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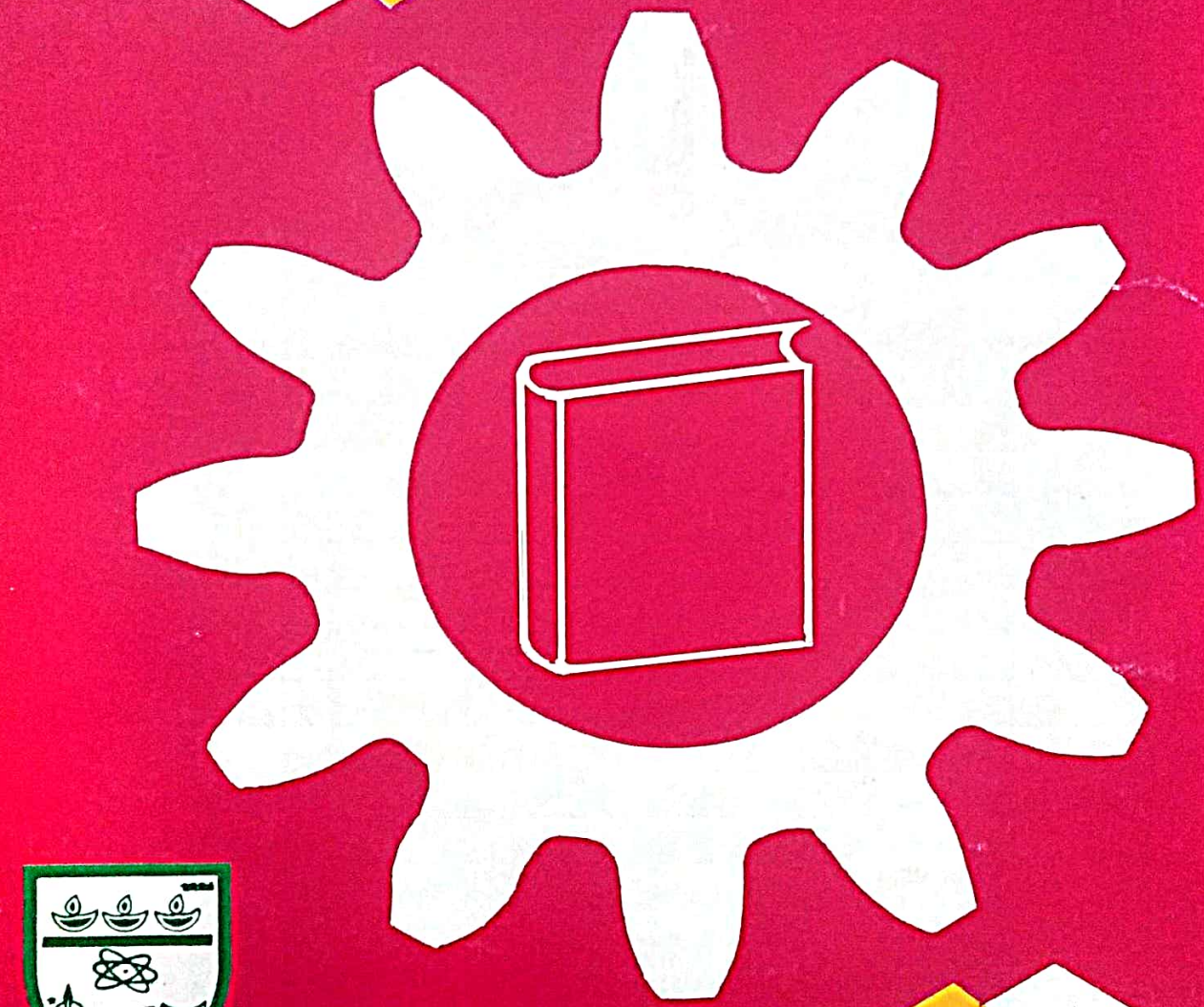

TECHNICAL TEACHERS' TRAINING INSTITUTE

CHENNAI 600113 INDIA

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EDITORIAL

We are glad to bring out the Journal of Technical and Vocational Education, issue 17th little earlier than previous years. For this issue we got encouraging response from our contributors in India. Almost all the articles and research papers were well thought out and well written but due to lack of space we were unable to accommodate all the papers.

The present issue the JTVE has come out with a variety of articles and papers in different areas of technical and vocational education. Professor B.Z. Samaga and his associates in their article have raised the issue of ISO 9000 certification. Their paper attempted to analyse the quality perspective in technical education from objective point of view on the subject. Dr. R.Srinivasan and Professor A.G. Augustine in their article on entrepreneurial orientation in technical and vocational curriculum have provided ten suggestions which according to them would sow the seeds of entrepreuernership developments in college students.

In an unique way Prof. S.G.Gopalakrishna and Sri D.S.Viswanath have presented their opinion on the role of technical education on industralisation. For the development of the national vis-a-vis technical education, they have suggested higher investment on science and technology, overhauling the syllabi and curricula to suit the changing beeds, updating the infrastructural facilities in educational institutions, better industry institute interaction and pursuing international collaboration for the advancement of science and technology.

Professor N. Ramachandran and his colleagues in their article have presented their views on the need for business and industry orientation of engineering colleges. They have provided few guidelines which will enable technical institutions for more involvement with business and industrial organisations.

So far, in our Journal of Technical and Vocational Education we could not publish anything with respect to certain important areas of technology. Printing Technology remained one such areas. Professor C.A.Njaka has contributed one article on technological development and the need for training and restraining of printers.

For this issue we have got some more contribution in the form of papers and articles in the area of Institute Industry Interaction. Shri S. Dhanapal and his colleague have contributed a paper on continuing education activities in polytechnics. In their paper they have attempted to understand the functioning of the continuing education cells of a few identified polytechnics along with their ongoing activities with the industries. Shri. K.P.Bharathan contributed another article on the scheme of community polytechnics and its interface with industry for enhancing employability.

In a different area altogether Dr. R. Rajendran presented on organizational role stress on the basis of empricial work. As a result of the study he has suggested the need for periodical "stress management programme" to improve personal development of executives. Dr. M. Narayana Rao and Sri G. Kulandaivel have contributed the article on adapting engineering education to internet revolution.

Career and vocational guidance is one of the important areas of technical education system. Professor N.F. Amechi has contributed the importance of occupational information in vocational guidance. Though the theme mostly connected to school education system, it has bearing on technical vocational education system also.

We acknowledge the contributions of anthors from India and abroad for this present issue. We welcome papers and research abstracts for future issues.

We thank Dr. R. Srinivasan for going through the proof at the shortest time along with his other responsibilities for the journal, and made it possible to appear well ahead of time.

Editor.

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Quality in Technical Education - IS ISO 9000 Certification Necessary?

P. SRINIVASA PAI, K. SUBRAHMANYA BHAT, B.R. VINAYA and B.S. SAMAGA

1.0 INTRODUCTION

The importance of quality in the products and service provided by organizations in the country has increased particularly with the advent of liberalization and globalization policies of the Government in 1991. The products and services offered by the Indian companies have to compete with that offered by multinational companies. In order to ascertain quality, to produce globally competitive products and services, organisations are trying to adopt various quality standards like ISO 9000, TQM, QS 9000 etc., In the light of the increased emphasis on quality in the industrial scenario of the country, the educational system also has to think in terms of quality, particularly the technical education, since the manpower inputs to the industries are from these technical institutions. Thus in order to establish and maintain the lead in the market, the industries have to adopt rigorous quality procedures and must have systems in place to develop themselves into global leaders. Similarly the technical education system imparted by various institutions also have to be subjected to quality procedures and systems in order to provide quality technical inputs to these industries. Various measures are being adopted. Similar to ISO 9000 standards being adopted in industries, technical institutions in the country are also trying to adopt ISO 9000 standards. A few technical institutions in the private as well as in the Government sector have already obtained ISO 9000 certification. The importance of ISO 9000 certification regarding quality is clear from the fact that the number of companies being certified in the country are increasing every year. This also acts as a gateway for the companies to enter the global market. Also this is a foundation for going in for Total Quality Management (TQM) and finally to the Continuous Quality Improvement Initiative (CQI). As far as the educational sector is concerned, there is still a debate going on as to whether ISO 9000 standards are required for educational institutions, technical institutions in particular.

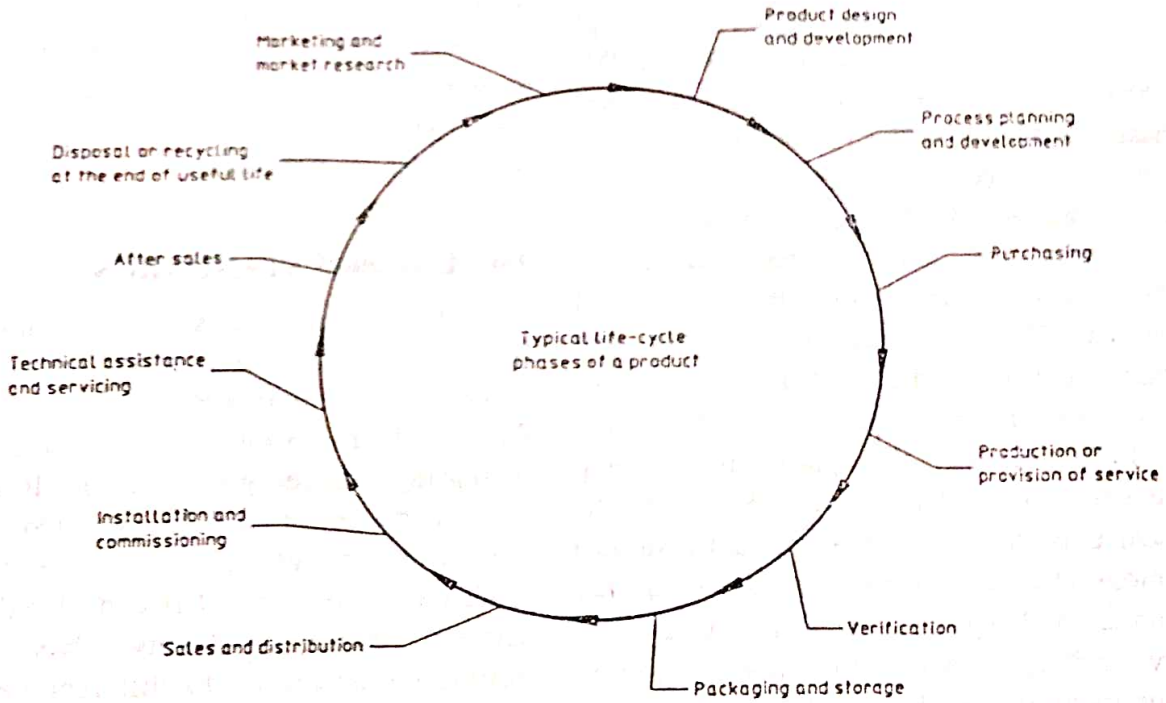
2.0 ISO 9000 STANDARDS

The quality system as defined by International Organization for Standardization (ISO) in its 9000 series of standards was developed in response to the challenges of increasing market globalization. It has been one of the most widely accepted standards worldwide. Initially it was restricted to product quality only, but now it is considered even for service quality. Quality has different definitions according to different people, but the most comprehensive definition is given in the ISO 8402: **"Totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs".** An entity could be an activity or a process, a product, an

organization, a system or a person, a service or any combination thereof. Thus it is clear from the definition that quality is irrevocably linked to the customer. In fact **customer satisfaction is the key to success in this modern competitive world.** In order to promote quality consciousness and to have a standard that is universally acceptable, the ISO 9000 series of standards were developed and first issued in 1987. This was revised in 1994 and now the third revision is going on and the ISO 9001/2000 standards are expected to be issued/circulated in October 2000.

3.0 EQUIVALENCE OF QUALITY AS APPLIED TO INDUSTRIES AND EDUCATIONAL INSTITUTIONS

An enterprise can remain in business and make profits over the long term only by satisfying the needs of its customer, whether it is in industries or in educational institutions. In order to satisfy the needs of the customers, the requirements of the customer have to be understood. The schematic of the main activities having an impact on quality in an industry is presented in **Fig. 1.** This shows the various phases and associated activities that have an impact on quality marketing and market research, product design and development, process planning and development purchasing, production or provisions of services, verification, packaging and storage, sales, installation and commissioning, after sales service, and finally disposal or recycling at the end of the product's useful life. Applied to an academic institution, the customer is the student, who demands an opportunity and environment for



Main activities having an impact on quality
(*Source*: ISO 9004-1:1994.)

Fig. 1

technical education which is to be certified for quality as per ISO 9000 standards. In analogy to an industry phases and activities that have an impact on quality of education imparted in a technical institution can be thought of as:

1. Market research-Ascertaining the demand for various existing courses and for finalizing the new courses to be offered.

2. Designing the curriculum and training programme for various new courses to be offered or for updating the curriculum and course content of existing courses. This is true in case of universities, institutions deemed to be universities, autonomous institutions. But for institutions affiliated to various universities, the curriculum or the syllabi will be given by the respective universities.

3. Upgradation of infrastructural facilities both in terms of laboratories and qualified staff, both for existing and new courses to be offered by the institute.

4. Planning of teaching/learning processes.

5. Evaluation of the effectiveness of the system on producing the desired results through feedback, examinations and tests on students.

6. After sales and customer service-Counselling and supporting the passed out students in continuing education and to become independent entrepreneurs through additional facilities like STEP.

4.0 STEPS FOR INTRODUCTION OF ISO 9000 IN AN ACADEMIC INSTITUTION

The steps for introduction of ISO 9000 are as follows:

Step 1: Preliminary decision of management for introduction of ISO 9000.

Step 2: Policy statement of intention of what is to be achieved - This could be achieved by first framing a Vision statement at the top management level, which will steer the direction in which the institution should move, may be looking at the, scenario, 5 to 10 years from now. In order to achieve this, mission statements could be formulated, which will give an idea about the overall management policy. Finally quality policy statement could be framed and necessary resources can be allocated for achieving the same. At this level, a firm commitment from the top management is a must for the successful implementation of this standard.

