

EGYPT'S ENGINEERING EDUCATION DEVELOPMENT PROJECT - FINAL ASSESSMENT AND FUTURE OUTLOOK

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INTRODUCTION

Egypt's Engineering Education Development Project (EEDP) has been funded through a loan agreement between the World Bank and the government of Egypt. The project generally has been aiming at the upgrading or the redesign of educational programs at the eighteen Egyptian faculties of engineering^{1,2,3}. The participation of the different engineering faculties has been allowed through a competitive proposal process involving open review and assessment with peer-review involvement. As it moves through its final year and approaches its end mark, the EEDP is undergoing assessment where achievements are outlined, past impediments and obstacles are identified, and aspirations for the immediate and far future are expressed.

This paper covers the project outline, its goals, procedures, and academic as well as administrative features. Also covered are the support programs which ensured the accomplishment of the project's global goals optimally and cost effectively. The achievements of this project fall into the following categories: Academic improvements, industrial linkages with academe including industry involvement in EEDP policy making, library automation and intra-networking, modern instructional tools development including interactive multimedia-based prototype educational courseware covering a range of topics, human resource development, program assessment and accreditation.

The paper accounts for the issues and events typically hindering engineering education development in a developing country. The detection and analysis of those impediments were made possible through a comprehensive monitoring system, namely, the Proposal Implementation Monitoring Committees (PIMC) to ensure that the proposed program is executed properly and in accordance with a pre-approved time schedule. This included site preparation and infrastructure refurbishing, equipment installation, commissioning, and utilization, and curriculum development and the preparation of renovated courseware material.

PROJECT OUTLINE AND POLICIES

Activities Supported by EEDP

Loan support for engineering education development under the EEDP project included provisions for development of engineering curricula and engineering education technology, procurement and commissioning of laboratory equipment, supply of instructional materials, including textbooks and library resources, academic fellowships and industrial attachments for staff upgrading (both teaching and technical support staff), consultants and visiting professors and specialists as required for the in-country development of staff, curriculum and materials, and support for applied research in educational technology and methodology and for short-term faculty development seminars to disseminate the research.

Criteria For Proposal Evaluation

The following criteria were generally considered by a proposed project. The final selection of a proposal for funding depended on meeting these criteria :

- (1) Evidence of infrastructure refurbishing.
- (2) Commitment to equipment maintenance.
- (3) Prioritizing academic needs ; higher priority in developing programs should be given to more basic curricula.
- (4) Linkage to relevant industry.
- (5) Expression of institutional needs.
- (6) Commitment of necessary human resources.
- (7) Academic reform and curriculum development.
- (8) Commitment to make project output accessible to monitoring committees.
- (9) Commitment to share experience and facilities with others.

Proposal Preparation Assistance Service

This was a mechanism provided by the EEDP to assist individual faculties of engineering to prepare project proposals. Such assistance included the provision of expert and technical services , library resource material ,material on engineering education, human resources such as a librarian, secretary, office facilities, ..etc. In view of the urgent need demonstrated by many smaller institutions assistance services were not geared to an executive cycle and ,therefore, commenced at any time. This together with the fact that many assistance programs needed much shorter durations than six months allowed more "assisted proposals" to be submitted to the EEDP. The disciplines for whose development requests for assistance were submitted were:

PROJECT ACHIEVEMENTS

The achievements attained by the EEDP project have been clearly acknowledged by the World Bank, by the Egyptian government, and most importantly by the colleges of engineering. Those achievements may be classified into the following categories:

1- Human resources development

A large number of engineering faculty members were involved in the various activities of the project. Nearly 15% of all engineering faculty members in Egypt were in one way or another involved in EEDP activities. Such involvement in itself enriched their capacities in education development and clearly reflected on their performance in their own colleges. Those activities included ,but not confined to, preparation of proposals, refereeing of submitted proposals, preparing specifications for educational materials, equipment, and laboratories, and curricular development.

Other means of human development included: study tours inside and outside the country, training courses , and workshops and seminars.

2- Academic improvements

Those took the form of curricular development especially in the areas of Basic & Engineering Sciences where physical sciences and basic engineering sciences were recognized by the EEDP to be fundamental to sound engineering education and to provide the foundation on

which strong and effective programs are built. Ten different subjects were identified to belong to this category, namely,

Computer Fundamentals, Mathematics, Physics, Engineering Chemistry, Basic Electronics, Basic Electrical Engineering, Thermodynamics, Fluid Mechanics, Materials Engineering, Workshops .

