr>
<tr>
<td>4.</td>
<td>Programmer</td>
<td>Engg. Graduate, Diploma MCS holders</td>
</tr>
<tr>
<td>5.</td>
<td>Analyst</td>
<td>MCA,MCs, BCs</td>
</tr>
<tr>
<td>6.</td>
<td>Business Analyst</td>
<td>MBA,CA,ICWA,MCA Com + IT Knowledge</td>
</tr>
<tr>
<td>8.</td>
<td>Designers</td>
<td>Diploma or Engg. Graduates, MCS</td>
</tr>
<tr>
<td>10.</td>
<td>Data Base Administrator</td>
<td>Diploma Holders+Specialized training in Oracles, etc.</td>
</tr>
<tr>
<td>11.</td>
<td>Network Engineer</td>
<td>Diploma holders+Specialized training in MCSE (Microsoft Certified software Engineers) CCNE (CISCO certified Networking Engineering)</td>
</tr>
<tr>
<td>12.</td>
<td>Network (Lan/WAN) Administrator</td>
<td>Diploma Engg Graduate with specialized training in CCNA CCIE (CISCO certified network Engineering)</td>
</tr>
<tr>
<td>13.</td>
<td>IT help Desks</td>
<td>Undergrads</td>
</tr>
<tr>
<td>14.</td>
<td>Technical Support Engineers</td>
<td>Graduates, Diploma holders with technical know-how of PC maintenance</td>
</tr>
<tr>
<td>15.</td>
<td>Quality Engineers (Process Specialists)</td>
<td>Not necessarily from Engineering background</td>
</tr>
<tr>
<td>16.</td>
<td>Research Specialists optimization of codes algorithm (Reciope) Domain Specialist-Research in Instrumentation Support Groups Finance, HR, Administration</td>
<td>Graduate + DBM or MPM</td>
</tr>
<tr>
<td>17.</td>
<td>IT enabled services (BPO (Business Process Outsourcing) Call Centre Agent Data Entry Operator</td>
<td>Graduate Undergraduate Frequency in English Speaking Undergrates</td>
</tr>
</tbody>
</table>
Q. 10) What are the important terms and conditions in the employer-employee agreement when a potential candidate is selected as a potential employee?

Ans: The master agreement covers following areas:
(a) Employment related liability
(b) Time & place of work
(c) Term, termination and replacement
(d) Identification Vs. limitation of liability
(e) Ownership of Intellectual property rights
(f) Confidentiality
(g) Non compete and non solicitation
(h) Conduct of personnel
(i) Job code

Q. 11) What are the eligibility criteria for contracting staffing agency?

Ans: The eligibility criteria for a contracting staffing agency
(a) Number of contracts on roll
(b) Process and mark-up rates
(c) Annual revenue
(d) Ability to source specialized skills
(e) Response time
(f) Customer referral
(g) Flexibility and types of services offered.

An off shore registered agency can work on, on-site requirement when employers sign up local partners in specific geographies.

Q. 12) Do you insist for a formal certification of a candidate in respect of his ability to cope with jobs they will be faced with?

Ans: Technical or professional certification is becoming more common as a way for employers to ensure a level of competency or quality in all areas. Many product vendors offer certification or may even require certification of technicians and professionals who work with their products. The number of voluntary certification programs is also growing and this type of certification is available through organizations such as the Institute for Certification of Computing Professionals (ICCP). ICCP confers the designation Certification of Computing Professionals (CCP) to those who have at least 4 years of experience or 2 years of experience and a college degree. To qualify, individuals must pass a core examination plus exam in two specialty areas, or an exam in one specialty area and two computing
languages. Those with little or no experience must be tested for certification as an Associate Computer Professional (ACP). Certification is not mandatory but it may give a job-seeker a competitive advantage.

Q. 13) What are the job prospects (job outlook) in the area of Computer services?
Ans: Computer expertise and education would certainly enable 40% young population (in the age group 18 to 20) and 25% educated unemployed. To better their prospects in 1998-99 the rate of progress of computer service industry was 1.4% per annum which rose to 3% in 2003-2004 and it is expected to go up 7% (extrapolated estimate). The congeniality factor for this development is the rational policy of Government.

