

Administrative and Academic Support

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In the development of a new university the administrative support and the support given by teaching-related departments are complementary to the work of academics in their teaching, research and industrial interaction. This paper discusses the developmental process and the work of the administrative as well as the academic support departments in providing the required services in the overall development of the university highlighting some of the changes that have taken place in the short history of the Nanyang Technological University in the light of experience to meet challenging needs.

INTRODUCTION

THE PRIMARY functions of a university are teaching and research. Universities are often judged by the standard of teaching they maintain and the quality and quantity of research undertaken by their staff. To achieve the goal of establishing Nanyang Technological University (NTU) as a 'university of industry', a third element has been incorporated: to promote interaction with industry. To carry out these major functions of the university, it is essential that there is a well-organized and efficient system of administrative and academic support.

ORGANIZATION

The governing body of the NTU is the Council. It appoints staff and determines the terms and conditions of service. It also oversees the University's property, finance and general affairs.

The supreme academic body of the University is the Academic Board, which has control over admission, examination, instruction and research, and has the power to award degrees, diplomas and certificates.

The principal executive and academic officer of the University is the President. He is assisted by the Deputy President, Deans of Schools, Registrar, Bursar, Director of Personnel, Director of Student Affairs and heads of other administrative and academic support departments.

The University is organized into Schools, each headed by a Dean who is assisted by one or more Vice-Deans and Sub-Dean. The Vice-Deans generally take charge of curriculum matters and research activities within the School, while the Sub-Deans usually look after students' academic welfare and counselling. To enhance administrative efficiency and to facilitate interaction among staff members with professional/academic inter-

ests, each School is divided into small administrative units known as Divisions. Each division has typically 20-40 members of staff. The division is managed by the Division Head who is accountable to the Dean.

To ensure that the Dean's and Head's professional activities in teaching, research and industrial interaction are not hampered by the ever-increasing administrative workload as the School grows, a full-time administrative assistant is appointed in each School to assist its administrative functions.

Engineering education occupies a unique place in the history of this University. The University began as a technological institute with only three schools, all of which engineering. The organization chart of the University's predecessor institution, the Nanyang Technological Institute (NTI), in the initial five years is shown in Fig. 1.

Until 1986 all students on campus were engineering students, the number of which grew from 582 in 1982 to 2202 in 1986.

Along with the growth in the University, more schools and departments have been established. The Schools of Accountancy and Business and Applied Science were added in 1987 and 1989, respectively. A branch campus was set up in 1991 to house the National Institute of Education (NIE) where courses on arts, science, education and physical education are conducted. A simplified form of the present organization structure of the NTU is shown in Fig. 2.

Both the administrative and academic support structures of the NTU have undergone major changes to meet the needs associated with the expansion in size and disciplines. For example, in the area of administrative support, the original Registrar's Office was restructured into five new offices of registrar, personnel, development and planning, public relations and international relations. An Office of Endowment Fund Development and Alumni Affairs was also set up to