Step 3: Selection of the Certification agency by the management.

Step 4: Awareness and training to management and employees- This step is very important for the successful implementation of the standard in the organization. This could be achieved by first providing intensive training to the representatives of the top management and then they in turn could train the employees of the organization or the services of the certification agency can be called for providing training.

Step 5: Assigning of specific responsibilities to employees regarding quality systems.

Step 6: Writing down Work instructions and Procedures for complying with the various clauses of the standard

Step 7: Preparation of a quality manual setting out the organization's quality policy and providing an outline of system procedures. The sections of the quality manual should contain references to more detailed documents delineating procedures and instructions for various departments and functional groups.

Step 8: Training of people in the methods and procedures to be documented.

Step 9: Issuing of the Organization's quality policy and directives. The management should ensure that it is understood by all employees.

Step 10: Setting of the date for introducing the system and for issuing executive instructions for its implementation. Also necessary control mechanisms can be put in place to monitor and ensure system implementation and continued effectiveness. Initially it could be implemented in one or two departments as a pilot project and then it could be extended to other departments also, thereby covering the entire organization.

Step 11: Testing of the system for a trial period of a few months and carrying internal audits by the people of the organization to assess its compliance with ISO 9000 standards.

Step 12: Adoption of necessary corrective actions on the non conformities revealed by the audit if any.

Step 13: Conduction of a management review to verify that the system is in place.

Step 14: External auditing by the Certification agency.

5.0 PLANNING FOR THE ISO 9000 CERTIFICATION

Once a decision is taken by the top management to establish a quality system based on ISO 9000, an outline plan needs to be prepared including the selection of management representative who should be specially trained in ISO 9000 systems. Also a good consultant could be engaged by the organisation to prepare the ISO 9000 project plan for consideration by the organisation's management.

The planning should involve the following important elements.

(i) Standard to be implemented (choice of standard)

(ii) Major activities to be undertaken and departments involved.

(iii) Personnel to be allocated to the project-This includes the selection of management representative, and for the departmental level implementation,the heads of the various departments could be the representatives.

(iv) Outside consultants and necessary training inputs required.

(v) Resource allocation such as personnel, equipment and facilities etc.

(vi) Time schedule for various activities leading to the certification.

(vii) Working out the total cost for the implementation.

6.0 VARIOUS INPUTS FOR TECHNICAL EDUCATION AND WAYS OF MAINTAINING QUALITY FOR THE SAME

The technical education system could be considered as a process, which takes input and produces and output, with value added to it. The input to the system are students, who have to be trained such that they are acceptable to the employing organizations and the society. There are wide differences in their background, composition, calibre and motivation. The other inputs to the process include curricula, teaching staff, infrastructure, methodology of teaching, work evaluation, environment, work culture and feedback from students (present and past), employers and the society.

Each of these inputs have to be examined carefully and with reference to the ISO 9000 standards, standard policies and procedures have to be laid down (documented) and executed in a systematic way. The amount of control over the quality of inputs to the process is again different, and depends on various conditions. However necessary requirements for minimum quality of these inputs should be met, in order to implement these standards.Based on the quality policy, necessary procedures have to be formulated by each functional group (department) to control the quality of various inputs.

Following steps assume prime importance in the maintenance of quality–

(i) Admission of students to various courses in the institution could be based on certain minimum eligibility criteria, conducting of entrance tests by the institute or those conducted by the government agencies and based on the performance of the student in these tests.

(ii) Recruitment of staff members to various departments could be based on the norms and standards laid down by the controlling bodies like AICTE.

(iii) Provision of necessary infrastructural facilities like buildings, well equipped laboratories, well equipped library, teaching aids, reprographic facilities, internet facilities, facilities for sports, games and other extra curricular activities.

(iv) Campus recruitment of students through an effective training and placement centre.

(v) Regular contact and interaction with the parents of the students, informing them about the academic performance of their wards.

(vi) Regular interaction with the alumni (old students) of the institute and potential employers for getting their feedback.

6.1 Benefits ISO 9000 Quality System

ISO 9000 quality systems bring various benefits to their users. The primary benefit is that it brings confidence among its customers both existing and new.

The other benefits include—

(i) It assures opportunity and environment for quality technical education.

(ii) It provides ways and means for identifying and resolving non conformance with the standard preventing their recurrence.

(iii) It creates quality awareness among all employees and a sense of job satisfaction.

(iv) It provides a means for documenting the organization's processes and procedures which could serve as a basis for training

staff and also for improving their performance in the future.

(v) It helps in installing a cost-effective quality management system.

(vi) It provides national/international recognition and leads to positive image with greater acceptability.

7.0 LIMITATIONS OF ISO 9000 STANDARDS FOR EVALUATING QUALITY IN TECHNICAL EDUCATION

ISO 9000 standards whether it is the 1987 version or 1994 version are meant for industries, where there is a definite input, a process for transformation and an output, and where control of quality is possible in all the three stages. It has been extended now to other sectors like service industries namely banking, educational,institutions etc. In case of an educational institute, effective control of quality at the three stages is difficult, because we are dealing with human beings here in all the three stages, rather than machines and materials in industries which are inanimate. Academic institutions basically deal with the teaching-learning process. This process which helps a student to learn a course and make him acceptable to society is influenced by various factors like the calibre of student, the competency and talents of the teacher, the availability of necessary infrastructural facilities, the environment and the work culture. Hence the control of quality,cannot be fully objective as in industries, but has to be subjective in nature, which are influenced by several factors,many of which are beyond the effective control of the institution. Again, teaching as well as learning are processes which cannot be standardized, but only a broad framework could be established which will guide the process. The above limitations have to be given due consideration for the successful implementation of ISO 9000 standards.

8.0 CONCLUSION

Implementation of a quality system based on ISO 9000 in an educational institution can really transform the organization into a quality conscious one which can really be very well organized with cost effectiveness. It can definitely provide a competitive advantage to the institution. The need to supply quality technical manpower to the industries and organizations in this liberalized, competitive economy, really stresses the need to have a quality system in place in all the technical institutions. However the limitations which are involved in its implementation have to be understood very clearly, so that there are no hurdles in maintaining the system in any technical institution.

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Entrepreneurial Orientation in Technical and Vocational Curriculum

R. SRINIVASAN and A.G. AUGUSTINE

1.0 WHY ENTREPRENEURSHIP?

In the Technician sub system Entrepreneurship Development is a component in the final year curriculum. With the launching of Vocation courses at first degree level it is to be injected at the graduate level in Arts and Science Colleges.

In Economics we speak of four factors of production viz., Land, Labour, Capital and Organisation. Entrepreneur as the organiser coordinates and pools the other three factors and is solely responsible for the business carried on. Now we find the Government encouraging even women to take up entrepreneurship.

Entrepreneurs as a class of personnel are distinctly created through the various schemes thrown open. It is the need of the hour and Peter F. Drucker says entrepreneurship is "neither a science nor an art: it is practice... Entrepreneurship is considerably less risky, if the entrepreneur is methodical and does not violate elementary and well known rules."

The Madurai Kamaraj University has an Entrepreneurship Studies Department and it is desirable that all colleges offering vocational courses institute an Entrepreneurship and Industrial Relations Cell (EIRC) under the guidance of a senior faculty. The investigator out of curiosity circulated a Check List among college teachers and vocational degree course learners to elicit their views on entrepreneurship and its practicality. Seventy nine college teachers and ninety students answered the check list.

2.0 RESPONSES TO ENTREPRENEURSHIP AWARENESS

1. Both the faculty and students were unanimous in their opinion on the need to focus entrepreneurship in colleges.

2. Though opinion is divided on the idea of making entrepreneurship a compulsory component of curriculum yet 43% of faculty respondents favoured creating an awareness among final year degree students.

3. When the investigator in his casual discussions mentioned that entrepreneurship is not heriditary there were some reservations in subscribing to this view.

4. The respondents felt the need for starting a National/State Level Advisory Committee on Entrepreneurship to give useful information about entrepreneurship and its features.

5. 19 students (21%) only felt entrepreneurship is desirable for both men and women students.

6. 40 students (44%) said that they are not prepared to embark on risky ventures.

7. Only 7 college teachers (8%) wanted to get orientation in Training Entrepreneurs.

3.0 RELEVANCE OF ENTREPRENEURSHIP

Economists from the early days of Adamsmith recognized entrepreneurship for business and Chopra (1990) defines an entrepreneur as a "person who is skilled at identifying new products (or sometimes new methods of production), setting up operations to provide new products, marketing the products and arranging the financing of the operations". To orient students Entrepreneurial Awareness Camps could be organized in colleges and Career Guidance strategies are applicable in such an orientation. Rural Entrepreneurship is yet another idea which could be propagated. The educated youth who evince interest could be given incentives to launch business units in rural areas. The polytechnics implementing Community Polytechnic Scheme are carrying on Entrepreneurial Awareness among trained youth and provide all assistance to set up individual business ventures.

4.0 SUGGESTIONS

In the light of this minor attempt to sow seeds of entrepreneurship development in colleges the following suggestions are made for consideration by the authorities concerned.

1. Each final year student should visit an entrepreneurial concern and make a case study presentation of its functioning.

2. An Entrepreneurship Development Bank should be set up to finance prospective entrepreneurs. Alternatively the Industrial Development Bank of India (IDBI) and Small Industries Development Bank of India (SIDBI) could launch Entrepreneurship Development Banks as their subsidiaries.

3. A State Entrepreneur Training Centre (SETC) could be opened and each year a few final year students be given such a training to popularize the notion entrepreneurs are not born; but made. Also inviting successful entrepreneurs to give a talk to such students is a desirable feature.

4. A State Level Directory of Entrepreneurs should be released.

5. Though the Industrial Policy Statements contain some provisions for small industrialists an Exclusive Entrepreneurial Industrial Policy statement is a welcome.

6. Just as Teachers Day, Workers Day an Entrepreneurs Day could be identified and celebrated in all technical-vocational institutions.

7. The Industrial Estates are conglomeration of tiny and small units and are a fitting example of entrepreneurial endeavours. Once the unit is popular entrepreneurs could add up their turnover and assets.

8. A Fastrack Enterprise Resource Management (FERM) programme could be organised by the institutions offering technical-vocational courses to engineer further entrepreneurs. Such an initiation could help them consolidate their position and look at improved potentialities for further realization.

9. The latest Micro Credit Scheme to small traders launched by the Government of Tamil Nadu through District Central Cooperative Banks is a nice gesture on entrepreneurship. On the samelines even the Non Government Organizations (NGO) and Local Chapters of Chambers of Commerce could fund small businessmen in their own localities to give a boost to petty business establishments.

10. Anyhow it is to be remembered that among the plethora of factors contributing to successful entrepreneurs a high level of intrinsic motivation is the most obvious one. Based on these a deliberate attempt at making Entrepreneurship a common feature in technical-vocational institutions is the need of the day.

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Role of Technical Education on Industrialisation

S.G. GOPALAKRISHNA and D.S. VISWANATH

Experience in the past indicates that the socio-economic and political development of a country depends on its industrialisation, which in turn depends, to a great extent on technical education of its personnel. As is the heart to our body so is an engineering institution to our industrial society. The institution has to provide qualified technical person through quality education to keep the various organs of industrial society functioning with efficiency.

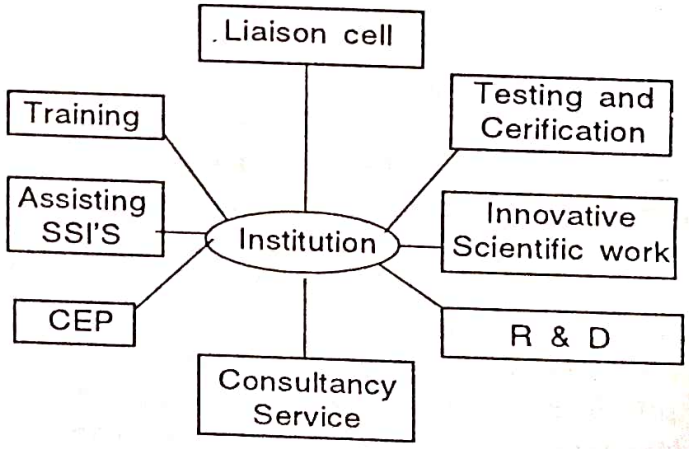
The change is so fast that many people and many nations find it difficult to cope with the change. Technology change has infact led to restructuring of the economy of the entire world. India is investing less that 1% of GNP on Science and Technology development. Indian industries spend only 0.6% of their total turnover on R & D budget.

The desirable characteristics of 21st century engineers are commitment to sustainable development, knowledge from neighbouring disciplines, ability to work in a team, exposure to commercial disciplines, creativity and innovation, integrative skills, ability to employ information technology, international out look and adaptability and flexibility.

The major role of industry is to pickup the students completing their formal education from technical institutions, give them proper training and mould them to individual requirement of the industry. The industry has to adopt the following policies for the betterment of technical education.

- Industry sponsored project.
- Active involvement in framing the curriculum.
- Adoption of institution.
- Funding HRD/AICTE.
- Training the faculty.
- Faculty exchange programme.

The various ways through which the institution could promote activities in industry are



- Setting up liaison cell with adequate data base on facilities, equipment and expertise available in the institution.
- Provide material characterisation, testing and certification facilities.
- Keep the industry informed about innovative scientific work.
- Provide Consultancy Service in all the fields of engineering.
- Undertake research related technology transfer in collaboration with R&D units in industry.
- Helping Small Scale Industries to practice modern industrial methods.
- Providing Vocational Training Programme to persons from industry.
- Continuing Education Programme.

After fifty years of independence we have achieved marginal growth in industrialisation. It is true that the role of technical education on moulding technical manpower of the country is significant. We all know that our country is thickly populated and majority of the people are living below poverty line. The rapid industrialisation and better technical education would certainly enhance the standard of living. What we need is self reliance, technology vision and technological excellence.