*On 25th January, 2005 the Prime Minister of India made an appeal to set an Action Plan for creating 7.60 employment opportunities. This Action Plan would imply a provision of Rs. 42,000 millions. Such a plan has to be implemented by the 'Planning Commission' in a free enterprise economy. It has to be implemented at regional level. The assumption which could have been made long ago in this respect by the planners was that ratio of labour to capital is very high in India. This however is not completely true under the present day circumstances. The unused financial resource in banks is to the extent of Rs. 6000 millions and foreign exchange resources also remain underutilized. Optimum use of such capital resources should be made in order to fully explore and exploit high labour potential in India.

In the effort to safeguard the vested interest of capital, it would be unjustifiable, illogical and incompatible to presume an employment generation policy which is submissive. More so when it is officially expected and declared by the President that by 2020 the growth rate of GDP would be 6% to 7%. The upper middle class would shine in India which will be recognized as a 'Developed Nation' in the global context. 'Job Opportunities for all' should be the motto and IIPM experts who are talking seriously about realization of President's dream of jobs for all advice Government to create employment in traditional small scale industries, village industries, in addition to agricultural sector, processing, fisheries, animal husbandry, poultry, etc. 7.60 crores of jobs could be created by investment of capital to the extent of Rs. 1500 millions.

*(Source: A local newspaper Loksatta (Udyog Bharari) Page 6 dt.4th Feb,05. an article by Mr. Malaya Choudhary - in India Today & Tomorrow.)

(129)
This is the main area of Governmental expenditure (wherein private sector will not like to enter) where gestation period is long and profit earning in the short run cannot be the objective of economic activity of the Welfare State of India. This implies not only controlling utilization and the rate of increase in money supply but also regulating it for creation of employment opportunities in certain sectors on priority basis.

Employment generation and growth in computer science sector are interwoven. The complexity of programming tasks for the developmental projects is going to increase requiring high level quality of education and training in computer programmers whether employed on a temporary or contract basis. Computer programmers are categorized as technicians, distinct from high level of theoretical expertise which is the characteristic of computer scientists, computer engineers and system analyst.

Q.14) What are the Career Opportunities for school drop-outs after 7th, 8th, 9th and 10th standard (Non SSC’s)

Ans: Major areas of opportunities for self employment are -
(a) Production
(b) Trade & commerce
(c) Service (Occupational skills) (Consultancy and Investment intermediary)

(a) Technical Jobs :
Pattern maker, Moulder, welder, Wireman, Carpenter, Plumbing, repairing Diesel Engine, Tailoring, Agricultural Equipment management, Leather Craft, Glass & Ceramic Trade, Painting, Catering, Shipping Career, Spinning & Weaving, Embroidery & allied courses, Dairy training, Fishing, Poultry, Bee, Horticulture-Gardening, Tractor Mechanic.

(b) Engineering :
Textile, Mechanical, Chemical, Automobile, Art & Hobby, Audio Video Media, Instruments, Repairs & maintenance Small Scale Industrial Projects, Screen Printing, Soft Toys, Travel & Tourism, Courier Service, Marketing. The use of laptop or notebook computer (PC’s) greatly increases functional efficiencies of the self employed. ERP software (Enterpre Resource Planning) Pentium P-III greatly facilitates small and medium scale business management. Operations like control over raw material and other stocks, tax operations, financial and banking transactions, personnel management operations and control over manpower costs, development of software for customization, disciplined and timely operations minimizing (130)
risks and costs and enhancement of goodwill through maximization of customer satisfaction. Thus, the expenditure (investment) in computer software makes business competitive at national and international level in the context of globalization.

The computer software development in the context of globalization consists of Microsoft and oracle followed by SAP (German Software Industry) SAP developed by IBM has laid considerably to productivity and increase in business turnover by creating a vast infrastructure supported by advanced software technology. SAP has provided unique technological support to Enterprise Resource Planning (ERP). Its role is similar to that played by photocopying and Xerox technology. It facilitates economy in the use of time and monetary resources (manpower, money and minutes) in the various areas of business management such as finance, marketing, purchase, mobilization of material distribution, after sales services, public relations by providing and updating the required information through advanced information technology. Production, Banking & finance, Service industry, governmental machinery have been using SAP - About 500 professional businesses in Maharashtra and 80 professional businesses in Pune have been taking advantage of SAP.

Q. 14) (a) Queries on the campus interviews and interviewers and the staff of the educational institutes arranging campus interviews-

Q.1) what is the nature of demand for computer degrees and software Market?
Ans: A lift of demand has been created for getting into computer courses in colleges, i.e. BSc (computers), B.E. (computers) or MCA.