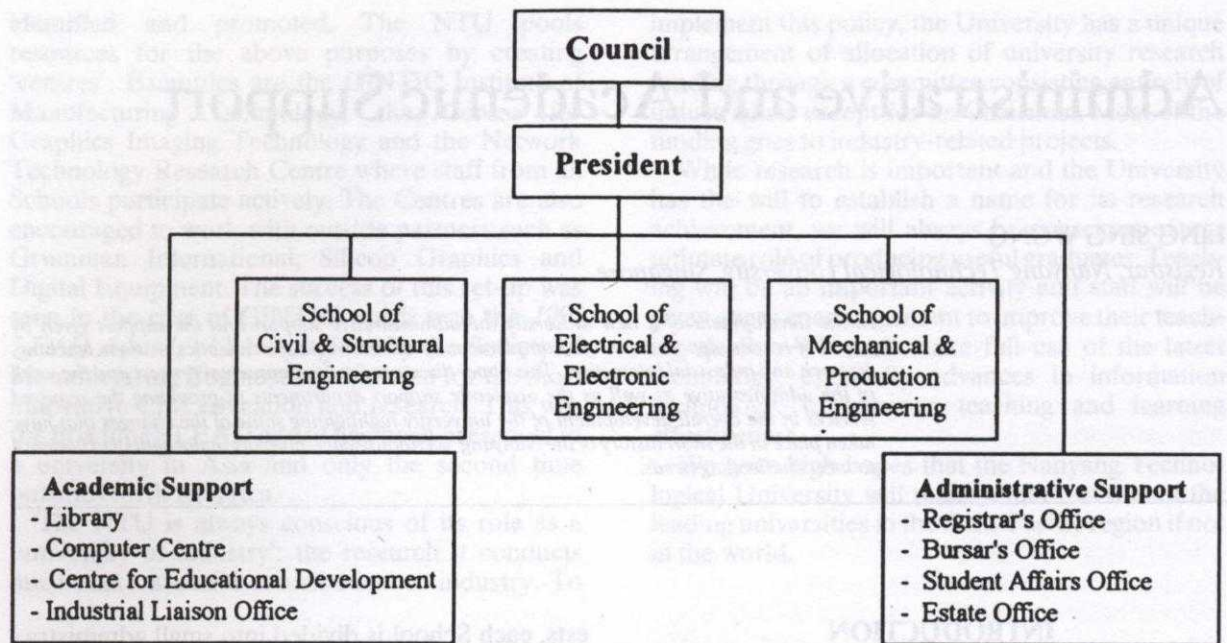


Fig. 1. Original organization of the NTL.

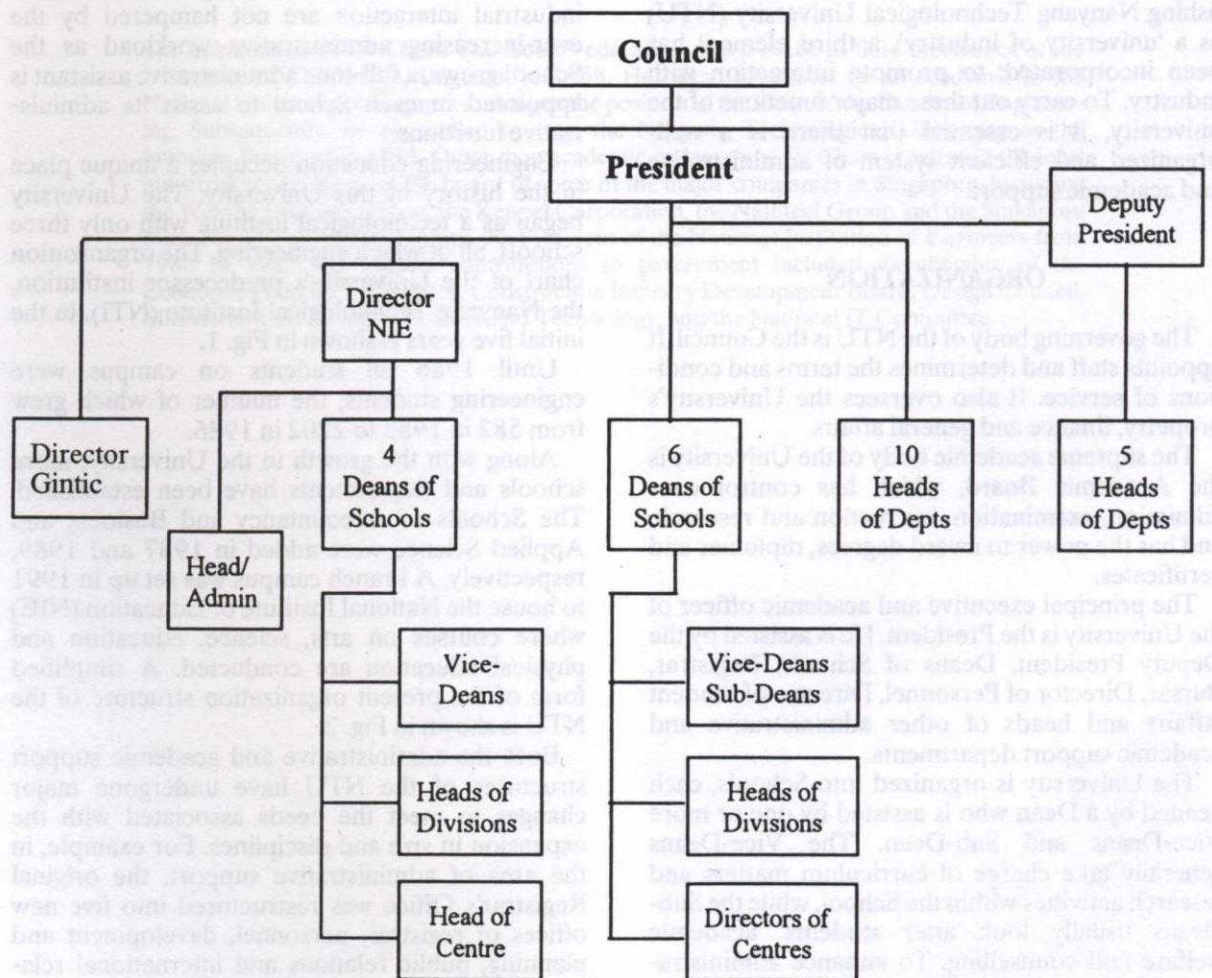


Fig. 2. Current organization of the NTU.

establish links with alumni and to promote public support in the endowment fund drive.