Suggestions for the development of the nation Vis-a-Vis technical education include higher investment on science and technology overhauling the syllabi and curricula to suit the changing needs, updating the infrastructural facilities in educational institutions, better industry institute interaction and pursuing international collaboration for the advancement of science and technology.

Continuing Education Activities in Polytechnics: A Case Study

S. DHANAPAL and B. MUKHOPADHYAY

1.0 NEED FOR CONTINUING ENGINEERING EDUCATION

Due to the recent developments in the global technical and economic scenario the Indian Industry is presently facing a number of challenges. Relaxation of trade restrictions and liberalisation of markets on the one hand and the rapid technological changes particularly in the Information and other high technology areas on the other hand call for economic restructuring within the country (Sanghvi 1994). The industry has started a restructuring process, to become more competitive in the national and international markets. This process has resulted in changing the mix of occupations and the manpower required by the employers. It also demands raising the skills of the work force to achieve increased productivity and reduced cost. The polytechnics whose curriculum reflect the recent technological changes have built up a reasonable instructional infrastructure, in these areas, and therefore they can play a constructive role in training the working technicians through Continuing Engineering Education programs.

The polytechnic system has a long tradition of Continuing Engineering Education activity (Maulik 1994). However their approach to Continuing Engineering Education was further reinforced and updated by the World Bank Assisted Technician Education Development Project in 1990s and in the Southern part of India by the Canada India Institutional Cooperation Project in late 1990s. These projects provided the material and managerial inputs to the polytechnics to strengthen their Continuing Engineering Education activity (Yule 1994 and Yule 1995).

In the present paper an attempt has been made to understand the functioning of the continuing education cells of few identified polytechnics along with their on going activities.

2.0 METHODOLOGY

2.1 Sample: A total of twelve polytechnics, four each from the States of Tamil Nadu, Andhra Pradesh and Karnataka were taken for the present study. These four polytechnics from each state were selected on the basis of purposive sampling technique and the urban/rural location of the polytechnics for the total sample were taken into consideration.

2.2 Procedure: Case study technique was used to collect qualitative data from the identified polytechnics for the present study. An interview schedule was prepared for this purpose. The schedule included the background of the polytechnics, status of the polytechnic, management of the continuing education cell, courses organised, target

groups, special courses offered, activities in high tech areas, contribution towards Internal Revenue Generation and future plans. The interview schedule was used as an aid to the case study.

The findings were analysed to understand the functioning of continuing education cells along with their ongoing activities.

3.0 OBSERVATIONS AND DISCUSSIONS

It was observed that all these polytechnics were engaged in continuing education activities for the past few years though there were a lot of variations in their activities. They were meeting the continuing educational needs of the local industry and business. On many occasions they also meet certain training needs of their students. The revenue generated through continuing education cell was mostly used for overall institutional development purpose.

3.1 Part Time Courses

In the emerging industrial scenario, the most vital components are knowledge, information and innovation. The workforce has to be provided with abundant opportunities for continuing education and retraining in various functional areas (Pillai 1994). Part time courses for orientation and updating of knowledge and skill cater to these needs. In the present study it was found that the 12 polytechnics have been running a total of 25 part time courses for employees of industry and trade as given in Table 1 and Table 2.

Table 1: Basic Level Part time courses for Employees of Industry and Trade.

Sl. No.	Area	Duration in Months
1.	Multimedia Development	Industry Prescribed
2.	Computer Applications	6
3.	Office Automation	3
4.	Computer Management	12
5.	Computer Hardware Maintenance	1/9
6.	Desk Top Publishing	2
7.	Certificate course on Internet and Email Service	Industry Prescribed.
8.	Window 95 and MS Office	2
9.	Computer Fundamentals and DOS	Industry Prescribed
10.	Servicing Television Receivers	Industry Prescribed
11.	Servicing Personal Computers	Industry Prescribed
12.	Basic Electrical Equipment Servicing	Industry Prescribed
13.	Certificate Course on Basic Electronics	Industry Prescribed
14.	Certificate Course on Printed Circuit Board Design and Manufacturing	Industry Prescribed
15.	Computer Aided Design and Computer Aided Manufacturing	Industry Prescribed
16.	AutoCAD	1

Table 2: Higher Level Part time courses for Employees of Industry and Trade

1.	Advanced Computer Programming	12
2.	Visual Basic and Visual C++	2
3.	RDBMS and Oracle	Industry Prescribed
4.	Web Page Designing	Industry Prescribed
5.	Introduction to 3D Studio Max	Industry Prescribed
6.	CNC Programming	Industry Prescribed
7.	Training Programme on 3 axis Milling Machine	Industry Prescribed
8.	Advanced course on Microprocessors and Applications	Industry Prescribed
9.	Servicing of Analog and Digital Equipment	Industry Prescribed

Table 1 lists 16 courses, which extend the knowledge and skill by providing basic level of familiarisation of specific areas. Table 2 gives the list of 9 courses, which lead to higher technological knowledge and skill of the technicians by a process of updation.

A lot of variations were observed with respect to the mode of operation of these courses. The number of courses organised by a polytechnic over the year varied from one institute to another. The number of times a course is repeated also varied from one institute to another. As far as the duration of the courses was concerned, the polytechnics, considering the course content decided them. But in many cases it was observed that course content and time was tailor made according to the need of the clientele. It was found that there was a great demand for computer-related courses and machine automation from the industries.

3.2 Special Courses for Industries

Time to time, all over the year, these polytechnics have been conducting a number of specialised courses as required by an industry or a group of industries. In carrying out these activities some of these polytechnics have developed unique specialisation in certain areas which can be compared with institutes of higher learning in technology and engineering. For instance one polytechnic has got the expertise in conducting 2 years course in Refinary Operation (Table 3).

Most of the courses were conducted for the technical staff of nearby industries. Certain qualifications like Diploma in Engineering, Degree in Science or some times SSLC, remained the entry qualifications with respect to different courses. In the present study on 12 polytechnics from three states, it was found that 16 special courses, each tailor made for a specific industry were run by these polytechnics as listed in Table 3.

In conducting certain programmes some of these polytecnics got expert help from Canada. It was possible to get expert help from Canada as a few polytechnics under the present study came under Canada-India Institutional Co-operation Project. Interestingly. Several programmes were run under Canada India Institutional sponsorship.

Table 3 Tailor made Courses Covering A Specific Industry

Sl.No.	Area	Duration
1.	Basic Refinary Operations	6 Months
2.	Refinary Operations	2 Years Course
3.	Logic controller and Electrical Maintenance	Industry Prescribed
4.	Electronic Equipment Maintenance	Industry Prescribed
5.	CNC Programming	3 Months
6.	Operation of Special Machines	Industry Prescribed
7.	Maintenance of Machines	Industry Prescribed
8.	Computer Operations	3 Weeks
9.	Excel and Tally Software	3 months
10.	ISO 9000 Awareness Programme	3 Days
11.	Instrumentation	2 Months
12.	Automobile Electrical System	Industry Prescribed
13.	Electronic Equipment Maintenance	Industry Prescribed
14.	Welding Technology	Industry Prescribed
15.	Supervisory Skill Development	30 Days
16.	Export Management Course	Industry Prescribed
17.	Air conditioning	Industry Prescribed
18.	Manufacturing Technology and Management for Textile industries	6 months

Table 4. Types of Organisations Covered Under Continuing Education Training Programme

Sl.No.	Types of Organisations	Number
1.	Manufacturing Industries	30
2.	Service Industries	6
3.	Government Departments/Agencies	3
4.	Banks	15

All the special courses ran by these polytechnics covered trainees from different types of industries, as given in Table 4. These included manufacturing industries - large scale and medium scale, servicing industries, Government Departments and Agencies and Banking sector. A good number of small-scale industries situated nearby these polytechnics utilised the benefits of continuing education programmes organised by these polytechnics. In certain cases opportunities to enroll in these special courses were extended to people for their career advancement who are otherwise not employed in the industry.

3.3. Programmes for entrepreneurs

Organising different types of programmes for prospective entrepreneurs and new entrepreneurs remained one of the major activities of these polytechnics. Again a lot of variations in activities were found in the present case study. For instance one of the polytechnics organised a three days Entrepreneurs Awareness Workshop once in a year, where as majority of the polytechnics have been organising a good number of programmes under Prime Minister's Rozgar Yojana, for the District Industries centres which have been selecting entrepreneurs for financial assistance by Banks.

The polytechnics have been conducting induction courses for entrepreneurs who were sanctioned financial assistance for starting small-scale industries. These courses are organised jointly with District Industries Centre and the Centre for Entrepreneurial Development of the respective states. Generally the induction programme was organised for a particular batch of new entrepreneurs. There were variations with respect to duration of the courses but usually it was two to three weeks. Course content generally covered the areas like leadership, motivation, marketing etc.

3.4 Memorandum of understanding (MoU)

Signing MoU with one or more than one industries were significant features of the continuing education programme of these polytechnics. Majority of the polytechnics have achieved this objective. For a particular polytechnic it was found that it had signed MoU with 10 industrial organisations in and around the city where the polytechnic is situated. Nevertheless, if a particular polytechnic was able to sign MoU even with one industry that could be considered as one of the highest achievement in the industry institute interaction process.

Through MoU polytechnics could conduct the courses for the industries and generating revenue; but certain larger benefits were derived by the polytechnics out of MoU. These benefits included:

- The polytechnics could participate in the meetings, seminar and exhibitions organised by the industry.
- The polytechnic could request for sending trainees from member industries for its continuing education courses.
- The polytechnics were able to facilitate industrial visits for their students.
- The polytechnics were able to arrange more guest lectures by industrial experts.
- The polytechnics were able to get employment for more students.
- Experts from industries and polytechnic faculty were able to interact more under the MoU umbrella.
- One of the polytechnics could sign MoU.

Polytechnics could benefit more if they could sign MoU with an association of industries, instead of a single industry. For instance, one polytechnic in Tamil Nadu, Signed MoU with Coimbatore District Small Scale Industry Association. As a result, the polytechnic could derive benefit from a large number of member industries.

4.0 CONCLUSION

The global economic restructuring and rapid technological changes call for updation and retraining of industrial workforce to

achieve productivity. The polytechnics have built up a reasonable instructional infrastructure and can play a constructive role in training the working technicians through continuing Engineering Education programmes. The polytechnics conduct not only generalised programmes in the basic and advanced areas but also need based programmess tailor made for an industry. Computer related courses and machine automation related courses are in good demand. The polytechnics exhibit flexibility in deciding the course duration. They take initiative to sign Memorandum of Understanding with the industry so that they can carry out Continuing Education and other collaboration activities with the industry.

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Study of Organisational Role Stress Among Executives and Application of Stress Management Programme

RAJENDRAN R.

1.0 INTRODUCTION

Stress is considered as a positive force leading to effective work and maintenance of good physical and mental health. Also, insufficient might lead to "rust-out" while over exposure to stress might lead to "burn-out" stress is an inevitable concomitant to individual progress or development. Every one experiences a fair amount of stress irrespective of personal characteristics, environmental and social conditions.

Stress is the result of a transaction between the person and his situation (Cox Mckay, 1981). The amount of stress experienced will depend on the adequacy of the individual's personal resources and coping strategies with the situation.

For the last few decades much attention has been focussed to organizational stress, particularly the role stress was drawn by Kahn et al (1964) Katz and Khan (1966), suggested that an organization and can be defined as a system of roles and the concept of role is central to the understanding of individual's integration in a system. Pareek (1976) pointed out that it is through the role that the individual interacts with and gets integrated with the system.

Kahn et al (1964) while examining the development of role stress distinguished three classes of predictor variable: organizational, personality and interpersonal. In role stress research, the main focus has been on organisational variables.

2.0 NEED FOR THE STUDY

Though stress being a multi-dimensional factor and it may be experienced at different levels of an organization; the workers level of stress is entirely different from the executives levels, the latter is more oriented with authority - responsibility relationship.

Theoretical evidences show that certain level of stress is tolerable and productive in nature, beyond that it produces health related problems to the personal. The Managers/Executives are subject to conditions and situations that are likely to bring about high level of continuous stress.

In the light of the above, there is a need for studying the relationship of organizational role stress with certain personal variable among the executives in public sector in organization. Also, in this study, in identification of "high" level of stress perceived by the executives may be benefited through stress management programme. The well-designed package programme not only

reduce the levels of stress but improve the personal development of the executives.

The objectives of the present study are as follows:

1. To identify the various areas of organisational role stress (ORS) among executives.
2. To identify the levels of stress on each dimensions of organisational role stress.
3. To find out the sex difference on the perception of organisational role stress.
4. To find out the difference between junior and senior executives on the perception of ORS.
5. To find out the years of experience have impact on the perceptions of ORS.
6. Whether the stress management programme will reduce the organisational role stress among executives.

2.1 Hypotheses

1. There will be a significant difference between male and female executives on the perception of the ORS dimensions namely:
   (a) Inter-Role Distance (IRD), (b) Role Stagnation (RS), (c) Role Expectation Conflict (REC), (d) Role Erosion (RE), (e) Role Overload (RO), (f) Role Isolation (RI), (g) Personal Inadequacy (PI), (h) Self-Role Distance (SRD), (i) Role Ambiguity (RA), (j) Resource Inadequacy (RIN)
2. There will be a significant different between junior and senior executives on the perception of the ORS dimensions.
3. There will be a significant difference between less than 10 and more than 10 years of experience group of executives on the perception of the ORS dimensions.
4. The Stress management programme will significantly reduce the levels of stress on ORS dimensions.

3.0 METHODOLOGY

Sample

The sample consisted of 80 junior and senior executives, working in Neyveli Lignite Corporation (NLC), Neyveli who were randomly selected. Their age ranges from 25 to 50 years with the mean age of 40 years. Their educational qualification were: Dip in Eng. Degree in Eng., M.B.A. etc.

Tool Used

Organizational Role Stress Scale (ORS)

ORS scale was developed by Udai Pareek (1982). The ORS scale contains five items for each role stress. It is total of 50 statements. It has 5 point scale (0-if you never feel this way, 1-if you occasionally feel this way, 2 if you sometimes feel this way, 3-if you frequently feel this way, 4-if you always feel this way).