Q.2) What is the cost of completing cost work degree courses?
Ans: Fees and donations for computer degree have raised high for the new courses like Information Technology (IT) designed and introduced recently.

Q.3) What is relevance of University Degree like B.A., B. Sc, B. com in getting a job in software?
Ans: University degrees have been losing relevance in software industry. What is required is acquiring skills in computer programming and operations. As long as aspiring candidate has the knowledge and expertise in computer operations, degrees do not matter much in getting a job. Even an undergraduate or even a school drops out can get a lucrative job in the software market, if he has the required operative skills.
Q.4) Why do the company advertisements ask for B.E./MCA?
Ans: The expectations mentioned in the advertisements only remain on paper. It remains formality.

Q.5) What is the main objective and basic principle of such advertisements and campus interviews?
Ans: In the modern scenario in the software markets jobs are delinked from degrees (formal higher secondary school and university education).

Q.6) What is your advice to the new entrants in the software market?
Ans: You must opt for computer science qualification, If you get that career automatically through merit - so far so good. However, when admission to computer science course through merit is not possible one need not be crazy about having another degree of university by pressurizing parents to pay high for going into a degree course because a university degree in any faculty cannot automatically enabled obtainment of a job in a software.

Q.7) How far can possessing a degree in computer sciences enable a candidate for a software job?
Ans: A degree in computer science alone cannot guarantee a software job because the college syllabi for the computer degree courses (BCA/MCA/MCS) are not updated according to the expectations of the employers. With the constant changes in the advanced technology software industry needs different innovative skills which should be acquired by the students.

Q.8) What are the deficiencies in the syllabi for the various subjects prepared by universities whose study is meant for getting a degree in computer science?
Ans: The subjects learnt by the students acquiring a Degree in Computer Science, mainly deal with the design aspects of software that helps a person working in R & D labs- which aim at developing software and new languages. However, in India software market is more service oriented than the research oriented. Foreign clients dictate new software requirements which are useful for business applications.

Q.9) What are the important areas of business applications of software?
Ans: Those given by the training institutions e.g. Visual Basics, Oracle,
JAVA, internet technologies, etc. unfortunately this business software is not included in the software curricula of colleges and universities which should make sincere and continuous efforts to update syllabi according to the industry requirement changes in which occur almost after every 6 months. At least once in a year, efforts should be made by colleges, universities to update courses and should not allow the courses to get obsolete or redundant. This seems to be lacking and impractical.

Q.10) What is the policy implication of this scenario for education institutions and Indian Government?
Ans: It is no use entertaining wrong ideas. It is not that the prevalent software courses are underestimated. Study of the design aspects of computers - (design of computers, software methodologies) is important as a background. But a computer student who has obtained a degree in computer must work in and spend more timing in computer labs. Such interest may not be taken by graduates in other non-computer faculties. The interviewers in the campus interview have unanimously opinioned that, after understanding the basics of software language and the platform on which they run, it is necessary for a computer student to update his knowledge about latest developments in the software industry. A dialogue with the campus interviewers can enable the students to get various clues in this respect. They can even get adequate reference (theory and practice) material like books and journals internet for working on. These references will provide knowledge regarding latest computer skills demanded by the industry. Such a development is necessary after learning the basic things in computer science degree course e.g. languages C, C++, and JAVA. This because these languages are going steady at all times and most applications are designed on this.

To conclude such efforts of updating knowledge will enable an aspiring student job-seeker in software industry to move along with the industry.

Q. 15) What is the nature of working conditions to the programmers?
Ans: Programmers test a program by running it to ensure that the instructions are correct and it produces the desired information. If errors do occur, the programmer must make the appropriate change and recheck the program until it produces the correct results, a process called “debugging.” Programmers working in a mainframe environment may still prepare instructions for a computer operator who will run the program. (The work of computer operators
Programmers often are grouped into two broad types: Applications programmers and systems programmers. Applications programmers usually are oriented toward business, engineering, or science. They write software to handle specific jobs within an organization, such as a program used in an inventory control system. They may also work alone to revise existing packaged software. Systems programmers, on the other hand, maintain and control the use of computer systems software. These workers make changes in the sets of instructions that determine how the network, workstations, and central processing unit of the system handles the various jobs they have been given and how they communicate with peripheral equipment, such as terminals, printers, and disk drives. Because of their knowledge of the entire computer system, systems programmers often help applications programmers determine the source of problems that may occur with their programs.