ADMINISTRATIVE SUPPORT

Registrar's Office

The main areas of responsibilities of the Registrar's Office under the present structure include student admissions, examinations, academic services, record keeping, committee work, and general administration.

All admissions and examinations are centrally administered under the charge of the Registrar. The staff of the Registrar's Office process all applications for admissions to both the undergraduate and the graduate courses. For University examinations, the office makes all arrangements, including the printing of examination question papers, the issue of examination results and official transcripts. They also arrange the annual convocation ceremonies for graduates.

The Registrar works closely with the Deans of Schools on all Academic matters. He and his staff service the Schools. They arrange for meetings of Schools and keep the minutes of such meetings. They ensure that academic rules and regulations made by the Academic Board are observed and complied with so as to maintain consistency in all administrative procedures adopted by the Schools.

The Registrar's Office has recently been involved in the development and implementation of a new academic unit (AU) system for the undergraduate courses. With the flexibility in the choice of subjects and pace of studies under the AU system, there is a need to devise an efficient way to handle class registration by a large student body—approximately 12,000 in 1995. A computer software known as Student Automated Registration System (STARS) was developed by the Registrar's Office in conjunction with the Computer Centre staff. STARS allow students to check on the availability of subjects, register for subjects, drop subjects or be placed on a waitlist. It also enables them to print their personal timetable after their registration is finalized. With the aid of STARS, the students can register their subjects either through a personal computer that has access to the NTU computer network, or via the voice response system using any available telephone line.

Office automation and computerization have made it possible for the Registrar's Office to overcome the problem of increased workload. Through 'Student-LINK', a programme developed by the Computer Centre, and the installation of a touch-tone telephone system, students can register for classes and examinations, make amendments to the record of personal data such as changes in postal address and telephone number, and obtain their examination results through the use of personal computer on campus or at home with the use of a modem. This has eliminated the necessity of students having to turn up in person at the

Registrar's Office for such activities. It has also cut down the amount of paperwork by staff of the Registrar's Office.

Bursar's Office

The main role of the Bursar's Office is to provide administrative support on finance-related functions of the University, including resource planning and allocation, accountability and control. These involve the preparation of annual budget estimates, maintenance of accounts, collection of revenue and payment of expenditure (including payroll), management of research grants and contracts, investment of funds, and preparation of annual accounts for audit.

In the early 1980s, a simple dedicated accounting machine was employed in the Bursar's Office to keep records of expenditure and revenue and to generate financial reports. There were other separate systems to cater for payroll, student billing and inventory. However, these systems were not integrated and also required a certain degree of manual input. For instance, for the inventory system maintained by the Bursar's Office, the users had to record asset data on hardcopy inventory record forms and send the forms to the Bursar's Office for transferring into the inventory system. Monthly inventory reports were generated and sent to users for their information and verification. Further, the preparation of purchase requisitions and purchase orders was also handled manually.

In 1987, an automated financial management system was developed through the acquisition of a dedicated software package from Information Associates, USA. This marked the beginning of a multiphased project on financial management which was completed in 1992.

The multiphased project comprises the Financial Records System (FRS), Financial Purchasing System (FPS) and the Fixed Assets System (FXS) implemented over a period of 5½ years. Beginning with FRS acquired in 1987, the other related modules, FPS and FXS, have been added over the years from 1988 to 1991. In 1991, the FRS, FPS and FXS were also implemented over the Bukit Timah campus of the National Institute of Education (NIE), thus making the system a multi-campus system.

With the FRS, the University's approved budgets for its operating expenditure are loaded into the individual School's/Department's accounts. Each School/Department forms a cost centre and the Dean/Head is responsible for the accounts under his charge. The Dean/Head has direct on-line access to accounts in the Financial Records System under his charge and is able to view and act on the up-to-date financial information relating to his School/Department. Budgetary control is enforced as soon as approved budgets are loaded into the various accounts. Purchase requisitions are rejected by the system if there are insufficient funds in the accounts.