Developing these sciences ran -under the EEDP- into three consecutive stages: reviewing and examining the present state of educational facilities, developing what was regarded as model programs in those areas (including building program structures, developing course contents , and designing practical work and laboratory experiments, specifying equipment necessary for the above requirements), and assessing the educational deficiency in each institution and the consequent cost of rehabilitating the present programs and facilities.

3- Industrial linkages with academe

Activities in this area included: industry involvement in EEDP policy making, setting industrial links as criterion for funding, curriculum development based on industrial needs, accreditation based on industrial link

The EEDP-promoted link between the universities and the industry was manifested by the following cooperation activities: industry-supplied equipment to engineering colleges, university equipment lent to industry, and computer-related development programs for the industry made by engineering faculties.

4-Modern instructional tools development

This basically constitutes interactive multimedia-based prototype educational courseware covering a range of topics. The EEDP offered its support to the efforts made by groups of professors to develop multi-media materials for engineering students. One typical good example was to develop multimedia educational support aids for teaching Fluid Mechanics and Aerodynamics subjects at Cairo University. The efforts focused on utilizing latest technologies in multimedia area and the experience gained by the Aerogroup during the last years in the design and use of computational and graphical presentation techniques as teaching aids and/or support..

5- Program assessment and accreditation.

The need is being felt for a new system capable of evaluating and rating the degrees offered by the different institutions. It is now widely believed in Egypt and elsewhere that only through evaluation that higher education may be able to emerge on a sounder footing. The EEDP management has examined the issue of education evaluation in more depth and has launched a study which aimed at the establishment of an independent evaluation and accreditation body for engineering education. The study team began by consulting the charters , procedures , and regulations of many reputable accreditation organizations such as ABET in the U.S.A., Engineering Council's professional societies in the U.K, ..etc. A draft proposal for a national accreditation body was then prepared. Draft procedures were put to work by exercising the evaluation mechanism on sample programs in selected institutions. The institution was told in advance how to prepare itself for evaluation while potential reviewers were educated on evaluation procedures.

6-Library automation and intra-networking.

This activity will be presented in the following section at length as it is turning into a major accomplishment which is believed to open new horizons to engineering education in Egypt and promises to convert education from a traditional form into a modern form which keeps abreast with future global developments.

COMPUTER NETWORK FOR ENGINEERING LIBRARIES (CNEL)

Description of CNEL

The Computer Network for Engineering Libraries (CNEL) consists of 18 nodes, corresponding to the 18 Engineering Faculties in Egypt. The nodes are classified into 3 Primary Nodes and 15 Secondary Nodes. Each primary node stores the database information for all 18 Engineering Libraries. It is also connected to a central Internet gateway. As such, each primary node acts as a Class C Internet node responsible for a number of secondary nodes in its domain.

The secondary node stores the database for the local library information. It also accesses the database for other Engineering Libraries via its parent primary node. In addition, it accesses the Internet via the same primary node

Table 1 lists all nodes in the CNEL, their geographic location, their class type (primary or secondary), as well as the name of the homing primary node for each secondary node.

Within each node (whether primary or secondary), a local area network is installed. The server manages access to the library database, and to the INTERNET. Two of the PCs are equipped with bar code readers so as to handle circulation activities at the library. One PC is dedicated to the Library Staff for Catalogueing and Acquisition activities, while the other PC is to be used for Searching activities by the Library User or Library Staff. The communication gateway, in conjunction with the appropriate software, provides connectivity between the secondary node and its parent primary node, and between the primary node and the central gateway.

A network management system (NMS) is installed in each primary node. Such facility allows the system administrator to carry out the necessary management functions at the primary node and the secondary nodes in its domain, as well as to exchange management information with other NMS located at other primary nodes.

Figure 1 depicts the schematic diagram for the components of a primary node, while Figure. 2 depicts the secondary node schematic diagram.

The physical links between the different nodes are based on the Public Switched Telephone Network (PSTN), the X.25 Packet Switched Network (EGYPTNET), and/or the VSAT Network

Table 1. List of nodes and their types in the proposed Computer Network for Engineering Libraries