In some organizations, particularly smaller ones, workers more commonly referred to as programmer-analysts are responsible for both the systems analysis and the actual programming work. (A more detailed description of the work of programmer analysts is presented in the statement on computer scientists). Advanced programming languages and new object-oriented programming capabilities are increasing the efficiency and productivity of both programmers and users. The transition from a mainframe environment to a primarily PC-based environment has blurred the once rigid distinction between the programmer and the user. Increasingly, adopt users are taking over many of the tasks previously performed by programmers. For example, the growing use of packaged software, like spreadsheet and data base management software packages, allows users to write simple programs to access data and perform calculations.

Programmers in software development companies may work directly with experts from various fields to create software either programs designed for specific clients or packaged software for general user ranging from games and educational software to programs for desktop publishing, financial planning, and spreadsheets. Much of this type of programming is in the preparation of packaged software, which comprises one of the most rapidly growing segments of the computer services industry.
Environment

Computer programmers held about 5,68,000 jobs in 1996. Programmers are employed in almost every industry, but the largest concentration is in the computer and data processing services industry which includes firms that write and sell software. Large numbers of programmers can also be found working for firms that provide engineering and management services, manufacturers of computer and office equipment, financial institutions, insurance carriers, educational institutions, and government agencies.

A growing number of computer programmers are employed on a temporary or contract basis or work as independent consultants as companies demand expertise with newer programming languages or more specialized areas of application. Rather than hiring programmers as permanent employees and then laying them off after a job is completed, employers can contract with temporary help agencies, consulting firms or directly with programmers themselves. A marketing firm, for example, may only require the services of several programmers to write and "debug" the software necessary to get a new database management system running. This practice also enables companies to bring in people with a specific set of skills, usually in one of the latest technologies as it applies to their business needs. Bringing in an independent contractor or consultant with a certain level of experience in a new or advanced programming language, for example, enables an establishment to complete a particular job without having to retrain existing workers. Such jobs may last anywhere from several weeks to a year or longer. There were 20,000 self-employed computer programmers in 1996 and this number is expected to increase.

Training, Other Qualifications, and Advancement

While there are many training paths available for programmers, mainly because employers' needs are so varied, the level of education and quality of training employers seek have been rising due to the growth in the number of qualified applicants and the increasing complexity of some programming tasks. Bachelor's degrees are now commonly required, although some programmers qualify with 2-year degrees or certificates. College graduates who are interested in changing careers or developing an area of expertise also may return to a two-year community college or technical school for additional training. In the absence of a degree, substantial specialized experience or expertise may be needed. Even with a degree, employers appear to be placing more emphasis on previous experience for all types of programmers.
Table 1. Percent distribution of highest level of school completed or degree received, computer programmers, 1996

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High school graduate or equivalent or less</td>
<td>10.0</td>
</tr>
<tr>
<td>Some college, no degree</td>
<td>20.9</td>
</tr>
<tr>
<td>Associate's degree</td>
<td>9.6</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>45.2</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>14.2</td>
</tr>
</tbody>
</table>

The majority of computer programmers almost 60 percent had a bachelor's degree or higher in 1996. (See table 1.) Of these, some hold a B.A. or B.Sc. in computer science, mathematics, or information systems while others have taken special courses in computer programming to supplement their study in fields such as accounting, inventory control, or other business areas. As the level of education and training required by employers continues to rise, this percentage should increase in the future.

Skills needed vary from job to job and the demand for various skills is generally driven by changes in technology. Employers using computers for scientific or engineering applications generally prefer college graduates who have degrees in computer or information science, mathematics, engineering, or the physical sciences. Graduate degrees in related fields may be required for some jobs. Employers who use computers for business applications prefer to hire people who have had college update their training by taking courses sponsored by the employer or software vendors.

For skilled workers, who keep up to date with the latest technology, the prospects for advancement are good. In large organizations, they may be promoted to lead programmer and be given supervisory responsibilities. Some applications programmers may move into systems programming after they gain experience and take courses in systems software. With general business experience, programmers may become programmer - analysts or systems analysts, or be promoted to a managerial position. Other programmers, with specialize knowledge and experience with a language or operating system, may work in research and development areas such as multimedia or Internet technology. As employers increasingly contract out programming jobs, more opportunities should arise for experienced programmers with expertise in a specific area to work as consultants.