For purchases, FPS enables users to create

purchase requisitions, and approve and convert them to purchase orders electronically through computers. As FXS is integrated with FPS, certain asset data are extracted when the assets are paid for. The users need only to furnish pertinent asset data into the system. Moreover, the users can recall asset data from the on-line service. Gone are the days of the paper purchase requisitions and inventory record forms.

The execution of the project required careful prior planning in the initial years. The project teams that represented Finance, Purchasing, Fixed Assets and the Computer Centre have been totally committed and dedicated in their efforts to meet the necessary deadlines. Briefings and training sessions for all users were conducted before each system was implemented. The Bursar's Office runs 'refresher course' for users, as well as continually keeping in touch with other institutional users, the majority of whom are institutions of higher learning.

The systems described above have enabled the Schools/Departments to adhere to procedural requirements and ensure that purchases for teaching and research materials and equipment are obtained expeditiously and economically.

Personnel Office

Being a 'labour-intensive' organization, with the manpower costs accounting for about 70% of its total recurrent operating budget, the NTU recognizes the critical role of human resource management. In particular, the main focus of its human resource management is to recruit good calibre staff suited for the job, and continuously develop and motivate a responsible workforce that is effective and has the capacity to perform and contribute towards the achievement of the NTU's objectives.

The Personnel Office assists in the formulation and implementation of policies concerned with the management and development of human resources of the University. It looks after matters concerning staff recruitment, terms and conditions of service (such as salaries and contract matters), staff appraisal and promotion, training and development, welfare (such as housing, medical and leave benefits), staff disciplinary matters, and the maintenance of staff records. In addition, it plays an important supportive role in promoting the productivity movement of the University.

In a separate paper on 'Staff Recruitment and Development: Looking Beyond the Boundary', details of the major problems encountered and strategies adopted on staff recruitment and development are discussed.

Staff recruitment and manpower planning. When the NTI was established on 8 August 1981, it began operation with only 15 academic staff, including three Deans of Schools. One of the areas which the Institute accorded high priority was the recruitment of quality staff to cope with the immediate

needs of providing for the first intake of students to be admitted a few months later, as well as the future needs of the planned expansion of student enrolment over the years to meet the demand of the restructured economy of Singapore.

The University had to face the challenging task of attracting teaching staff with higher academic qualifications as well as relevant years of professional experience, at a time when the industry itself was very short of engineering professionals. Difficulties were also encountered in recruiting support staff as there was also a general shortage of technical clerical support staff in Singapore due to the tight labour market. The problems were further aggravated by the fact that the development of the University had to be accelerated in response to new demands of the economy, putting more pressure on the recruitment of staff. Multi-pronged strategies were adopted by the NTI to cope with the problems of recruiting good calibre staff who could fit into the Institute and contribute to the achievement of its mission.

As at 1 March 1994, the NTU had expanded to a total staff strength of 2083 which comprises 870 academic (teaching) staff, 178 administrative, library and computer professional staff and 1035 other support staff. In addition, there are about 170 full-time research and development staff in the research institutes and centres of the University. Taking only the present four Engineering Schools of the University, the academic staff strength is 458 and these academic staff are assisted by a total of 372 technical and clerical/secretarial support staff.

Staff establishment. With the rapid progress and changes in technology, the University pays great attention in ensuring that staff are kept abreast with the forefront of knowledge in their respective fields of specialization. Emphasis is also given to ensuring that the staff are in touch with the needs of the industry if the University is to pursue and maintain its position as the 'university of the industry'. Another important area of staff development is concerned with the enhancement of their competence in teaching.

A proper appraisal and reward system is critical to the effectiveness of staff performance and productivity of an organization. The NTU has over the years developed several strategies in this aspect of human resource management, which include an annual staff appraisal and salary adjustment/promotion review for each staff member.

Productivity improvement. Recognizing the importance of having a team of efficient and motivated support staff, especially in a tight labour market, the University has been actively promoting productivity improvement for every level of staff. The NTU has adopted the quality circles concept and, in January 1993, implemented a comprehensive staff suggestions scheme, both of which complement each other in encouraging staff, especially support staff, to take responsibility for identifying problems and suggesting solutions, and

to instil in them a stronger team spirit, greater confidence, self-esteem and job satisfaction. The Personnel Office has been playing a key role in the development and co-ordination of the University's productivity improvement program. One of the Personnel Office's ongoing projects is the development and implementation of an information systems plan on personnel functions to provide an effective tool for human resource management in the University.

ACADEMIC SUPPORT

The major sources of academic support for teaching and research come from the library, the Computer Centre and the Centre for Educational Development.