Scoring

The total score of ORS scale range between 0 to 200 and on each role stress range from 0 to 20. A simple summation of the scores of the subject on each role stress would indicate the scores on that dimension. Pareek (1982) has identified the following 10 stresses based on organizational roles.

(a) Inter-Role Distance (IRD)

(b) Role Stagnation (RS)

(c) Role Expectation Conflict (REC)

(d) Role Erosion (RE)

(e) Role Overload (RO)

(f) Role Isolation (RI)

(g) Personal Inadequacy (PI)

(h) Self-Role Distance (SRD)

(i) Role Ambiguity (Ra)

Table-1 shows the mean difference between male and female executives on organisational role stress sub-scale. It was observed from the table that significant difference was found between male and female executives on the variables: Inter-role distance, Role stagnation, Role expectation conflict, Role overload, Role isolation and Role ambiguity. Hence, the proposed hypotheses No. 1 (a) (b) and (f) are accepted at 0.05 level and 1 (c), (e) and (g) are accepted at 0.01 level. The result of the present study is confirmed with the findings of Soumi and Sen (1993) and GlowinKowski and Copper (1986).

No significant difference was noticed on the variables such as: Role erosion, Personal Inadequacy, Self-role distance and Resource Inadequacy. Therefore, the formulated hypotheses No. 1 (d), (g), (h) and (j) are rejected. Overall, all male executives obtained high scores than female executives.

Table - 1

Significance of Mean Difference Between Male and Female Executives on ORS Sub-scale.

S.No.	Variable	Male N=60) Mean	Female (N=20) Mean	M.D.	S.E.	"t"
1.	Inter Role Distance	8.27	6.20	2.07	0.98	2.11*
2.	Role Stagnation	9.52	7.13	2.39	1.02	2.34*
3.	Role Expectation Conflict	11.01	5.026	5.75	2.02	2.84*
4.	Role Erosion	10.20	9.50	0.70	1.13	0.61NS
5.	Role Overload	13.34	7.82	5.52	1.93	2.86**
6.	Role Isolation	8.94	13.08	5.04	2.21	2.28*
7.	Personal Inadequacy	7.25	8.29	1.04	0.82	1.26NS
8.	Self-Role Distance	9.10	8.82	0.28	0.69	0.40NS
9.	Role Ambiguity	5.36	7.86	2.50	0.91	2.74*
10.	Resource Inadequacy	10.90	9.82	1.06	0.94	1.12NS

*Sig. at 0.05 level **Sig at 0.01 level NS - Not Significant.

Table -2

Significance of Mean Difference between Male and Female Executives on ORS sub-scale.

S.No.	Variables	Junior (N=37) Mean	Senior (N=43) Mean	M.D.	S.E.	"t"
1.	Inter Role Distance	10.09	8.90	1.15	1.36	0.84NS
2.	Role Stagnation	6.20	11.21	5.01	2.11	2.37*
3.	Role Expectation Conflict	12.26	8.91	3.35	1.52	2.20*
4.	Role Erosion	10.20	5.02	5.18	2.01	2.57*
5.	Role Overload	12.94	7.71	5.23	1.72	3.04**
6.	Role Isolation	9.26	5.27	3.99	1.54	2.59*
7.	Personal Inadequacy	9.31	6.62	2.65	1.18	2.24*
8.	Self-Role Distance	8.61	8.06	0.55	0.72	.76NS
9.	Role Ambiguity	7.07	5.52	1.55	0.63	2.46*
10.	Resource Inadequacy	12.94	12.56	0.38	0.62	1.61NS

*Sig. at 0.05 level; **Sig. at 0.01 level; NS - Not significant

Table - 3

Significance of Mean Difference between Less than 10 Years and More than 10 years of Experience Group on ORS sub-scale.

S.No.	Variables	1-10 years (N=31) Mean	11 & above (N=49) Mean	M.D.	S.E.	"t"
1.	Inter Role Distance	10.24	6.86	3.38	1.51	2.23*
2.	Role Stagnation	6.62	12.30	5.68	2.11	2.69*
3.	Role Expectation Conflict	10.12	6.26	3.36	1.44	2.68*
4.	Role Erosion	9.98	6.21	3.77	1.25	3.01*
5.	Role Overload	11.82	6.26	5.56	2.03	2.73**
6.	Role Isolation	8.82	4.62	4.20	1.92	2.18*
7.	Personal Inadequacy	7.96	5.13	2.83	0.77	3.67*
8.	Self-Role Distance	8.25	7.71	0.54	0.33	1.63NS
9.	Role Ambiguity	11.12	6.66	4.46	1.82	2.45*
10.	Resource Inadequacy	12.17	13.46	1.29	0.76	1.69NS

*Sig. at 0.05 level; **Sig. at 0.01 level; NS = Not significant.

Table-2 shows the significance of mean difference between Junior and senior executives on organisational role stress sub-scale. The obtained "t" - values were found to be significant for the ORS variable such as: Role stagnation, Role expectation conflict, Role erosion, Role overload, Role isolation, Personal Inadequacy and Role ambiguity. Hence the formulated Hypotheses No. 2 (b), (d), (f), (g) and (i) are accepted at 0.05 level and N0:2 (C) is accepted at 0.01 level. No significant difference was found on the variables such as: Inter-role distance, self-role distance and Resource inadequacy. Therefore, the proposed hypotheses No. 2 (a), (h) and (j) are rejected. Further, the table indicates that Junior executives were found to be high role stress compared to senior executives.

The result of the present study is partially confirmed with the study of Pestonjee (1987). In his study, inter role distance and role erosion were found to dominant whereas role ambiguity and personnel Inadequacy were the least contributors of role stress among the three categories of managerial personnel.

Table - 3 indicates the mean difference 1-10 years and 11 & above years of experience group of executives on ORS sub-scale. The obtained "t" values were found to be significant for the variables such as: Inter-role distance, Role stagnation, Role expectation conflict, Role erosion, Role overload, Role Isolation, Personal Inadequacy and Role ambiguity. The proposed hypotheses No. 3 (a), (f) and (l) are accepted at 0.05 level and No. 3 (a), (f) and (g) are accepted at 0.01

Table - 4

Significance of Mean Difference between Experimental and Control Group before the Training Programme.

S.No.	Variable	Ex. group (N=60) Mean	Control group (N=20) Mean	M.D.	S.E.	"t"
1.	Inter Role Distance	10.30	10.47	0.17	0.22	0.77NS
2.	Role Stagnation	10.11	10.33	0.22	0.56	0.39NS
3.	Role Expectation Conflict	13.90	12.82	1.08	0.98	1.10NS
4.	Role Erosion	11.52	12.01	0.49	1.12	0.43NS
5.	Role Overload	13.70	12.72	0.98	1.26	0.77NS
6.	Role Isolation	13.02	12.96	0.06	0.25	0.24NS
7.	Personal Inadequacy	10.71	10.25	0.46	0.91	0.50NS
8.	Self-Role Distance	12.05	11.50	0.55	1.38	0.40NS
9.	Role Ambiguity	9.26	8.57	0.69	1.10	0.62NS
10.	Resource Inadequacy	13.09	12.75	0.34	0.56	0.60NS

NS = Not Significant

level. Further, the table shows that no significant difference noticed on self-role distance and Resource Inadequacy variable. Hence, the formulated hypotheses No. 3 (h) and (j) and are rejected. The significant difference found in the present study was supported by the findings of Gupta and Pratap (1987) and Srilata (1991).

The Table - 4 shows the significance of mean difference between experimental and control group before the training programme.

The obtained "t" - values on all the ORS variable found to be insignificant. In infers before the stress management programme both experimental (N=15) control group (N=15) were found to be in "High" level of stress in all the variables studied.

Table - 5 indicates the significant mean difference among the experimental group after the training programme. The obtained "t"-value of 2.39 and 2.48 for Self-Role Distance (SRD) and Role Ambiguity (RA) were found Significant at 0.05 level. Whereas the "t"-value of 2.84, 3.78, 3.30 and 3.87 for inter Role Distance (IRD), Role overload (RO), Role Isolation (RI) and personal Inadequacy (PI) were found significant at 0.01 level.

After training programme, the perception level of stress among the experimental group was reduced into "moderate" stress level. Hence the formulated hypotheses No. 4 (a), (e), (f), (g), (h), (l) are accepted.

Table - 5

Significance of Mean Difference between Experimental and Control Group after the Training Programme.

S.No.	Variable	Before training (N=15) Mean	After training (N=15) Mean	M.D.	S.E.	"t"
1.	Inter Role Distance	10.30	7.11	3.19	1.12	2.84**
2.	Role Stagnation	10.11	9.26	0.85	1.29	0.65NS
3.	Role Expectation Conflict	13.90	12.03	1.87	1.38	1.36NS
4.	Role Erosion	11.52	10.33	1.19	1.28	0.92NS
5.	Role Overload	13.70	8.89	4.81	1.27	3.78**
6.	Role Isolation	13.02	8.52	4.50	1.36	3.30**
7.	Personal Inadequacy	10.71	6.02	4.69	1.21	3.87**
8.	Self-Role Distance	12.05	7.11	4.94	2.06	2.39*
9.	Role Ambiguity	9.26	6.82	2.44	0.98	2.48*
10.	Resource Inadequacy	13.09	11.35	1.74	0.78	1.46NS

*Sig. at 0.05 level; **Sig. at 0.01 level; NS = Not Significant

Table - 6

Significance of Mean Difference in the Control Group before and after the Training Programme.

S.No.	Variable	Before (N=10) Mean	After (N-10) Mean	M.D.	S.E.	"t"
1.	Inter Role Distance	10.47	10.92	0.45	0.58	0.77NS
2.	Role Stagnation	10.33	9.92	0.41	0.72	0.55NS
3.	Role Expectation Conflict	12.82	13.02	0.20	1.56	0.12NS
4.	Role Erosion	12.01	10.96	1.05	0.82	1.28NS
5.	Role Overload	12.72	13.62	0.90	1.01	0.89NS
6.	Role Isolation	12.96	12.05	0.91	1.21	0.75NS
7.	Personal Inadequacy	10.25	11.11	0.86	0.91	0.94NS
8.	Self-Role Distance	11.25	12.36	1.13	1.31	0.86NS
9.	Role Ambiguity	8.57	10.20	1.63	0.96	1.69NS
10.	Resource Inadequacy	12.75	11.72	1.03	0.72	1.31NS

NS = Not Significant

No significant improvement found in the variables'. Role stagnation (RS), Role Expectation Conflict (REC), Role Erosion (RE), and Resource Inadequacy (RI). Hence, the formulated hypotheses No. (b) (c), (d) and (I) are rejected.

For the stress reduction, the relaxation training is advocated by the study of Gleeson (1987).

The obtained "t"-values in the Table - 6 indicates no significant difference among the control group on all the variables, after the training programme.

DISCUSSION

Comparison of male and female executives, male second higher on Inter-role distance, Role stagnation, Role expectation conflict, Role over load. Whereas female executives scored high on Role Isolation and Role ambiguity. The result of the present study is confirmed with the study of Soumi and Sen (1993) and Glowinkowski and Copper (1986). In their study male and female executives differed significantly on role ambiguity, role conflict and inter-role distance.

Comparision of junior and senior executives on ORS sub-scale indicates that out of 10 variables, 3 variables such as Inter-role distance, self-role distance and Resource Inadequacy were found insignificant. Other 7 variables were significantly related. Further, the junior executives were scored high on: Role expectation conflict, Role erosion, Role overload, Role Isolation, Personal Inadequacy and Role ambiguity. Only the variable Role stagnation, the senior executives scored higher. It indicates that with age advances/increases, there is a delay or no promotional avenues in their organisation. The result of the present

study is confirmed with the study of Glowinkowski and copper (1986) and Gupta and Pratap (1987).

Further, the comparison of two different length of service on ORS sub-scale indicates that less experienced group of executives were prone to more role stress such as: Inter-role distance, Role expectation conflict, Role erosion, Role overload, Role Isolation, Personal Inadequacy and Role ambiguity. More experienced group (11 & above years) were found significantly higher means in Role Stagnation variable. This findings is partially confirmed with the findings of Gupta and Pratap (1987) and Srilata (1991). In their study, executives with a service of 10 years, experienced more of Inter-role distance and Role expectation conflict. Further, their study indicated that the executives with more than 10 years experience faced more of personal inadequacy and these results were contradictory to the present study.

The stress management programme given to the experimental group showed remarkable reduction in stress level on the variable: Inter-role distance, Role overload, Role Isolation, Personal Inadequacy, self-role distance, and Role Ambiguity.

Overall, the results of the present study indicated that a periodical "Stress management programme" to be conducted to the potential high stress group and evaluation to be carried out.

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Business and Industry Orientation for Faculty Members in Technical Institutions and Engineering College (TIECS)

N. RAMACHANDRAN, V.R. VIVEKANANDAN and C. VIMALA

1.0 INTRODUCTION

Technical institutions, and Engineering Colleges (TIECs) are viewed as service providers from the modern management point of view. Their objectives are identified as imparting knowledge and developing engineering skills in students. The students are therefore viewed as customers. The present day expectation is that the curriculum is to be designed that it extends beyond the academic coverage by including co-curricular and extra-curricular activities appropriately.

The students who successfully graduate on completion of their studies choose either challenging careers entrepreneurship. Their customers are the business and industry on the one hand and the society at large on the other hand.

The present status of the services rendered by the TIECs including the role of the faculty members and the transformation required in the present context are studied in this article. The technical education institutions are taken for the study though most of the points will be applicable to the TIECs providing programmes in other disciplines as well.

2.0 EXPECTATIONS OF THE BUSINESS AND INDUSTRY

The business and industry expect from TIECs that they are able to participate in joint ventures for developing new products and processes.

Industry or business origanisations expect that the students graduating from TIECs fit their requirements directly. Extending further training to these graduates is no longer envisaged by the small and large enterprises any longer. At best, they might offer a very brief job-orientated training.