Dr. Sharad Joshi a career consultant has remarked that the priorities of the graduates (B.Com., BA's) should change from government service (Job) to private corporate job and from private corporate jobs to independent job for self employment since 1980 government allocation process has given way to
privatization in the large scale and small scale industrial sector. Graduated students from various faculties expect that suitable job should be provided by the economic system and the Government. However, when rate of employment generation is falling, the jobseekers have to equip themselves with the necessary technical knowledge (confirmed by the process of certification) and create job opportunities for themselves by their own efforts. They must face the challenging real situation that government jobs are not available. The corporate sector has changed its personal policies and are reducing their financial commitments in the manpower utilization. Consequently, mere possession of a degree of a university is not adequate for a student. They must supplement this by acquisition of computer knowledge and skills in computer application in the various fields and in both the urban and rural sector. They must complete in professional course which is the need of the hour.

Q.16) What is the scenario for employment potential for computer jobs in future ?
Ans: Employment of programmers is expected to grow faster than the average through the year 2006. Jobs for both systems and applications programmers should be plentiful in data processing service firms, software houses, and computer consulting businesses. These types of establishments are part of computer and data processing services, which is projected to be the fastest growing industry. As companies attempt to control costs and keep up with changing technology, they will maintain a need for programmers to assist in conversions to new languages and from one system to the next. In addition, numerous job openings for programmers will result from the need to replace programmers who move to other occupations or leave the labor force. Most programmers who leave transfer to other occupations, such as manager or systems analyst.

Despite numerous openings, however, the consolidation and centralization of systems and applications should continue to moderate growth, as will developments in packaged software, advanced programming languages and tools, and the growing ability of users to design, write, and implement more of their own programs to meet their changing needs. As the level of technological innovation and sophistication increases, programmers should continue to face increasing competition from programming businesses overseas where more of the routine work can be outsourced at a lower cost.

As programming tasks become more complex and increasingly sophisticated skills and experience are demanded by employers, graduates of 2-year programs, and people with less than a 2-year degree or its equivalent in work
experience, should face stronger competition for programming jobs. Competition for entry level positions, however, can even affect applicants with a bachelor's degree. Although demand fluctuates as employer's needs change with technology, prospects should be best for college graduates with knowledge of and experience working with a variety of programming languages and tools, particularly C++ and other object oriented languages such as Smalltalk, Visual Basic, Ada, and Java as well as newer, domain-specific languages that apply to computer networking, data base management, and Internet applications. In order to remain competitive, college graduates should keep up to date with the latest skills and technologies.

Many employers prefer to hire applicants with previous experience in the field. Employers are increasingly interested in programmers who can combine areas of technical expertise or who are adaptable and able to learn and incorporate new skills. Therefore, individuals who want to become programmers can enhance their chances of doing so by combining the appropriate formal training with practical work experience. Students should try to gain experience by participating in a college work-study program, or undertaking an internship. Students also can greatly improve their employment prospects by taking courses such as accounting, management, engineering, or science allied fields in which applications programmers are in demand. With the expansion of client/server environments, employers will continue to look for programmers with strong technical skills who understand their business and its programming needs. Businesses also look for programmers who develop a technical specialization in areas such as client/server programming, multimedia technology, Graphic User Interface (GUI), and 4th and 5th generation programming tools. Programmers will be creating and maintaining expert systems and embedding these technologies in more and more products. Other areas of progress include data communications and the business application of Internet technologies. Networking computers so they can communicate with each other is necessary to achieve the greater efficiency organizations require to remain competitive. Demand for programmers with strong object-oriented programming capabilities and experience should arise from the expansion of Intranets, extranets and World Wide Web applications.

Earnings

Median earnings of programmers who worked full time in 1996 were about $40,100 a year. The middle 50 percent earned between about $30,700 and $52,000 a year. The lowest 10 percent earned less than $22,700; the highest 10 percent earned more than $65,200. Starting salary offers for graduates with a bachelor's degree in the area of computer programming averaged about $35,167.
a year in private industry in 1997, according to the National Association of Colleges and Employers. Programmers working in the West and Northeast earned somewhat more than those working in the South and Midwest. On average, systems programmers earn more than applications programmers.

A survey of workplaces in 160 metropolitan areas reported that beginning programmers had median annual earnings of about $27,000 in 1995. Experienced mid-level programmers with some supervisory responsibilities had median annual earnings of about $40,000. Median annual earnings for programmers at the supervisory or team leader level were about $55,000.