Library

The primary roles of the library are to provide information to support academic activities in teaching and research, and to extend its resources and services to industry.

The Library Committee. A Library Committee was set up with the Deans of the Engineering Schools as members and the Librarian served as its Secretary. The Library Committee plays an effective role as a link between the library and the teaching and research staff.

The main function of the Committee is to make policy decisions on library collection development, budget control, and rules and regulations on the use of library resources and services. Should the implementation of any policy require substantial work to be carried out, the tasks would be entrusted to the library co-ordinators, appointed by the Deans. For example, the selection of library materials for acquisition is mainly carried out by the teaching staff, with the library co-ordinators liaising between the teaching staff and the library's Resource and Acquisitions Departments.

Planning, collections and usage. The library staff interacted closely with the architect/planners in providing their professional input on the space layout and other function requirements. Care has been taken to plan the layout of the library to ensure efficient space utilization and the creation of a conducive environment, in terms of lighting and access to collections, for learning.

In the initial stage, efforts were made to build up the collection of texts and reference materials for undergraduate courses covering subjects ranging from civil engineering (including structures, construction, hydraulics, geotechnics, surveying, transportation, water resources and environmental engineering), electrical engineering (including computer and control engineering) to mechanical engineering (including applied mechanics, production engineering, and aeronautical engineering). The aim was to cater for a maximum of 3000 engineering undergraduates. To supplement the

library collection of texts and subscription journals, efforts were made to establish inter-library co-operation (such as inter-library loans and the supply of photocopies of journal articles both locally and internationally).

Despite the emphasis on undergraduate teaching, attempts were also made in the early 1980s to start the nucleus of a research collection in support of staff research and future expansion of graduate research programmes. In pursuance of this policy, the library started to build up an extensive collection of indexes and abstracts (the Engineering Index and indexes and abstracts in the various engineering and technical fields), standards (including a complete set of the British Standards) and major journals in the respective engineering disciplines. In 1985, a research collection in the field of computer-aided design and computer-aided manufacturing (CAD-CAM) was initiated to serve the research needs of a newly established research institute in this field of specialization. The CAD-CAM collection turned out to be one of the finest such collections in the region.

Strategies for book selection were carefully devised, and a variety of ways and means were deployed. For building up the undergraduate collection, selection of texts and reference materials was done from subject lists of the Books in Print, publishers' catalogues, and guides to the various engineering and technical literatures. In addition, steps were taken to acquire reading materials required and recommended by the teaching staff. To date, the engineering collection, with more than 10 years of efforts put into its development, has reached 250,000 volumes and is generally adequate for supporting engineering studies and research. The growth pattern of the library collection, and the loan usage of the collection for the past ten years is shown in Fig. 3.

Automation. The implementation of library automation has been the most significant task undertaken by the library. In the beginning in 1982, when no computing facility was available to the library, it was decided to join a batch-processing shared-cataloguing co-operative through the MALMARC system at the Universiti Sains Malaysia, for cataloguing, and maintaining the library catalogue on microfiche, as a computer output. The system was upgraded to an online integrated one in 1988 when the ATLAS library software package was introduced. Participation in MALMARC enabled the library to maintain its catalogue data in machine-readable form in the MARC format, which is an international communication format, paving the way for the library to be a member of the international community of information networks. Significantly, the 'migration' of the catalogue data of some 40,000 items through a tape from the MALMARC system to the ATLAS system in 1988 took only 15 hours of machine time, involving hardly any extra costs of material and manpower.

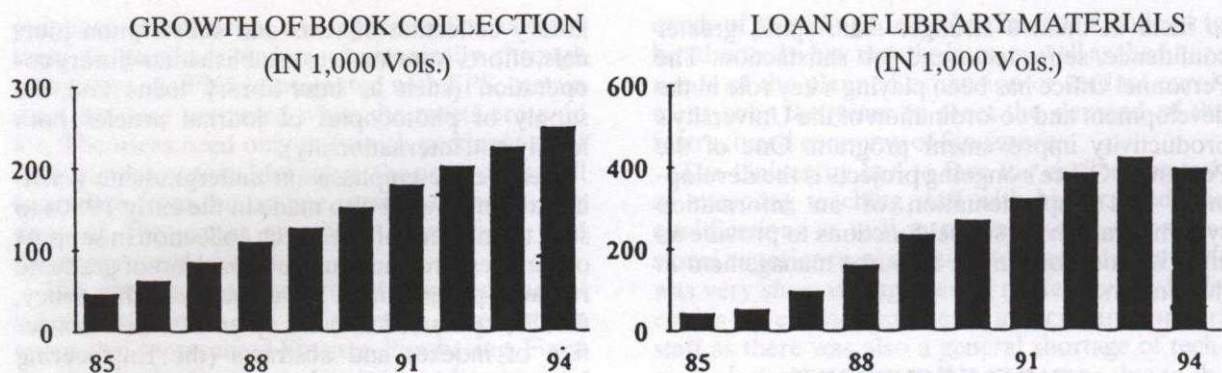


Fig. 3. Library development.