Depending on the competence of individual faculty members in the field of application, the business and industry might come forward to offer research funding.

All these will be possible only if the faculty members are found to have the necessary training and experience in the field through association with established organisations. Business outlook is expected of the individual faculty members where business and industry wish to offer a cooperation project.

3.0 GREAT STRENGTHS OF BUSINESS AND INDUSTRY

The strengths considered here are in comparison to those of the TIECs.

This way, the financial muscle power and manufacturing experience of the business and industry is high. That is the reward they gain through risk taking in their operations.

Depending on the necessity, business and industry are able to decide on spending on R&D. Not many TIECs are found to have been endowed with such a prospect.

Often, the workforce that the large-scale industry has is something very high compared to that of the TIECs.

The expertise that business and industry have in project management is something that the TIECs cannot be expected to match. The same is the case with assets such as tools and plants, and buildings. Yet, the TIECs can enter into Memorandum of Understanding (MOU) with business and industry toward mutual benefit.

Often business and industry in the medium and small scale sectors fail to make the best use of such resources for want of educated personnel. The strength of the industry may be better supplemented with expertise of the faculty members.

4.0 CASE STUDY OF SUBJECTS WHERE BUSINESS AND INDUSTRY ORIENTATION IS A MUST

Almost all the subjects that find practical application in business and industry are better taught if the faculty members are offered the corresponding orientation.

Two typical examples are considered here. Safety engineering is a branch of study where hazardous operations in industry are taught. Today, the term industry covers a wide range of operational plants employing a variety of processes, techniques and complex machinery. The scope for study includes operational plants and project phases.

A faculty member teaching the subject can visualise things better only with a good orientation training.

The second case is the subject 'engineering economics'. This subject is usually dealt with by a faculty member with commerce or engineering background. In either case, the presentation can be effective, only if the faculty member has proper orientation.

Table 1
Comparison Between
TIECs and Business and Insutry

S. No.	Title	TIECs	Business and Industry
1.	Organizational structure	Mostly flat	Often hierarchical with more levels.
2.	Human resources	Mostly knowledge workers	A mix of blue collar, white collar and knowledge workers.
3.	Hazardous operations	Practically nil	Some what high.
4.	Financial responsibility for higher management executives	Limited	Very high.
5.	Technology application	Theoretical and experimental	Practical.
6.	R&D	Extraordinary efforts are required for fund generation.	Funding may not be very difficult in most cases.

4.1 TIECs can Benchmark with Business and Industry

Obviously, there are many dissimilarities between TIECs and business and industrial organisations. The very basic difference is that the TIECs are service providers of a special nature.

As regards business and industry, they too may have services as one of their products, yet, their mainstay is manufacturing and dealing with products.

5.0 COMMON AREA OF COOPERATION

Despite the varying differences, TIECs can benchmark with business and industry in some of the common areas.

Some of the areas to benchmark are listed below:

1. Quality Management System (QMS).
2. Environmental Management System (EMS).
3. Management Information Service (MIS).
4. Customer services.
5. Human Resources Management (HRM).
6. Application of statistical techniques.
7. Strategic planning.
8. Performance appraisal.
9. Team work.

5.1 Consultancy Potential of TIECs

Though the financial strength of business and industry is quite high, the TIECs have a variety of expertise that can be offered to the business and industry, especially, the enterprises in the small and medium categories.

To list out a few possibilities:

1. Certification by the testing laboratories.
2. Certification of instruments and equipment.
3. Preparation of documentation such as contract and technical specifications, management systems, designing various formats.
4. Assistance by way of information to be interpreted from the standards
5. Preparation of detailed project reports.
6. Progress monitoring with the help of PERT/CPM techniques.
7. Behavioural training for various levels of employees.
8. Assistance in statutory and legal matters including arbitration, registrations, etc.,
9. Teaching computer literacy at various levels.
10. Application of Operation Research (OR), statistical and other mathematical techniques.
11. Value engineering studies.
12. Conducting quality, environmental and operational health and safety (OH&S) audits.
13. Preparation of technical literature for products.

Taking into consideration the high qualification of the faculty members, it can be found that the list will be even larger.

The business and industry will be able to offer such assignments only if the faculty members display their strengths with relevant orientation.

6.0 CONCLUSION

Business and industry will be the major takers of the graduates coming out of higher TIECS. As the graduates enter their career or entrepreneurship.

The curriculum developed should make the graduates fit the requirements of these takers.

As students they have to be taught the theory along with practical works. Yet, the TIECs may not have all the laboratory, plant and workshop facilities fully. If the students are taken out to visit industries and business houses, this shortfall will be made good.

The faculty members should have also visited as many industries and business centres as possible. In addition, they should have gone through practical training in these organizations, especially, in the relevant field.

The training for the faculty members should not stop with acquiring technical knowledge and skills but should also include management skills and business acumen. The knowledge and expertise so acquired should be updated through reading current literature, joining research work and taking up joint consultancy works with industries. This make the business and industrial orientation relevant and practical.

The Importance of Occupational Information in Vocational Guidance

AMECHI N.F.

1.0 THE CONCEPT OF VOCATIONAL GUIDANCE

The word "vocation according to the Longman Dictionary of Contemporary English (1978) means a job which a person does because he thinks he has a specific fitness or ability to give service to other people. Some writers define "vocation" as one's primary work role at any given time, whether paid or unpaid employment. Others regard "vocation" as one's work, occupation as means of livelihood. From all these definitions it shows that "vocation" has much to do with one's occupation in life.

"Guidance" to a lay man means directing, piloting or steering. However, guidance has been defined in different ways by different authors, according to their opoinions and biases, but generally the various definitions directs towards a central theme.

According to Miller (1965) guidance services refer to those organised activities within the total school programme which are intended to assist students (pupils) with their individual developmental needs. Miller maintained that guidance services are not instructional in purpose; neither do they linked to the subject matter purposes of different subjects. It is assumed that the services provided will accord with the basic cultural values of the individual's society. Froehlich (1958) defined guidance services as those services which are designed to help the school to adjust to the pupil and to help the pupil to make adjustments to the school and to life. Furthersome, Forehlich indicated that guidance services are facilitating services which try to help the school do a better job of meeting individual pupil needs. They also help the pupil to meet better, the demands of the school, his peer groups, members of his family, and other adults.

According to the World Book Encyclopedia (1977, p.407), guidance is the process of helping persons to make the best possible decisions about their lives, and aiding them in solving their problems. It includes helping students choose the proper course to take in school and aiding them in deciding what careers to follow after their education is completed.

Ipaye (1993) stated that guidance covers all the means whereby an institution identifies and responds to the invidual needs of pupils or students no matter the nature of the need, no matter its source, thereby helping a person to develop his maximum potential.

From all these definitions, it is clear that guidance is a term used to describe a variety of services which have the common objective of helping pupils become increasingly

self-guided in the maximum utilization of their talents and opportunities. In other words, guidance is a function of the school for purpose of assisting, helping or aiding the pupils or students to perceive themselves with regard to their potentitals, talents and available opportunities. In this paper, some vital topics like vocational guidance, occupational information, occupational choice, methods of vocational guidance and factors which influence job preference will be dealt with for easy understanding of the title.

1.1 Vocational Guidance

This the process of assisting the individual to choose an occupation, prepare for it, enter upon and progress in it. Peter et al (1966) stated that vocational guidance is intended to aid young people in choosing an occupation, preparing themselves for it, finding an opening in it, and building up a carrer of efficiency and success.

Essentially, the individual is helped to choose, prepare for, enter upon and make progress in an occupation. Through vocational guidance, the individual is assisted to discover his abilities, interests and talents. Where all these are not considered first, the assistance given to the individual may not be effective. The focal point of vocational guidance is the individual's need and development of the student who finds himself in a world in which he is confused regarding choice of occupation among increasing options.

Vocational guidance aims at forestalling mistakes by individuals in making occupational decisions or choices that might later turn to be frustrating or disastrous to the individual. It is, therefore, more preventive in nature than corrective.

2.0. OCCUPATIONAL INFORMATION

According to Osuala (1985), occupational information means accurate, understandable, and usable fact that describe, explain and interprete occupations, vocations, carreers and jobs. It includes facts about enterance requirements, opportunities for employment, working conditions, nature of work done, duties performed, opportunities for advancement, rates of pay, health hazards encountered, trends and outlook.

Olayinka (1997) gave some of the vital information required before choosing an occupation as follows:-

1. The minimum educational requirements for entry into the occupation.
2. The period of training required, if any.
3. The general conditions of service which may include:
   (a) The type of reward in the form of salary.
   (b) Fringe benefits such as free accommodation, leave allowance, children allowance, facilities for study leave, assurance to give scholarship to sons and daughters of workers, opportunities for accelerated promotion, inducement to own property or build a house and an insurance policy to cover accidents.
   (c) other conditions of work such as working on Sundays, working for long hours, working for long sitting sessions, extensive travelling, night duty, and absence from home for several days or weeks.

(d) the pension scheme, the retiring age, the gratuity and other benefits.

4. social status and prestige attached to the occupation such as type of esteem for the workers, demand of the career, and other prospects for social influence and advancement. Left unguided, pupils are more prone to choose occupations without directely relating them to their interest, aptitude, ability and talent and without considering other conditions relevant to the occupations.

2.1. Occupational Choice

Today most Nigerian youth are still trained in the traditional academic institutions, which in reality have proved disfunctional in terms of demands of today. Nigeria, at this stage should give her citizens a system of education which should not only be functional but should also be job-oriented. Individuals often decide upon the work to do immediately they leave secondary school. For some, a tentative decision will come relatively early but for others, decision on the kind of occupation to choose will come later. If individuals know something about opportunities likely to be open to them and if they have considered their own interests and abilities and eventually engage in the right kind of occupation, they will be more efficient economically as well as happier. Pressure should not be exerted but guidance should be given. Their choice, tentatively held or otherwise merit consideration. They should have an idea of the time at which their decisions must ultimately be reached.

3.0 METHODS OF VOCATIONAL GUIDANCE

Several methods are adopted in bringing vocational guidance services to the youth, particularly those in school. Hopson and Hayes (1968), have listed some of these methods as follows:

1. Each young person seeking vocational guidance should be provided with adequate opportunity for counselling interview with a vocational guidance officer, more particularly at the time he may be able to choose specific vocational courses; or to leave school for other occupational training (including apprenticeship) or for work. Methods of interview should be continuously adapted with a view to ensuring the most complete analysis possible of individual ability in relation to occupational opportunities and requirements.

2. Records of school progress, including, as desired and as appropriate in individual cases, an evaluation of capacity, educational attainments, aptitudes and personality, should be used as may be considered appropriate for vocational guidance. With due respect to the confidential character of the information contained therein.

3. The facilities for the medical examination of young persons should be utilized as appropriate and developed as necessary for purposes of vocational guidance. Advice for remedial action and such other help as may be possible and useful for purposes of vocational adjustment should be provided as needed in each individual's case.

From the foregoing, it is clear that the focus of guidance is the individual. All the efforts of the guidance personnel are aimed at

directing the individual to discover his aptitudes, interests or preferences and capabilities which wil enable him enter the occupation in which he is best suited. It is only then that the individual will be able to contribute meaningfully in the society in which he lives.

3.1 Factors which Influence Job Preference

In the process of taking a decision on whether to choose a particular job or not, an individual considers first his ability, interest and aptitude for the occupation. While considering his abilities and interest he also needs to consider some factors which will encourage or prevent him from taking to a particular job. Some of the factors which influence job preferences of youth are as follows:-

3.2. High Earning

The financial remuneration of occupation is one of the most important factors which an individual considers in selecting an occupation. Youth tend to prefer an occupation whose financial rewards and other fringe benefits are very high. But to some people the high income is second in importance. Every effort should be made to help the youth understand many other rewards that may accompany an occupation; for example, service to mankind, opportunity for personal satisfaction, opportunity to express one's special talents or interest and maintenance of good mental and physical health. However, it is unrealistic to neglect or minimize the factor of monetary returns.

3.3. Special Personal Qualities

Occupations may make different demands upon the physical, mental, social or other qualities of workers. Unless an individual can meet these special requirements, the prospective worker has little chance of entering the occupation. Similarly, an individual must be physically fit to perform a job which requires arduous, physical exertion or which may involve the handling of heavy machineries.

Usually work involving outside assignments is performed in all kinds of weather. Hence arms, legs and feet must be sufficiently intact and functioning in order that individual may perform satisfactorily on the job. Thus only those who possess the requisite attributes can take to a given type of job.

3.4. Age

The age of students affect the type of occupation they choose. For example, at the early stages of development, many children announce their vocational preferences, while others choose occupations of their parents or the heroes they admire. As the child grows up, he may come to realise that he may not cope with the occupation he has chosen. Thus, early vocational choice has the tendency to affect the future life of the child.

3.5. Interest

Some peoples prefer jobs that involve frequent interactions with people and they derive joy by being humorous, friendly helpful, understanding and sympathetic towards other persons. There are many jobs in which people with the above qualities can derive joy and personal satisfaction. For example, teaching as a job, demands that each teacher should be a lover of pupils entrusted to his care. He should be a person who is friendly and approachable and is not partial in dealing with the pupils under him. A good

sense of humour and devotion to duty are other assets of a good teacher. On the other hand, a person who has no patience and cannot stand incessant worries of the pupils and is not helpful ought not choose teaching as a job because he/she is going to be a misfit.

3.6. Aptitude

Interest alone is not the only criterion for choosing a career. It is one thing to be interested in becoming an engineer but it is another important matter to have a necessary aptitude for the courses which may lead to engineering, For an example, a person whose performance in mathematics is below average, should reconsider his preference for a career or job in engineering.

3.7. Talents

Aptitudes and talents are closely related. When we talk about a "born" or a talented artist, we refer to the person's exceptional ability to perform extra-ordinarily well. Talent in this context may refer to that innate ability which makes a person perform a specific task without making a conscious effort. A person who shows interest in, and has aptitude and talent for a job, is likely to derive job satisfaction.