According to Robert Half International Inc., starting salaries ranged from $32,500 to $39,000 for programmers and $47,500 to $60,000 for systems programmers in large establishments in 1997. Starting salaries for programmers in small establishments ranged from $28,000 to $37,000.

In the Federal Government, the entrance salary for programmers with a college degree or qualifying experience was about $19,520 a year in early 1997; for those with a superior academic record, $24,180.

Related Occupations

Programmers must pay great attention to detail as they write and "debug" programs. Other professional workers who must be detail-oriented include computer scientists, computer engineers, and systems analysts, statisticians, mathematicians, engineers, financial analysts, accountants, auditors, actuaries, and operations research analysts.

Sources of Additional Information

State employment service offices can provide information about job openings for computer programmers. Also check with your city's chamber of commerce for information on the area's largest employers.

For information about certification as a computing professional, Contact:

Further information about computer careers is available from:
The Association for Computing (ACM), 1515 Broadway, New York, NY 10036.
Wage Policy

1) The HRD Manager has decided to raise the salary for all employees in dept number 20 by 0.05. Whenever any raise is given to all the employees, a record for the same is maintained in the BMP-RAISE table. It includes the employee number, the date when the raise was given and the actual raise. Write a PL / SQL block to update the salary of each employee and insert a record in the EMP-RAISE table.

2) Write a cursor which will accept dept no. and job from user and will display name, job, dept no. and salary of all employees in the department and for that job.

3) Write a PL/SQL block of code that first inserts a record in an 'EMP' table. Update the salaries of Blake and Clark by Rs. 2000 and Rs. 1500 respectively. Then check to see that the total salary does not exceed 20,000. If the total salary is greater than 20,000 then undo the updates made to salaries of Clark and Blake.

4) Write a PL / SQL block to display all names in descending order from 'EMP' table whose salary is greater than 5000, Maximum records should not be more than 5.

5) Create a trigger that will disallow the user to perform insert or update activities on EMP table.

6) Write a cursor, which will display the top five highest paid employees from the table. Create a trigger that will convert the characters in upper case while they enter in the table.

7) Write a PL7SQL block to accept two numbers from the user and perform mathematical operations on them.

8) Write a program to accept the employee no. from the user and belonging to the sales department. Display his name, job, salary and commission. If the employee does not receive any commission then update his record by giving him Rs. 500 as commission. Also check that the total compensation (i.e. salary + commission) does not exceed the President's salary.
Career Consultancy Services and Response of the prospective Careerists

Career consultancy service supports students to understand their career interests, evaluate and access career opportunities and effectively implement their career decision. The functional areas of career consultancy services are:

(a) Undergraduate work placement programme
(b) Advertising on career website and notice boards
(c) Meeting students on advisory sessions, mock interviews and career evaluations reviews
(d) Studying attributes of students making a lucrative career

These attributes or personality traits are:

(i) students entering employment
(ii) students going abroad for further studies and jobs in foreign countries
(iii) students priority to remuneration over other higher career opportunities.
(iv) students reactions to general unemployment situation in the country (whether optimistic or pessimistic)
(v) students response to advisory sources and growth in the demand for careers in the process of job hunting.
(vi) students response to placement offers in the field of specializations like food science, technology, engineering, computer science, chemistry, pharmacy, finance and fine arts.
(vii) Follow up of students' response to drop-in advice, career review, interviews, conference, seminars and student fairs and career education liaison with academic departments and web talks and informative interviews on highlighted future challenges.

(e) financial support for graduation, by targeting students from different faculties.

(f) Acting as intermediaries or links to employers' website, links to job sites, choice sites and educational institutions and government directorates

(g) Advertising vacancies on the job bulletins and career information publications.
General characteristics of advisory and placement programmes organized by consultancy services organizations are:

(a) In respect of undergraduate work placement programme students participation from the various faculties has been

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Electrical engineering</td>
<td>25%</td>
</tr>
<tr>
<td>And computer science</td>
<td>25%</td>
</tr>
<tr>
<td>Food</td>
<td>26%</td>
</tr>
<tr>
<td>Food science</td>
<td>14%</td>
</tr>
<tr>
<td>Nutritional services</td>
<td>14%</td>
</tr>
<tr>
<td>Finance</td>
<td>15%</td>
</tr>
<tr>
<td>Chemistry and pharmacy</td>
<td>15%</td>
</tr>
<tr>
<td>Process engineering</td>
<td>2%</td>
</tr>
</tbody>
</table>