Node #	Faculty Name	University Name	Geographic Location	Node Type	Parent Node
1	Cairo	Cairo	Cairo	1ry	---
2	Fayoum	Cairo	Fayoum	2ry	1
3	Ain Shams	Ain Shams	Cairo	2ry	1
4	Helwan	Helwan	Cairo	2ry	1
5	Matarya	Helwan	Cairo	2ry	1
6	Port Said	Suez Canal	Port Said	2ry	1
7	Suez	Suez Canal	Suez	2ry	1
8	Shoubra	Zagazig	Cairo	2ry	1
9	Alexandria	Alexandria	Alexandria	1ry	---
10	Tanta	Tanta	Tanta	2ry	9
11	Kafr El-Sheikh	Tanta	Tanta	2ry	9
12	Mansoura	Mansoura	Mansoura	2ry	9
13	Menouf	Menoufia	Menouf	2ry	9
14	Shebin El-Kom	Menoufia	Shebin El-Kom	2ry	9
15	Zagazig	Zagazig	Zagazig	2ry	9
16	Assiut	Assiut	Assiut	1ry	---
17	Menia	Menia	Menia	2ry	16

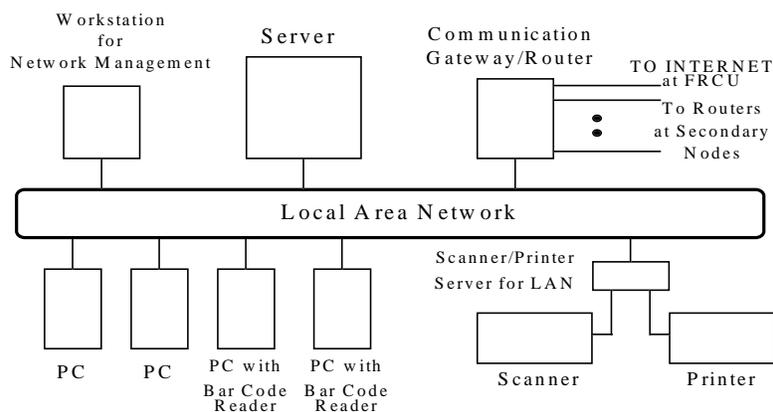


Fig. 1 Components of local area network at primary node

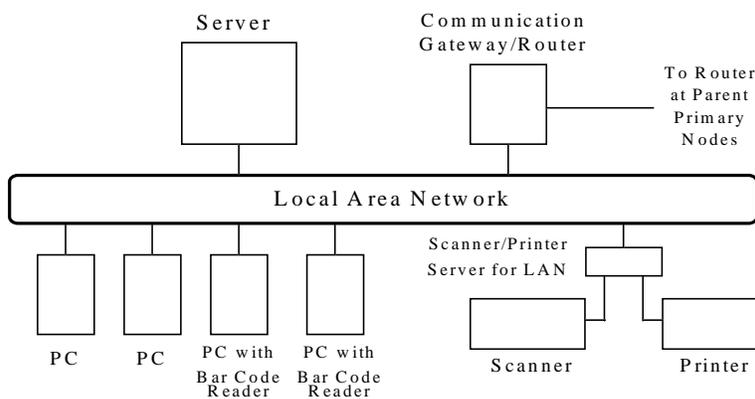


Fig. 2 Components of local area network at secondary node

Services Provided by CNEL

At the Secondary Node :- Access to local database for library information system ; Access to database at primary node concerning other library information systems ; Exchange of E-Mail and performing file transfer between users at the secondary node, as well as between users at different nodes ; Access to INTERNET services (e.g. E-Mail, FTP, WWW, and TELNET) ; Support of multimedia applications and their communication

At the Primary Node :- in addition to similar services as above ; Acting as a Class C Internet node ; Providing WWW server facilities ; Performing network management functions at the local network level, as well as for the secondary nodes belonging to it.

General System Features

- Separate files are maintained for each library or combining information into system-wide files.
- The system shall require password access control to access remote databases.
- Hardware operates in a real-time interactive mode and can create, update, maintain, and access all data for library materials and patrons in real-time.
- Expansion to include additional features or enhancements and improvements in technology is possible without interruptions to the programs already running.
- Software to support acquisitions, interlibrary loan, journal citation, information and referral file, and other modules is being supplied.
- The system provides functional links to the Internet, and perform standard Internet functions such as E-mail, file transfer (FTP), remote login (Telnet), World Wide Web (WWW) browsing, and WVVW server.
- The system hardware and software supports and runs the interfacing standards developed under the Open Systems Interface Reference Model, including Z39.50.
- The system provides continuous backups for the duplication of files in case of system failure.
- The system provides integrated management capability that includes configuration management, performance management, and fault management.

Functional Aspects of the Library Automation Software

General requirements

1- The system has the following integrated modules:

- A) Cataloging and database maintenance
- B) Circulation
- C) Acquisitions
- D) Serials control
- E) Patron access catalog
- F) Report generator
- G) Z 39.50 server capabilities

Access to Internet and its services as well as providing WWW server capabilities for its library records.