The current ATLAS system is a modern online library system, handling all the library operations, such as acquisition, cataloguing, OPAC (online public access catalogue) searching, circulation and serials control. It allows the library to shorten acquisition time, improve cataloguing output, eliminate queues at the loan counters, speed up bibliographic searches and enhance productivity in general. Its service has been further enhanced by being connected to the University e-mail for a host of automated library-related activities, such as overdue reminders, reservation requests, photocopy requests, inter-library loan requests and recommendations of titles for library acquisition. Provisions have also been made for the system to be accessible not only by means of the 2000 PCs connected to the NTU net, the campus network, but also by means of any PC off the campus through Internet.

The library is taking full advantage of the advances in new information technology. Multimedia materials and materials held on CD-ROMs, including full-text and full-image titles, are made easily available in the library. Navigating the Internet is now the norm. A self-check loan system has been introduced to reduce pressure at the loan counters in peak hours. R&D work is being conducted to enhance the capabilities of the ATLAS system, including making it capable of handling Chinese script.

Manpower development. The aim of the library manpower development policy is to enhance productivity in the various library operations by deploying the least possible number of staff with the intensive use of information technology (IT). Since IT is in a state of flux with rapid development and change, it is imperative for library staff constantly to update themselves through the various means of continuing education to keep abreast with developments.

In addition to the basic professional training for trainee librarians, which the University supports with a Librarian Training Scholarship for eligible candidates, all other professional staff are also encouraged to take short courses related to new

library techniques or new IT applications, to participate actively in professional conferences and to engage in publishing professionally. Non-professional staff are similarly encouraged to upgrade themselves through training courses.

Computer Centre

The Computer Centre is the central IT arm of the NTU, responsible for the implementation and service of the campus-wide IT system. Its key role is planning, implementing and maintaining the campus-wide IT infrastructure and information services to support the University's educational and administrative functions.

The NTI, as a new startup in 1981, had the opportunity to plan its IT infrastructure from scratch. It was clear that piecemeal acquisitions of computing facilities would lead to isolated and underutilized computing resources. To get the greatest leverage from the University's IT funds, a major goal was to maximize sharing of computing facilities, and to minimize resource duplication and support manpower. A taskforce led by the Computer Centre thus took a top-down approach to develop a campus-wide IT infrastructure plan, taking into consideration the common computing needs of the engineering courses and those of the University's administration. The IT strategies adopted in this planning and the subsequently acquired IT facilities are detailed in another paper, 'Development of Laboratories and Computer Facilities'.

Sharing computing facilities and administrative data. The common computing needs of the various engineering courses were catered for by a large central computing cluster manned by the Computer Centre. Easy access to this central academic computing resource was made possible by a campus-wide computer network. While the engineering schools were allowed to purchase their own dedicated computer systems to meet their own special needs, such as computer-aided design applications, purchase of general-purpose computers for their own use was discouraged and required the endorsement of the President. Addi-

tional budgets were periodically allocated to the Computer Centre to upgrade the central academic computing cluster to keep up with the increases in the common computing needs of the engineering courses in terms of both computing power, storage capacities and software packages.

The computing needs of the University administration were catered for by a separate computing cluster. Similarly easy access and sharing of this central administrative computing cluster were made possible by the campus network. Prior to the IT infrastructure planning, a blueprint outlining the University's data requirements and the need for data sharing among the administrative departments was prepared. Through their involvement in preparing this blueprint for data architecture, the departments became more aware of their key roles in consistent data definition, data ownership and data sharing. The blueprint guided the implementation of a comprehensive and integrated administrative database with minimum data duplication and development efforts.

Maximizing productivity. In line with the government's drive for productivity, the NTU adopted a policy to expand and upgrade its equipment and computing resources, but held tight reins on manpower expansion. This coerced the Schools and in particular the administrative departments to automate their administrative processes as much as possible. Thus although the NTI was established much later than many other tertiary institutions in Singapore, it was able to establish itself as the first to have a fully computerized library administration, financial management and campus-wide office automation. The Registrar's Office also fully automated its student administrative database and provided a one-stop on-line curriculum service to all students to lighten its own workload. All students were required to own and pay for a computer account so that they could do on-line registration for courses, examinations and industrial or business attachments as well as other requests via this 'do-it-yourself' on-line service.