3.8. Sex Influence

In most parts of the country the cultural role expectations of men and women are known to be clearly defined. Studies have shown significant relationships between sex and occupational aspirations, preferences and choices. Since boys and girls undergo different socialising experiences, they tend to learn different sex roles and behaviour patterns and develop different interests. These roles and interest later become dominant factors in job choices. Studies of some determinants of vocational preferences among students in Nigeria reveal that sex differences appear to be a dominant factor.

For example, boys prefer engineering, medicine and agriculture while girls prefer nursing and teaching. This indicates that sex plays an important role in determining the job preferences of students. Other research findings which have supported sex differences in job preferences and choices show that in some Nigerian secondary schools more male students prefer realistic, investigate and enterprising careers than females, while some other studies, showed that boys were more interested in out door, mechanic and persuasive occupations computional, artistic, literary and clerical activities.

4.0. THE OCCUPATIONAL INFORMATION SERVICES

According to Osuala (1985) an occupational information service is an absolute necessity in any well-rounded vocational guidance programme. For an individual to make an intelligent and realistic choice of an occupation and secure the necessary preparation for entering it, not only must he know his own personal assets and liabilities but he must also know the world of work. Before the vocational counsellor can assist youth and adults in the wise selection of an occupation and the planning of a training programme, he too must know a great deal about the world of work. He must have at hand information about the local labour market and about the requirements and opportunities in the various occupations in local and surrounding towns.

4.1. Occupational Information

Osuala (1985) defined occupational information to mean accurate, understandable, and usable facts that describe, explain and interpret occupations, vocations, careers and jobs. It includes facts about entrance requirements, opportunities for employment, working conditions, nature of work done, duties performed, opportunities for advancement, rates of pay, health hazards encountered, trends and outlook.

4.2. Occupation Information Service

This term means an organised arrangement for securing occupational information and disseminating it in the vocational guidance programme. Such a service requires money, efforts, time and a conviction about its importance on the part of those who are responsible for its organisation and operation (Osuala, 1985).

The awareness of occupational information helps the students to make objective and impersonal choice of careers, since they are not aware of the characteristic of the various occupations - students are assisted to achieve an increasing degree of maturity in working towards the solution of their varied personal adjustment problems when they are provided with occupational information. This could be done by helping the individual students to understand himself better, develop an understanding of his opportunities and acquire the ability to handle problems of human relationship.

According to MacDaniel (1945) occupational information is important in that the school staff or counsellors are enabled to interprete and use information concerning the characteristics, needs and opportunities available to the students.

Occupational information provided in time assists the individual to acquire such knowledge of the characteristics and functions, duties and rewards of the group of occupations within which his choice will probably lie and this makes for intelligent choice.

The erroneous ideas held by people about some occupations are corrected when occupational information are provided. For example many people who are talented in some occupations like teaching, secretaryship or law have often been found to reject them because of the misconceptions some people may have about occupations. If occupational information is provided, people will be assisted to know the true positions of whatever information they have about the different occupations.

Super (1955) observed that occupational information is necessary since it helps individuals to make decisions and choices involved in planning a future and building a career. This includes decisions and choices necessary in effecting satisfactory vocational adjustments.

5.0 CONCLUSION

Helping all individuals become more aware of the vocational alternatives available to them at particular stages of their development and to understand the probable consequences of those alternatives.

Helping all individuals to achieve a satisfying vocational identify that allows them to relate a prospective work life to an acceptable like style.

Helping all individuals to acquire a set of work, relevant coping and mastery behaviours that enable them to engage the world with dignity, self-esteem, independence and effectiveness.

Helping the entire society to conceive and organise the institution of work in ways that satisfy legitimate human needs in fully human ways.

Helping the total society to build an opportunity structure that is devoid of racial, ethnic, sexual and social prejudice and that is based upon recognition of the talent and potential inherent in all its members.

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Technological Development and The Need for Training and Retraining of Printers

CHINAEZE A. NJAKA

1.0. INTRODUCTION

Printing technology has come a long way, since its invention in China about the 7th or 8th century A.D. Printing is known to have contributed more to the spread of civilization than any other invention, and in my considered opinion, will continue to be one of civilization's greatest inventions. Printing is one of our most important means of mass communication. Print to Walter (1991) is the preferred communication medium for transmitting information. According to him, it's permanent; it's portable, it's personal; and it's easy to use. It's also cheaper. Printing forms the basis of our whole educational system, and has therefore given impetus to the growth and accumulation of knowledge.

Printing has facilitated the spread of ideas that have helped to shape alterations in social relations made possible by industrial development and economic transformation. There is overwhelming evidence to the fact that modern business depend on printing for everything from sales invoice to money, and other security documents. Advertising equally depends mainly on printing to sell goods and services.

The printing and publishing industry is today a big business and ranks high among the other industries in many countries of the world. In addition to books, magazines and newspapers, thousands of other publications are printed everyday for our use.

2.0. EVOLUTION OF PRINTING TECHNOLOGY

In the past, three fundamental advances in human communication according to Asimov (1989) evolved that altered every facet of our world enormously and permanently. The first according to him, was speech, the second writing, and the third printing. And printing, as we know it today have equally evolved over the years. According to Bruno (1982) the present-day printing reached its current status, primarily as a result of five major developments, which include:

1. The invention of printing from movable types;
2. The invention of the Linotype typesetting machine, which did mechanically and quickly what Gutenberg and his successors for generations have done laboriously by hand.
3. The application of power to the printing press, culminating in the development of the high speed, web-fed, multicolour rotary press;

4. The application of the Camera-first to photo-engraving, then to lithography, especially offset, and via phototype setting, to composition of type matter; and

5. The application of electronics and computers.

In support of Bruno's fifth development, Asimov (1989) pointed that a fourth advance in communication every bit as important as the first three is the computer which according to him will enable most human beings to be more creative than they've ever been before. The impact of the application of computers to printing technology is still being felt and will continue to be felt for sometime to come. At the moment, the application has had a profound impact on present day printers.

The increasing use of automated controls in operations, combined with computer or computer-assisted presses and type-setting facilities, in the opinions of Prust et al (1989) has tended to make printing less of an individual "craft" without sacrificing traditional craftsmanship. The use of these new technical developments has brought with it a managerial revolution, with less concern given to the merits of a particular printing process, and more attention paid to satisfying the markets for individual printed products.

On January 28th 1985, a dramatic change again took place in the industry as a result of technological development. The change was the introduction of the term and concept of desktop publishing by Aldus Corporation of U.S.A. According to Dressler, et al (1987) four unique ideas came to light:

1. The idea that publishing could be done with equipment small enough to fit upon a desktop.

2. Publishing was more than just typing word onto a page. Rather, it involved a total system capable of providing, as output, publishable pages, including graphics.

3. Non-professionals could (and would) have control over the publishing process; and

4. The system making all of this possible would be inexpensive enough for popular adoption and would be sold in retail outlets.

The above revelations, in the opinion of this writer, is enough to scare the hell out of any printer who was afraid of change. But it should not in any way be so, because change is inevitable and must be expected at any time.

To Hannemann (1992), the principal result of this technology was to escalate the separation of the individual from the hands-on techniques associated with traditional (or conventional) craft of pre-press functions. Techniques which the printers had long cherished as proof of our craft were now possible without psychomotor training and practice. Skills and knowledge that had previously taken years to acquire and master were now packaged by software designers.

Like many other technological advancements in the history of printing and publishing, Hannemann continued, it is ironic that this change should come from outside the industry. Companies like Varityper, Compugraphic, Linotype, etc has spent years and huge sums of money to create an infrastructure of proprietary hardware and

software, and had continued a rich heritage of well constructed fonts - only to have a little, relatively young company Aldus Corporation turn the industry inside out.

This writer personally feels that we printers should not be frightened by these developments, instead we should be motivated by it. This is because, an industry which have had an image problem for quite sometime, and has over the years been viewed so much as a trade, rather than a profession, is indirectly being accorded recognition at last. We, as printers should see it not as a threat, but as a challenge which we must be prepared to face. The question then is, How do we prepare for this challenge?

3.0. THE NEEDS FOR TRAINING AND RETRAINING:

In answer to the above question, I think the only way we can prepare to be able to face the challenge is by organising for our printers, periodic training and retraining programmes. The training will afford them the opportunity of updating their knowledge and at the same time acquaint them with the changes taking place in the industry.

According to Smith (1991) every industry is in a race to remain competitive, to maintain a reasonable profit, and to experience growth. The printing industry is no exception. But advances in technology have dramatically changed training needs especially in the last few years. According to him, the other forces driving these changes are economic reality, growing international competition, and a work force rapidly becoming "capitalized" or performing a greater number of tasks through automation and computerization.

For decades, smith continued, teaching employees basic industrial skills was enough to prepare them to perform production operations. However, computers and computer-driven electronic systems are rapidly taking over the tasks that used to be done manually. Therefore, basic skills training is no longer sufficient. Even the basic requirements for applying normal working skills are changing radically. It is as a result of this, the periodic training and retraining programmes must be organised for serving as well as incoming printers to reflect the changes taking place in the industry.

For educational institutions, the current pace of technological advancement within the industry requires that they continually fine tune their curricula in order to adequately prepare students to meet the needs of their future employers. For this reason therefore, educators cannot afford to remain docile no matter the level. They also can ill afford to look the other way or ignore advances that impact their subject matter and programmes. This means that they must have to move along with the changes to be able to function effectively.

Experts are of the opinion that preparing students today for a more digital and technological tomorrow requires change. It is on this basis that Druker (1994) emphasized that the employee of the future will be a "knowledge worker". Given that, today's students must learn how to use a myriad of communication technologies which will enable knowledge workers to function. In addition, he concluded, technologies will become more and more overlapping due to refinements and converging systems.

Schools and Industries Must Cooperate

The importance of cooperation between the industry and the schools in planning curriculum of an industrial based programme, such as printing technology cannot be overemphasized. This is also, since educational institutions are important suppliers of manpower to the industry. In order for schools to adequately provide the needed skills by industry, there needs to be an open line of communication. Such a collaboration will serve both industry and educational interests. This communication has to be a continuous one in order that interests may be property served.

In a study conducted at Iowa State University, USA, Odesina (1988) found that schools must reflect changes in curriculum based on technological changes to meet the emerging and prevalent industrial practices. He also stated that given the changing nature of the industry, surveys must be conducted regularly to determine needs of the industry. It is on the basis of this needs that the educational institutions must plan their curricula.

In order to be well prepared, the need to seek opinions from employers about what their expectations are of employees is very important. This would help in determining what changes need to be made in the curriculum so that printing technology graduates will be given a sound education to meet industry needs.

At present, people in the industry who hold degrees have improved the image of printing as a profession and have provided new and creative ways of operating and managing printing companies effectively and efficiently. They also have provided the expertise for interacting with digital computers, electronics, satellite transmission, lasers and integrated systems technology now being used in the industry.

4.0 CONCLUSION

There is overwhelming evidence to the fact that printing technology has changed tremendously, since its invention so many years ago. These changes are mostly as a result of technological advancements in the industry. The increasing use of automated controls in operations, combined with computer or computer-assisted presses and type-setting facilities, has posed a serious threat to the older techniques associated with the traditional methods of printing.

The only way to stem the tide resulting from these changes is by organising periodic training and retraining for printers, aimed at updating their knowledge so as to enable them perform their functions creditably. The educational institutions in cooperation with printing industries while planning their curriculum must reflect these changes to be able to provide the relevant skills. This is very important because the new printing industry needs individuals who possess both a commitment to productivity and knowledge of computer-integrated printing production.

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Scheme of Community Polytechnics and its Interface with Industry for Enhancing Employability

K.P. BHARATHAN

1.0. PREAMBLE:

The under utilized human resource, knowledge, skill, machines, laboratories and other infrastructural facilities available in polytechnics are being utilized for accelerating the pace of rural development in the country by the introduction of the scheme of Community Polytechnics since 1979. The polytechnics which were virtually functioning in isolation from the community around with a little or no concern to the needs of the community were able to make their presence felt among the general public through the implementation of the scheme. The variety of activities undertaken by the Community Polytechnics are being appreciated widely by all concerned viz., the beneficiaries, Government departments, organisations working in the field of rural development, voluntary agencies as well as the public in general.

2.0. COMMUNITY POLYTECHNICS - THE PRESENT SCENARIO:

The community Polytechnics undertake various activities suited to their local needs in five major areas, after ascertaining the felt needs of the people and identifying the development potential of the villages around by conducting socio-economic and technical survey.

The five major areas are-

1. Manpower development and training
2. Transfer of Technology
3. Technical services
4. Support services
5. Dissemination of Information

2.1. Manpower Development and Training

Among the five major areas "Manpower Development and Training" is the one which is being implemented successfully by all the Community Polytechnics through their main and extension centers. The target for this area of activity begins with identification of appropriate trades suitable for training taking into consideration of the employment potential and ends with helping the trained personnel in securing self/wage employment. Success of this programme lies in the number of trained personnel securing employment and the level of the job secured by them. The opinion of the target group is sought in the selection of trades. Wherever possible selection of candidates to the programmes is made based on the aptitude, talent, annual income of the family intention to undertake self/wage

employment in the specific area after the training is over, etc. Due consideration is given to SC/ST candidates as well as women. Not only in-house training, but also on the job training is given by professional trainers working in specific field, in trades requiring skill development. Technical as well as non-technical; manufacturing sector as well as service sector.; single skill as well as multi skill programmes are identified and impiemented aiming at economic empowerment. During the last phase of the programmes, awareness on entrepreneurship development is also given to the trainees to build confidence as well as to bear the anticipated risk in starting self-employment ventures. All possible guidance and assistance are offered in preparing project reports as well as in securing loan from the financial institutions. Statistics shows that many of the trained personnel prefer to undertake wage employment locally, near by towns and even abroad especially in gulf countries. Few of them start their own ventures either individually or jointly in the form of partnership or forming co-operative societies.