Note: Growing demand for placement positions and growing prospects for graduate employability and development of transferable personal skills are the key observations on the basis of the above break up analysis. Students were made aware the range of technical and non technical skills. On the basis of interactions with employers e.g. The big IT companies are prepared to extend the period of placement and variety of sectors is available for placement in the fields of engineering, banking and finance AND THE FEEDBACK HAS BEEN VERY POSITIVE. The employers' awareness about the availability of expert consultancy career services and employer liaison activities have increased. Students are also encouraged to design a data base according to the changing requirements of the employers.

The relative importance of faculties which is notable is that there are following definite preference trends (higher or longer) the choice of students' choice, who belong to various faculties.
Students in the field of commerce, learning specific technology have relatively highest options for presently available jobs following by students interested in future studies. A very insignificant part of students are not available for employment and seek future higher education.

**LIST OF QUESTIONS IN THE QUESTIONNAIRES**

1. What are the eligibility conditions for computer engineers (programmers)?
2. What changes in the syllabi and curricula of degree courses are necessary in view of fast changing technology?
3. What are your expectations about the candidates who aspire for a career as a computer programmer?
4. Considering frequent advances in technology what kind of computer programmes (software) are awaited for the aspiring computer experts?
5. Would you give specific suggestions with illustrations?
6. What are the specific job requirements for the graduate and undergraduate entrants?
7. What is the relation between functions and job availability for computer operators?
8. What is your approach and guidance to write while meeting candidates for campus interviews?

(143)
9) What are the eligibility conditions in terms of formal education for computer operators and programmes?

10) What are the important terms and conditions in the employer-employee agreement when a potential candidate is selected as a potential employee?

11) What are the eligibility criteria for contracting staffing agency?

12) Do you insist for a formal certification of a candidate in respect of his ability to cope with jobs they will be faced with?

13) What are the job prospects (job outlook) in the area of computer services?

14) What are the career opportunities for school drop outs after 7th, 8th, 9th and 10th standard (Non SSC’s)?

14 (a) Queries on the campus Interviews:

(1) What is the nature of demand for computer degrees and software market?

(2) What is the cost of completing cost degree courses?

(3) What is the relevance of University Degree like B.A., BSc, Bcom, in getting a job in software?

(4) Why do the company advertisements ask for B.E./MCA?

(5) What is the main objective and basic principle of such advertisements and campus interviews?

(6) What is your advice to the new entrants in the software market?

(7) How far can possessing a degree in computer sciences enable a candidate for a software job?

(8) What are the deficiencies in the syllabi for the various subjects prepared by universities whose study is meant for getting a degree in computer science?

(9) What are the important areas of business applications of software?

(10) What is the policy implication of this scenario for education institutions and Indian Government?

(15) What is the nature of working conditions to the programmers?

(16) What is the scenario for employment potential for computer jobs in future?
The Questionnaires sent to industrial Employers and educational institutions covered information on-

a) Eligibility Requirements for computer engineers.
b) Changes in the syllabi and curricula required to suit the new eligibility criteria.
c) Employers' expectations about the new recruits.
d) Employers' specific suggestions regarding computer knowledge and application skills.
e) Job requirements for graduate and undergraduate entrants.
f) Relationship between functions on the jobs and availability of eligible candidates as computer operators.
   Employers' approach in selecting entrants (candidates)
g) Eligibility conditions with reference to formal education.
h) Nature and contents of employer-employee agreements.
i) Job codes prepared by the employers.
j) Eligibility criteria for the contractual appointments.
k) Employers' expectations regarding formal certification.
l) Future prospects in the job-assignments.
m) Queries on the campus interviews and efforts of the educational institutions in preparing the candidates for the campus interviews.
n) Relevance of knowledge and instruction imparted by educational institutions.
o) Nature of verifying conditions-employments and other benefits-chances of promotions, visits to foreign companies.
p) Training facilities provided by the employer.
q) Scenario for future employment potential.
r) Job related occupations.
s) Personnel (HRD) policy and wage policy of the recruiting employer.
t) Induction programmes by the educational institutions (engineering colleges and universities and Management Institutes).
u) Characteristics of Placements made by the employer.