The tight supply of clerical support manpower also compelled staff to learn to use personal computers for their daily office work and communications, including preparation of their own teaching materials.

To minimize the support manpower in the Computer Centre, a coherent computing environment based on one common operating system for host computers, one common PC LAN (personal computer local area network) operating system and one common electronic mail system was implemented. In addition, in-house development of administrative applications was standardized on a common database development tool and information delivery system, and guided by the comprehensive data architecture blueprint mentioned earlier. Where possible, administrative applications were automated with off-the-shelf software packages to keep in-house development efforts to a

minimum. This strategy enabled the Computer Centre to perform its roles with limited manpower (which has increased from about 20 in 1985 to the present 43), which is comparatively low in view of the growth in student enrolment from 2078 in 1985 to 11,052 in 1994.

Coherent and heterogeneous platforms. In implementing a coherent computing environment, the Computer Centre did not inhibit the engineering schools and research centres from acquiring their own dedicated computing systems with different operating systems and linking them to the campus network. In other words, each school or centre was allowed to have their own favoured computing platforms and to build up their own effective support strengths. This arrangement has the advantage of enabling every school or centre to establish strategic partnerships with their main suppliers. At the same time, the University as a whole has a diversity of integrated computing resources to meet its varied needs.

Maximizing computer literacy and utilization. To inculcate the habit of using computers among engineering students, the first-year engineering course was required to include computer assignments on the central academic computer cluster as part of its course curriculum. Students were also encouraged to use computers outside their coursework. To this end, information services such as electronic mail, discussions, bulletin boards, electronic bookshelves, on-line CD-based information, overseas communications and newswire feeds were made available. As mentioned earlier, the University made it mandatory for each student to own and pay for a computer account. Besides enabling the implementation of an on-line curriculum service and encouraging students to make greater use of the available information services, the compulsory student computer account policy also allowed the administration, the schools and the students easily to reach out electronically to one another. For example, the library regularly sends electronic reminders to students to return overdue books.

Teaching staff are encouraged to use computers and video to augment teaching within lecture theatres, which are wired with computer network points and video transmission outlets. Video and digital data can be transmitted to lecture theatres over the computer network, making it easy for the teaching staff to use both video and computer-based information to support their teaching.

Regular IT training courses conducted by the Computer Centre as well as external organizations are available to encourage staff to make greater use of IT tools. These training courses are complemented by an on-campus Digital-NTU Training Centre which was jointly established in 1987 by the Digital Equipment and the University. This Centre is fully manned by Digital Equipment and provides both instructor-led computer courses and self-

paced courseware which are available at no cost to the University's staff and students.

Forging strategic IT partnerships. The Computer Centre, as the main purchaser of computing resources, played an important role in helping the University to forge strategic partnerships with IT vendors. For instance, the University was successful in getting Digital Equipment as a joint partner in the establishment of the Network Technology Research Centre (NTRC) and the Digital-NTU Training Centre, as well as having Digital Equipment establish its own Asia Network Operations Centre on the campus.

It was found more by accident (through the Computer Centre's involvement in the NTRC) than by design that the internal research partnership formed between the Computer Centre, the NTRC and the Schools could generate excellent research synergy. A research centre like the NTRC provides a focus for research resources and efforts. The Computer Centre provides a 'live' IT infrastructure for research and development. This internal research partnership also has a greater pulling force which helps draw participation from industry in applied R&D projects.

Evolving role of the Computer Centre. As the 'bread-and-butter' computing applications and resources get fully implemented, the Computer Centre needs to move on to create an 'information age' environment in which a modern workforce will be educated and trained for a globally competitive economy in the 1990s and beyond. At the same time, a large-scale IT infrastructure managed by the Computer Centre has emerged to serve not only the University's basic teaching and administrative needs, but as a real test-bed for relevant R&D projects. Hence opportunities exist for the Computer Centre to build up strategic research alliances with research centres and schools as well as external bodies to realize the University's future IT vision. To tap such opportunities, the Computer Centre needs to realign its goals and strategies, and re-examine how to evolve the present IT infrastructure and its manpower not only to meet the new challenges but to play a more proactive role in the University's pursuit of excellence in IT research.