2.2. Transfer of Technology

Popularisation of the tested and proven technologies in rural areas for adoption by the villagers is the programme planned in this area. The technologies having cost effectiveness, high efficiency, saving in labour, high productivity, using renewable sources of energy are transferred to rural areas using different strategies like demonstration, motivating to adopt, transferring/installation, maintenance, repair and sustenance of the technologies etc. Suitability to specific villages is decided taking into account of their engineering efficiency, economic viability and social acceptability. Some of the technologies chosen for transfer are bio-gas plants, solar appliances, smokeless chullahs, windmills, rural latrines, cost effective building, ferro-cement items, drip irrigation, wood burning stove, filter point tube wells etc.

2.3. Technical Services

Repair of agricultural implements, electrical gadgets, domestic appliances etc, servicing of automobiles, software development work, establishing production/ consultancy centres, construction/installation and plumbing and defect rectification of bio-gas plants, smokeless chullahs, low cost latrines, cost effective buildings, etc, offering consultancy to start enterprises, undertaking material, soil and water testing, promoting production/service centres, organising technical service camps periodically in villages, rendering technical assistance to other agencies and departments, imparting need based training to officials of such organisations etc are some of the activities undertaken in this area.

2.4. Support Services

Educating villagers about rural sanitation, public health, pollution control, use of renewable resources of energy, liaison with financial institutions to help trained personnel to secure loan, promotion of DWCRA units and co-operatives, preparation of project reports, conduct of EDP, non-formal education, carrying out social service activities involving N.S.S volunteers etc, are being undertaken in this area.

2.5. Dissemination of Information

For information dissemination, the strategies adopted are -

printing/procuring and distribution of leaflets, brochures etc containing information on newer technologies and rural development, organising technical exhibitors to display appropriate technology items, conducting video programmes, organising seminars and awareness camps, using other print and electronic media etc.

These areas are covered by the main centre as well as community extension centres set up in rent free buildings at specific locations to cover 5 - 6 villages. A nine member local implementation committee manages the affairs of the centre, with the field assistant under CPS as the convener. Some of these activities are implemented by the Community Polytechnics independently and some others in collaboration with other agencies/schemes working in the field of rural development as well as voluntary organisations having dedicated voluntary workers and massive support of the public, with which good rapport had been established by the community polytechnics.

3.0. WAYS AND MEANS FOR EMPLOYABILITY

For taking up any employment/job, training is a prequiste. Tremendous scope exists for the employability of unemployed in all the areas of activity envisaged in the scheme of Community Polytechnics.

With the present trend of privatisation, the effects of globalisation and the new liberalisation policy followed by the structural transformation programmes, a clear transformation is taking place in the social structure. At this juncture the vocation/skill training programmes should have clear priorities and focus to meet the existential needs of the unemployed rural youth. Skill training programme should clearly have economic empowerment as objective. The programme should be designed to strengthen the rural economy and to help the rural communities earn a sustainable income by providing goods and services to their people. Technical manpower for production, installation, maintenance and repair are required in rural areas. With the limited resources available, optimum results should be aimed at. In the long run this strengthens the rural economy as well as develops the area. The preparation of these entrepreneurs/skilled workers have four distinct stages.

3.1. Pre-Training

A group of 15-20 rural unemployed youth are brought together by the Community Polytechnic and are taken around to witness several urban and semi-urban enterprises. They are then taken back to the villages to identify the market opportunities, motivate them to assess their aptitudes and help each youth to choose his/her area of interest.

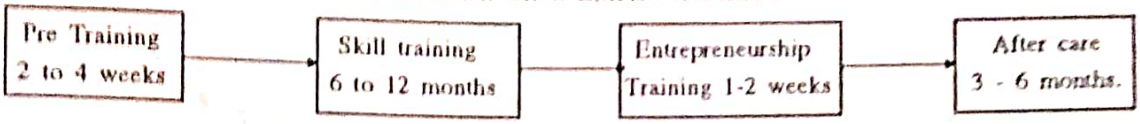
3.2. Skill Training

Once the youth have identified their area of interest and motivated, the skill are to be imparted. Either they can be trained in polytechnic or its extension centres or they can be sent as apprentices to work with Craftsmen/Entrepreneurs who are already carrying on the trade in semi-urban or urban set up and who will be given incentive to accept their trainees.

3.3. Entrepreneurship Training

Training in entrepreneurship will form an important component of preparing the youth, which can be conducted after completion of skill training in the polytechnics.

SCHEME OF COMMUNITY POLYTECHNICS AND ITS INTERFACE WITH INDUSTRY FOR ENHANCING EMPLOYABILITY



Stages for Preparing Entrepreneurs

3.4. After care

Skills/micro enterprises chosen may be technical in nature or non-technical; may be in the productive sector, service sector or business sector. Now the youth need support to set up their enterprises. Support may be in the form of access to finance, assistance in obtaining infrastructural facilities, standing as guaranters for the financial support received etc.

After the gestation period of about 3-6 months, the youth should have sustainable income generation through self employment. For this, the youth stick on reduced cost, improved productivity, sustainable and improved quality by overcoming the intense competition in the market. Speed and imagination are the two hallmarks of any successful entrepreneur.

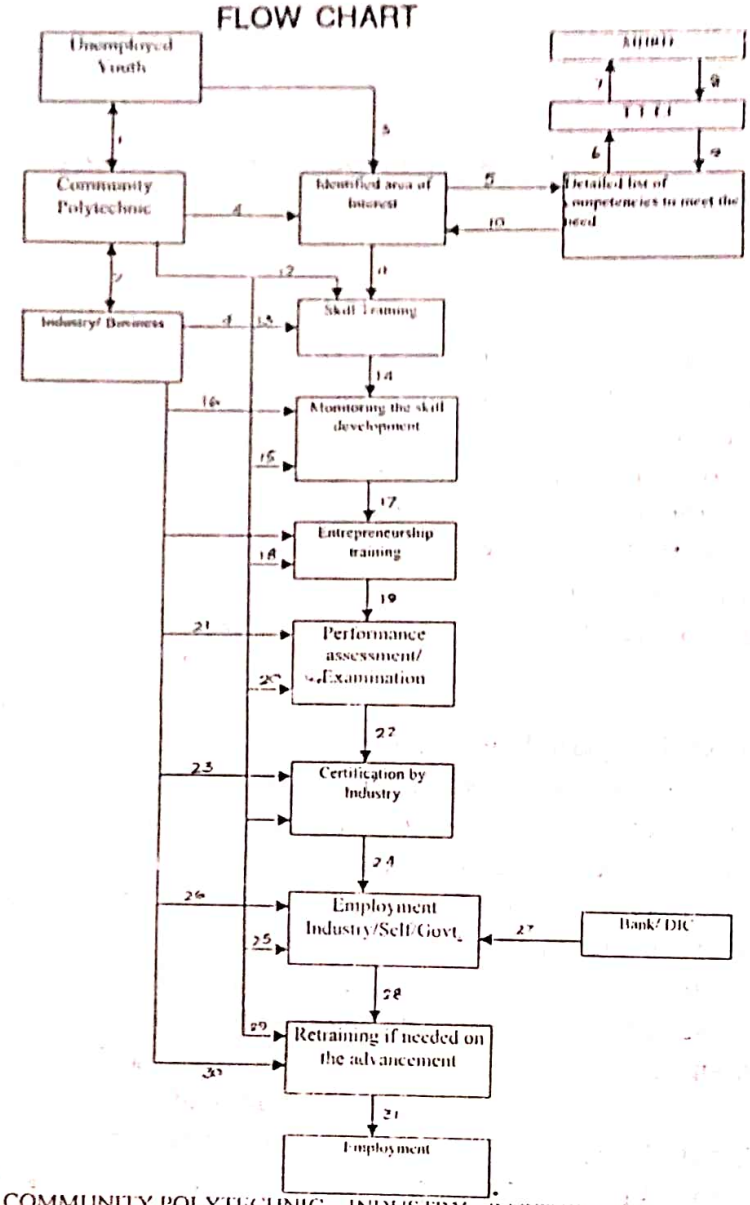
4.0. ENHANCEMENT OF EMPLOYABILITY WITH INDUSTRY INTERFACE

The small, medium and large scale industries set up in urban and semi-urban areas can help the Community Polytechnics in enhancing the employability of the rural youth by conducting training programmes in specific trades. It can be in productive/assembly sector, service sector or business sector. The programme may be industry specific or production/service specific. Training in identified area to all the youth can be given in the industry itself, or a master trainer can be trained in the industry, who in turn will train the youth at the community extension centres attached to the Community Polytechnics. Wherever specific equipment/machinery is required, that may be provided by the industry concerned. At every stage of training performance appraisal may be made by the industry to appraise the quality of the trainees as well as the programme. The duration of training programme can be fixed for individual trainees based on their performance. After satisfactory completion of the programme, certificates will be issued by the industry itself, based on the result of continuous evaluation by which the trained personnel will become acceptable to the employer. The trained personnel can take up manufacture of small items or assembling of some of the items in their village and supply them to the industry concerned. Some others can undertake the work in service sector as authorised mechnanic/craftsman. In both cases care should be taken to assure quality to the customer. Periodical retraining programmes may be arranged to keep pace with the advancement taking place in those specific fields.

5.0. CONCLUSION

The community polytechnics in the country so far have been engaged in training rural youth for self/wage employment and nearly 70 to 80% of the trained personnel were in a position to secure employment to earn their livelyhood. The trade certificates

FLOW CHART



COMMUNITY POLYTECHNIC – INDUSTRY - PARTNERSHIP

issued were helpful to secure loan and other facilities from the financial institutions. The trades selected are in productivity sector like manufactures of steel furniture items, food processing, garment making etc or in assembling sector like assembling of electronic clock, battery assembling, electronic choke assembling etc or in the services like repair of solar appliances, wiring screen printing, pump set repair etc. Now industry specific and product/assembly specific training programmes are on the anvil which, if materialises, would enhance the employability of the trained personnel. The Community Polytechnics here, will have the role of a facilitator and if successful 100% placement of the trained personnel will be assured.

Paper sent to TTTI, Bhopal for the National Workshop on Industry - Institute Partnership through Community Polytechics held on 21 Sep. 2000.

Adapting Engineering Education to Internet Revolution

M.NARAYANA RAO and G.KULANTHAIVEL

1.0 INTRODUCTION

Engineering education has received considerable attention and support in the country ever since independence and has expanded very significantly in these five decades. The fine network of Institutions of higher learning IISc, IITs, TTTIs, universities and engineering colleges (regional'state'private) as well as a large pool of engineering graduates and post graduates in different branches coming out of these institutions annually are a clear testimony to this. Our country has witnessed a remarkable growth in engineering education facilities, particularly in new areas like computer science and engineering, electronics and telecommunications etc. The Indian Engineering System is now one of the largest in the world. But this manpower pool has yet to make major impact on the economic development scene in the country.

- "The recent explosive growth of networking raises the possibility of widespread collaborative open ended learning activities" (Edelson, Pea, & Gomez, 1996)
- "The world is constantly evolving, creating the challenge for individuals and organizations to deal with change and for schools and universities to prepare people for change" (Eden, Eisenberg, Fischer, & Repenning, 1996)
- "The fact: it (the evolution of computing) is the world's best communication tool combined with what will be the world's largest library, creating the first and only universal continuous learning environment, relentlessly changing the way we work, live, court and learn" (Wilson, 1997)

Such sentences, which reflect a feeling of revolution, are not unique. There are hundred of presentations and articles in journals which start with the spirit expressed above, trying to capture the idea that information technologies change the way we live, work, think, and behave.

A significant change, mainly is in the increase in the number of people who joined the community of computer users lately, that is, within the past three to five years. This huge increase is reflected in every graph, indicating the number of computer users in general, and the number of Internet users in particular. One factor which influence this increase is the emergence of information technologies in general, and of electronic communication tools in particular. This means that one may sit in front of the computer screen without feeling isolated.

2.0. INTERNET EVOLUTION

The strength of Internet lies in that it is a technology which performs the evolution in its natural fold and one of the many factors responsible for this success has been the simpler adaptation to evolving network technologies. Internet has been around since 1968. It was used for transporting military information between various locations in USA. Initially it was known as ARPANET (Advanced Research Project Agency Network). However, it is estimated that the first real internet began in January 1983 when TCP/IP protocol was adopted and the National Science Foundation (NSF) in the United States was the last to manage internet. Subsequently, in the April 1995 the National Science Foundation turned the National Science Foundation Net backbone over for commercial utilization and this in a way gave birth to internet as we know today.

Internet is one of the communication technologies which may be stated to effect changes in the society. It has progressed remarkably during the past 5 years. There were 40 million internet users accessing internet and over 10 million hosts on the internet in the year 1996. As per the estimate, internet users are doubling every year and it reached a figure of 60 million hosts to connect 200 million people before starting of the new millennium.

3.0. FACILITIES OFFERED BY INTERNET

There is a huge of information available through the Internet. For many users, it is a valuable source of news, business communication, entertainment and technical education. There are many features like E-Mail, News Groups, World Wide Web, Telnet, File Transfer, Video Conferencing, Internet Chat, Digital Libraries, Directories and Bulletin Board Systems (BBS).

4.0. EDUCATIONAL APPLICATIONS OF INTERNET

Education and training mainly comprises of two activities, namely, providing information and providing interaction amongst the students, and amongst the teachers and students. It is possible to use communication technology effectively in the teaching-learning process.

Academic Communication, Administration, Curriculum Development and Instructional Materials, Digital Libraries/Books and Journals, Software Distribution, Teacher - Students Interaction, Teacher Training, Continuing Education Programmes, Students Activity and Group Interaction and Distribution Campus Management are some of the applications.

5.0. KNOWLEDGE AND SKILLS REQUIRED

Using a computer network is relatively straight forward: Using it profitably for educational purposes may not be quite so simple. This is not but due to technological problems but due to methodological issues and problems arising more generally from the peculiar feature of computer mediated communication. It is essential that a learner has the following skills and abilities to collect and present the information gathered from internet and to synthesize subsequent deductions and inferences from the material.