- 2- The system supports Interlibrary loan, Journal citation, Information and referral, and Inventorying
- 3- The system is integrated, with all modules sharing a common bibliographic database (except as libraries sharing the system may choose to maintain separate files) and a common command language.
- 4- It can move from one library module to another without logging off and on.
- 5- The system uses two languages, namely English and Arabic.

Cataloging and Database Maintenance Aspects

- 1- The system detects duplicate records - including duplicate bibliographic, authority, and item records - entered into it and retain them in a review file.
- 2- The system allows accommodation of full MARC bibliographic, authority, and holding records.
- 3- The system is capable of inputting and outputting bibliographic, authority, and holding records in MARC 11 communication format.
- 4- The system is capable of accepting on-line transfer of bibliographic and authority record from CLC (or, at the option of the library Administration, from RLIN or WLN).
- 5- The system is capable of accepting transfer of bibliographic records from CD-ROM-based systems, including Bibliofile.

Serials Control

- 1- The system is able to accommodate all types of serials, including, but not restricted to: periodicals , proceedings, transactions, indexes, and loose-leaf material
- 2- The system has the following serials control capabilities: ordering , check-in, union listing, claiming.
- 3- The system provides the ability to search for serials records by at least: title , call number, ISSN, publisher, corporate author/title, conference title, keyword , and subject .

Patron Access Catalog

- 1- The patron access catalog provides access to both individual library holdings and combined system-wide bibliographic files and authority files.
- 2- The system permits keyword searching of title, series, subject, personal name, corporate name, and conference name.
- 3- The system permits patrons to undertake Boolean searches using terms in AND, OR, and NOT relationships.
- 4- The system shall allow the storing (and modification) of patron search results for the duration of the session.
- 5- The system shall be able to search remote databases.

Circulation

- 1- The system provides for electronic scanning of bar code labels on patron cards and library materials.
- 2- The system provides for the keyboarding of item and patron information.
- 3- The patron file contains at least the following: patron identification number, patron name, permanent, and school addresses and telephone numbers, any restrictions on borrowing,

type of patron, fees or fines owned, materials ,outstanding, holds, last action date, expiration date of registration.

Acquisitions

- 1- The following acquisition functions are accommodated: - pre-order searching ordering, claiming, cancellation of orders, receipt processing, fund accounting, vendor accounting
- 2- A variety of materials are accommodated, including but not limited to: monographs, serials, documents,
- 3- The system shall accommodate and identify items in a variety of formats, including but not limited to: print, microfilm, video, audio.

Inter-library Loan

- 1- The system is capable of accommodating an interlibrary loan (ILL) module capable to manage the library's borrowing of materials from other libraries.
- 2- The ILL module supports the lending of materials from the library's collections to other libraries.

Report Generator

- 1- The system includes a report generator module.
- 2- The report generator offers a wide range of formatting options, including, but not limited to: tabular and text presentation, column widths, number of lines per page, page headers and footers,
- 3- The report generator shall offer sorting capabilities.
- 4- The report generator shall allow for specification of the data content of a report , including choice of titles, column headings, data elements, row labels, header and footnote contents.

OBSTACLES FACING ENGINEERING EDUCATION DEVELOPMENT

This section summarizes the issues and events typically hindering engineering education development in Egypt and may reflect similar problems in developing countries. The detection and analysis of those impediments were made possible through a comprehensive monitoring system devised within the EEDP.

- 1) Lack of enthusiasm and self-motivation in some institutions to submit proposals for education development :- This was remedied to a good extent by dispatching project experts to those colleges to increase their awareness and offer technical support.
- 2) Lack of continuity:- Faculty members assigned to prepare , and later supervise the implementation of , development proposals received temporary assignments elsewhere in country and abroad as it is usually the case in developing countries. Those assignments are usually attractive opportunities with the industry or with foreign universities.
- 3) Inadequacy of equipment specifications :- Because many proposal writers as well as referees have been out of pace with recent developments in the international market, equipment may be proposed and indeed procured which is somewhat outdated.

- 4) Poor after-sale technical support:- This is becoming a major obstacle to all attempts to modernize educational facilities. Local representatives of international equipment suppliers do not provide a strong technical support which is normally needed for after-sale service and maintenance.

References

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Professor Anis earned his M. Eng. & Ph.D. degrees from McGill University, Canada, in 1970 & 1973, respectively. He was a visiting professor at Waterloo and British Columbia Universities, Canada, and cooperated with the MIT, Cincinnati and Kansas State Universities, USA. His Biography appears in five national and international biographical volumes. He is currently professor of Electrical Engineering at Cairo University.