Centre for Educational Development

The Centre for Educational Development (CED) was established in April 1982. It was anticipated at the initial stage of planning that the media requirements in the engineering Schools would be heavy and that a centralized service for audiovisual facilities would be a more economical approach to provide media support for the teaching and research activities of staff. The provision of educational support involves a multitude of activities, ranging from the development, production and presentation of the materials. Using this concept as a framework, the staff and facilities of the CED are organized to provide development

services, production services and presentation services. This organizational structure is flexible and permits the staff and facilities of the CED to be integrated in different ways to serve the engineering Schools and the administrative departments.

To meet the varied needs and requirements of the Engineering Schools for instructional support, the Centre is guided by the advice and recommendations of the Educational Services and Media Committee. Each School has a member of the academic staff represented in this Committee. The members in the Committee also serve as the Audiovisual Resource Co-ordinators in their respective Schools.

Instructional development services. Instructional development services are offered in the form of training, consultancy and information dissemination. Seminars and workshops are organized for members of the academic staff in development and utilization of instructional media. Induction courses on the basic principles and practice of teaching are held for new lecturers joining the NTU. Microteaching clinics are also conducted for the academic staff to improve their teaching skills. In the area of consultancy, the Director of the CED and educational media specialists are available to the academic staff to give advice and assistance on matters pertaining to teaching and learning as well as to the design, production and utilization of instructional materials. Many of the teaching staff are also involved in conducting courses to upgrade the knowledge and skills of qualified engineers serving in industry. In this regard, the CED also works closely with the teaching staff in the engineering Schools to develop training materials for the continuing education of engineers in Singapore. A newsletter, which carries information on current issues and topics related to tertiary education, is published four times a year. This newsletter and other information booklets on audiovisual facilities and services in the NTU are distributed to all members of the academic staff.

Production services. Effective teaching requires the use of well-prepared instructional materials. Production services are provided to help academic staff produce such materials. Services in the areas of audiovisual recording, multimedia production, graphic design, photography and reprography are manned by educational media specialists and technical staff. The Centre also promotes the use of modern instructional methods and techniques through regular seminars and workshops conducted for the academic staff. In terms of specific media support activities, the Centre helps the academic staff in the design, production and utilization of audiovisual materials for teaching and training.

Presentation services. The area of presentation services involves the provision of audiovisual facilities in the classrooms and lecture theatres for teaching. Periodically, seminars and conferences

and other special events are organized by the engineering Schools and research Centres. The CED provides the audiovisual support for these occasions as well. The services include the acquisition and loan of audiovisual equipment and resource materials, classroom audiovisual support, and maintaining and operating video transmission and videoconferencing.

In the area of classroom audiovisual services, the CED frequently receives requests for the setting of teaching facilities required by several lecturers teaching in different rooms at the same time. It is extremely difficult to deploy technicians to serve these lecturers when, at the same time, they have to undertake video-recording assignments that have been arranged and agreed upon with some other lecturers much earlier. It is even more difficult to provide classroom audiovisual services to the teaching staff when the technical staff in the CED are required to set up and operate audiovisual facilities for the many conferences and seminars organized by the engineering Schools and research Centres.

Mr Ling Sing Wong is the Registrar of the NTU. He has been involved in setting up the University's central administration since its establishment as Nanyang Technological Institute (NTI) in 1981 and has been responsible for much of the development of NTI/NTU. Originally trained in the UK as a school teacher, Mr Ling has worked as a teacher and, later, educational administrator for over 35 years. He was the Deputy Registrar of the National University of Singapore prior to his joining the NTI in 1981.

CONCLUDING REMARKS

The NTU has undergone a period of rapid growth coupled with changes in administrative structure. From its humble beginnings with 582 engineering students in 1982, it has developed into a comprehensive university offering a wide range of courses to some 14,000 students now. The emphasis on productivity and computerization has been the single key factor that accounted for the development of an efficient system of administrative and academic support. As each department expanded, it became apparent that there should be a certain degree of decentralization of control to maintain an efficient administrative system. Departments with multiple functions were restructured and new departments created along functional lines to enhance efficiency. In all these processes it was the full co-operation and support given by academic, administrative and professional staff that have helped the NTU to achieve its objectives.

Acknowledgements—The author is grateful to the following persons who have contributed towards the writing of this article: Mrs Tan En Lin, Bursar; Mrs Lun Chor Yee, Director of Personnel; Mr Lim Hong Too, Librarian; Mr Low Kin Kiong, Director of the Computer Centre; Dr Lau Kam Cheong, Director of the Centre for Educational Development.