- Basic knowledge of computer
- Familiarity with multimedia software.
- Using Networking Services

- Access to Information
  - knowledge of tools for remote access to information and
  - knowledge of strategies for information retrieval.
- Sharing Information and Knowledge
- Cooperation and Work group Coordination
- Teaching and Learning on the Network

6.0. METHODOLOGY TO BE ADAPTED

The WEB is a large system of servers which offers all kinds of information to any one on the NET. Globally, World Wide Web (WWW) is an area of the Internet where documents and files are connected via Hyper Text and Hyper Text Markup Language (HTML). In Education system, this powerful feature of Internet, (through Intranet/VSAT) can be used to complete all the instructional material developed in any discipline, information related to R and D, trends, inventions and innovations, in the form of Web page, stored in a web site. Those web pages containing multimedia elements makes it a powerful media of instruction, which can be accessed by any learner away from the college or Institution. He/she would be able to get good quality engineering education delivered at his/her doorstep. The research scholars engaged in R and D work can also make use of it by accessing the latest R and D, trends, inventions, innovations taking place globally through Internet and also can have guidance from experts sitting at any remote locations. A virtual simulated laboratory environment can also be provided, where the learners can virtually experiment in virtual reality.

7.0. TECHNOLOGY REQUIREMENTS

Technology requirements for doing web based courses need to be revised on a yearly basis. It might be best to exceed what is listed below. Requirements are likely to increase each year, as new technologies become available. As on date, Pentium III (speed 500MHz) computer system with Widows 98, 64 MB RAM memory, 8.4 GB Hard Disk space, 48X speed read CD-ROM drive with speakers is available, which will have more accessing speed with more space.

7.1. Network Connectivity

- Modem, Integrated Services Digital Network (ISDN), or dedicated connectivity for at least 20 hours/week. Several web pages provide information about the Internet Service Providers (ISPs) who offer an Internet connection in your area. Now in India, the Digital Subscriber Line (DSL) connectivity offered by the ISP Dishnet is having faster access for Internet.
- 28.8 kbps or higher speed modem required (latest one is 56.6 kbps).
- Internet browsing software like Netscape Communicator/Microsoft Internet Explorer.
- Must include SLIP, PPP, or other TCP/IP connectivity.

7.2. Additional Requirements

Access to a telephone line for Internet connection for a minimum of 20 hrs/week, unless ISDN, Ethernet, or similar network technology is used. This will include live class interaction times and time for homework assignments.

- TV, VCR (VHS format) and VCD may be required for some classes.
- Software
  - Microsoft Word, Wordperfect, or another modern word processing program.
  - Spreadsheet software such as Microsoft Excel.
  - Database software such as FoxPro or Microscot Access.
  - Internet software
  - Email software (optional).

Most Internet software is available free for academic use. Recently, Microsoft launched Microsoft Office 2000, which has lot of facilities, that can be used for creation of website and other applications of Internet.

8.0. ADVANTAGES AND PROBLEMS OF INTERNET BASED TEACHING

The use of Internet WEB site can save lot of money, time and manpower on teaching/training process and documentation of education system. It will also help to share/pool, the expertise/intelligence available uniformly, throughout the world. In this method, learning is not confined to the walls of school/college. It promotes discovery learning, learning is learner oriented instead of teacher oriented, promotes knowledge sharing and problem solving in teams and keeps distance learner motivated and in constant contact with the resource person. It removes boredom or loneliness commonly associated with the learner of distance education programme. Low cost experimentation is possible in virtual labs, poor countries, which are short of resources and cannot create large infrastructure required for conventional teaching, can easily establish information structure with outside help for mass education programme.

The Internet at present is bedeviled by bottlenecks. It has become slow because of heavy traffic on information highway. There is at 2300% increase in the new loggers, which some time chokes the data pipes. Pictures, illustration and animation require more bandwidth and take much longer to load. In applying tele-teaching, it would be much better and wiser if most of the educational material containing such graphics is delivered to the learner on CD-ROMs and Internet link is utilised for further reading and communicating with the resource person. In future with the coming of ISDN technology which delivers data five times as fast as regular modem, part of the problem of speedy transfer of data will be solved but this technology is expensive and difficult to install.

The other solution could be that if a Virtual University is having large number of its students located in specified geographical area it could create an Intranet, which shall provide faster access to its students. This localised syndicate would be in a better position to serve its students with all types of educational material including graphic material.

The other problems that could crop up with the use of Internet are shortage of multimedia based self-learning material, resource limitation for Universities to set up information structure and cost of hardware and easy availability of telephone/Internet connection on demand. But these are minor hindrances, if one realises the immense benefit that would accrue from the use of Internet and teleteaching.

9.0. PLAN OF ACTION

To utilise the potential of Internet and even LANs, a systematic plan of action is needed. The Internet educational applications being in the infancy, offer challenging opportunities to the academic community to address various issues facing the education system. Some of the issues which need consideration are as under.

- How do we improve the quality of education?
- How do we reach large segments of populations which are illiterate?
- How do we increase the enrolment in the engineering education system?
- How do we provide the continuing education facilities to the professionals, schools drop outs or those who could not afford to continue their education etc?

The solutions to these problems are to be found out with in the constraints imposed by the system such as

- Sustainable growth rates of engineering education can not be more than 10% in many countries.
- The educational system is under severe financial constraints.

A careful analysis of the above, points out that the conventional approaches cannot meet the above demands, and we need to take recourse to the technology to find suitable solutions. Internet offers a fairly useful solution to the above.

The broad plan of action suggested is as under:

Establish Internet connectivity in all engineering educational Institutions with e-mail accounts for the students and teachers. For this Govertment or Directorates of Technical Education may take the help of some of the national organisations involved in providing network facilities in the country like National Informatics Centre (NIC). Provide atleast a few nodes at places that are easily accessible to all the students and for all the 24-hrs. Provide unrestricted use to students.

- Identity some key organization and entrust them with the responsibility of developing the applications support bringing in the changes in engineering educational Institution. The teacher training Institutions established in various countries for the engineering education systems may take up this responsibility.
- Web servers may be set-up at these key Institutions.
- Set up news groups and or list servers for different interest groups, according to the disciplines or sub-disciplines.
- The key Institutions may organise either direct or web based teacher training programmes on 'Internet, its use and applications'.
- Promote the use of student-teacher interaction through e-mail/Internet in all the engineering education institutions. This does not require any additional preparation on the part of the system, other than providing the Internet infrastructure.

- Develop engineering education information system consisting of Institution information, admission capacities, admission procedures and criteria, academic calender, infrastructural information, faculty etc. and provide it on the web. The information system may be of two levels - National/State level and the Institutional level.
- The key Institutions may develop clip media data bases, data bases of instructional materials, free/shareware software, and finally the repository of the instructional materials and make them available nationally. They may also develop directory of keybweb sites of Interest to engineering education system. The key Institutions may develop linkages with other Institutions/web sites with similar interests.
- The Key Institutions, along with engineering education Institutions, may develop web based continuing education programmes meant for different target groups.
- The key Institutions, along with other key Institutions, may jointly bring out journals and news letters of relevance to engineering education Institutions.
- Promote active participation of engineering education Institutions through guidance in utilising the network.

10.0. CONCERNS IN THE USE OF INTERNET IN ENGINEERING EDUCATION SYSTEM :

Even though the networking technologies are very powerful and useful in instructional systems to improve the efficiency and effectiveness of engineering education system, there are some concerns which need to be voiced with a view to facilitate the change. The concerns are as under :

- A number of technologies like slide projectors, OHP, video films, CAI has promised a bright future, but have failed to take roots. What were the reasons? What steps can we take to learn from the past.
- What strategies are needed to promote and foster the use of the network technologies in the engineering education system.
- Considering that web based materials use multimedia and hyper text features, we have to think how the students and the teachers make notes from these materials. Do we know enough on how to use these materials for teaching and learning? What training is required for the teachers and the students in the use of these materials?
- The conventional teaching emphasises the use of structured instructional materials and systematic presentation. The hyper text and web based learning materials are basically unstructured information and the presentation is normally driven by the user i.e. the student. Though, the retrieval, based on the needs of the students, there is no assurance, such need based searches lead to systematic learning and good cognitive mapping. The cognitive psychology needs to take a look at the learning from unstructured materials and its effect on cognitive mapping.

- What is the future of the books? Who will write them? Who will use them and how will they be used?
- What will be the shape of the future university ? Is the 'under-the-staircase' university concept threaten us or liberate us?
- Is there any difference between the learning styles of students, professionals, non-student/professional population? Is Internet integrating all these styles?
- Is internet suitable for all age groups of students and if not for whom is it suitable, why and how?
- The use of Internet will make the students challenge the information provided by the teacher. What threats does it pose?
- The unstructured materials, generally lead to not-so-meaningful searches and wandering the cyber space. How do we avoid it?
- What initiatives are needed to develop the internet applications pertaining to engineering education system.
- What global collaborations do you envisage? The impact of the use of Internet on engineering education system depends upon the information available all over the world and the access to such information. Thus goal could be achieved only through appropriate collaborations.

11.0. CONCLUSION

Several issues of current importance of Internet in engineering education in India have been discussed in this paper and the need for a thrust in several areas has been emphasized. The challenges of globalization, development and technology faced by the engineering education system in the country are indeed phenomenal; Serious efforts are now required to place engineering education in India on a high performance path so that the resulting manpower pool is capable of harnessing the country's resources, i.e., natural, fiscal and human, in an effective way. This will surely stimulate rapid economic progress of the country in a short time. Educational use of the Internet can be observed from two different perspectives, which can label respectively as 'networking education' and 'network-based education'. In the former case, information and communication technology is seen as the subject of the teaching/learning process. In the second case of network-based education, information and communication technology is regarded as an indispensable tool and a prerequisite for implementing certain educational models, such as online education. In the 21st century, which is only a few days ahead, worldwide access to knowledge and information will serve as a catalyst to meet and tackle problems in everyday life and to build up the quality of life for both the individual as well as the world community.

Presented at the XXIX Annual Convention of ISTE held at Kongu Engineering College, Perundurat, during 10-12, December, 1999.

RESEARCH ABSTRACT

NATIONAL REPORT ON EMPLOYMENT STATUS OF POLYTECHNIC PASSOUTS IN INDIA (TECH. ED. I & TECH. ED. II STATES)

V. Thanikachalam
Project Co-ordinator
Dec. 1999

1.0 PRELUDE

The Ministry of Human Resource Development, Government of India implemented a World Bank Assisted Technician Education Project between 1990 and 1999 in two stages benefitting 542 polytechnics covering 19 states.

In order to asses the benefits of the project to the students a Tracer Study on the Employment status of Diploma holders qualified from polytechnics was undertaken by all the four TTTIs in their respective regions. This study presented the import of the project over the last nine years (1990-99).

2.0 OBJECTIVES

The main objectives of the study were:

- To determine the number of students who were enrolled and who ultimately passedout in 1993-94/1994-95 and 1998-99.
- To determine and make a comparative study of the employment of the percentage of students passedout in 1994-95 and 1998.
- To determine the disciplines in which there are low opportunities of employment and the reasons thereof.
- To determine the number of diploma passouts, pursuing higher studies though full-time, part-time and distance mode and the areas in which higher studies are undertaken.

3.0 PROJECT DESIGN

In order to gather relevant data from the polytechnics, alumni of polytechnics, industrial personnel and others who are employers of diploma holders, four different instruments were developed. viz.,

- Basic data on Students.
- Student Questionnaire.
- Polytechnic Questionnaire.
- Guideline for taking data through interview of the Employers and used by the TTTIs in their respective regions.

In addition, the faculty of TTTIs visited project polytechnics, assisted them to interview the employed passouts. They have further assisted the polytechnic faculty to interview the industrial executives.

The entire Tracer Study adopted a descriptive cross-sectional research process to fulfil the objectives.

4.0 SAMPLE

For the final analysis on 15th December 1999, data provided by 110 polytechnics were used viz., Eastern Region (25); Northern Region (17); Southern Region (33) and Western Region (35).

In the Southern Region, 2142 male technicians and 1010 female technicians have responded to the questionnaires.

Besides samples of HRD personnel, executives of industries were also contacted to gather information.

5.0 FINDINGS

The following are the significant results.

1. Enrolment in polytechnics increased by 15.61%. Enrolment of women increased by 74.84%.

2. The percentage of passed-out also increased by 25%.

3. Based on the feedback, it is found that the following branches offer more than 40% of job.
   - — Textile Technology.
   - — Mechanical Engineering.
   - — Production Engineering.
   - — Modern Office Management.
   - — Automobile Engineering.
   - — Electrical and Electronics Engineering.
   - — Applied Electronics and Instrumentation.
   - — Metallurgy.
   - — Man-made Fibre Technology.
   - — Tool and Die Engineering.

4. The following branches offer 35-40% of employment
   - — Civil Engineering.
   - — Computer Science.

5. It is observed that maximum percentage of diploma holders is absorbed in the private sector and the lowest percentage is entrepreneurs. The rank order is:

— Private Sector	1
— Government Departments	2
— Public Sector	3
— Self Employment	4

6. The average salary varies from Rs. 1000-Rs. 4500/- p.m. Salary offered to diploma passed-outs of 1998 batch is higher by 20-25% than that of previous batches. Passed-outs from the disciplines like Architectural Assistantship, Secretarial Practice and Modern Office Management were found to be grossly under paid.

7. Percentage of employment of women varies from 33% to 50%; in some sectors the percentage is higher than 75% and their average salary level is Rs. 1400-4100/- p.m.

8. The percentage of students entering into full-time higher studies varies from 7% to 23% and that of part-time is from 7% to 35%

9. Autonomous polytechnics maintained good relationship with the industries through industrial training, testing and continuing education and hence the students were readily selected through campus interviews and naturally they have excelled in their performance.

10. Emphasis for future curriculum development should be based on the industrial needs of private enterprises, shop-floor human relations, better problem-solving skills, communication skills and maintenance skills.

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I, Dr. M. Narayana Rao, hereby declare that the particulars given above are true to the best of my knowledge and belief.

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