JSIST SEMINAR

TOWARDS AN INFORMATION SOCIETY
— Developments in Japan

11 — 12 December 1984
at
WTC Conference Hall 1
World Trade Centre, 11th Storey (Lobby D)

SIGNIFICANCE OF FIFTH GENERATION COMPUTER SYSTEMS RESEARCH AND DEVELOPMENT

KAZUHIRO FUCHI

Last year Professor Tatsuo Moto-oka from the University of Tokyo spoke on "Overview and Introduction to The Fifth Generation". This year Mr Kazuhiro Fuchi, Director of Research Centre, Institute for New Generation Computer Technology (ICOT). Japan, will speak on the "Significance of Fifth Generation Computer Systems Research and Development".

Biography

Mr Fuchi was born in 1936 and graduated with a BS degree in Applied Physics from the University of Tokyo in 1958. After graduation, he joined the Ministry of International Trade and Industry working as a Staff Researcher at the Electro-technical Laboratory. In April 1972, he was promoted to head the Voice Recognition Section of the Laboratory. By July. the same year. he was Head, Inference Mechanism Section of the Laboratory. In January 1980. Mr Fuchi became Director, Pattern Information Department of the Electro-technical Laboratory. When the Institute for New Generation Computer Technology (ICOT) in Tokyo was launched in June 1982 to take a leading role in Japan's Fifth Generation Computer Systems Project, Mr Fuchi was made the Director of the ICOT Research Centre.

Mr Fuchi has published a number of books and articles. His research accomplishments have been on computer architecture, programming languages, operating systems, speech recognition and natural language processing. His recent research topics are logic programming and new machine architecture.

INS CONCEPTION AND IT'S TRIAL – INS MODEL SYSTEM

TORU TAKAHASHI

As society becomes more information-intensive, the demand for more diverse and efficient telecommunication services has been growing rapidly. The advent of new communication services such as data communication and facsimilies also gave rise to new demands for more advanced telecommunication services. In order to investigate the application and social acceptance of a nation-wide information network system (INS) in which telecommunication is effectively combined with computers. the Nippon Telegraph and Telephone Public

Corporation (NTT) constructed a pilot plant called INS model system in Tokyo. Trial operation of this system started on 28 Sept 84 and will last until the end of March 1987. In his paper "INS Conception and it's trial", Mr Toru Takahashi, Deputy Director General, INS Model System Service Bureau. will describe in detail the objectives and features of INS and the Model System as well as the INS development schedule.

Biography

Mr Takahashi graduated from Tohoku University, Faculty of Engineering, Department of Telecommunications Engineering in March 1959. After graduation he joined the Nippon Telegraph and Telephone Public Corporation (NTT) and served as a staff engineer in the Engineering Bureau. In January 1976, he became Director, Inside Plant Engineering Division of the Plant Engineering Bureau. In July 1981, he became the Deputy Director General of the Shinetsu Telecommunications Bureau. He became Deputy Director General of the INS Model System Service Bureau since January 1984.

TOWARDS INTEGRATED OFFICE SYSTEMS — THE SIGNIFICANCE OF OFFICE SYSTEM ARCHITECTURE

HITOSHI WATANABE

Much has been said about Office Automation (OA) in many different fields. Various definitions of OA have also been offered by users and vendors. At NEC, OA is defined as a "modern intelligent communication system" that systematically and organically ties together office workers' thinking activities.

Based on this definition, an OA System is not just a simple collection of various OA devices. It is an integrated system based on a philosophy of systematization or architecture. Dr Hitoshi Watanabe, Vice President (Office Automation) of NEC Corporation in his paper "Towards Integrated Office Systems" will talk on the Significance of Office System Architecture".

Biography

Dr Watanabe graduated from the University of Kyoto, Faculty of Engineering, Department of Electrical Engineering in March 1953. After graduation he joined NEC Corporation and developed NEC's first digital computer for the purpose of computer aided circuit design. In 1958 he received his Dr Eng degree from Kyoto University. He became the Manager of the Computer Science Laboratory of NEC's Central Research Laboratory in 1966, where he concentrated on research of computer software. Between 1974 to 1980 he was General Manager of the Small Business Computer Division, where he developed the interactive multi-work station-type of small business computer (NEC's ASTRA). Currently he is the Vice President (Office Automation) of NEC Corporation. Dr Watanabe received the Best Paper Award from the Institute of Electronic Communication Engineers of Japan, three times. He also received the Best Book Award from the same Institute. He was an IEEE Fellow since 1971 and in 1984 received the IEEE Centennial Award.

For whom

Senior computer professionals, data processing managers and senior management associated with information technology industry.

Fee

SS150 per participant
(inclusive of seminar materials, refreshment and lunch)

Registration

Fill in the registration form and send it with a crossed cheque payable in Singapore dollars to the "Japan-Singapore Institute of Software Technology" by 4 December 1984.

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— Developments in Japan

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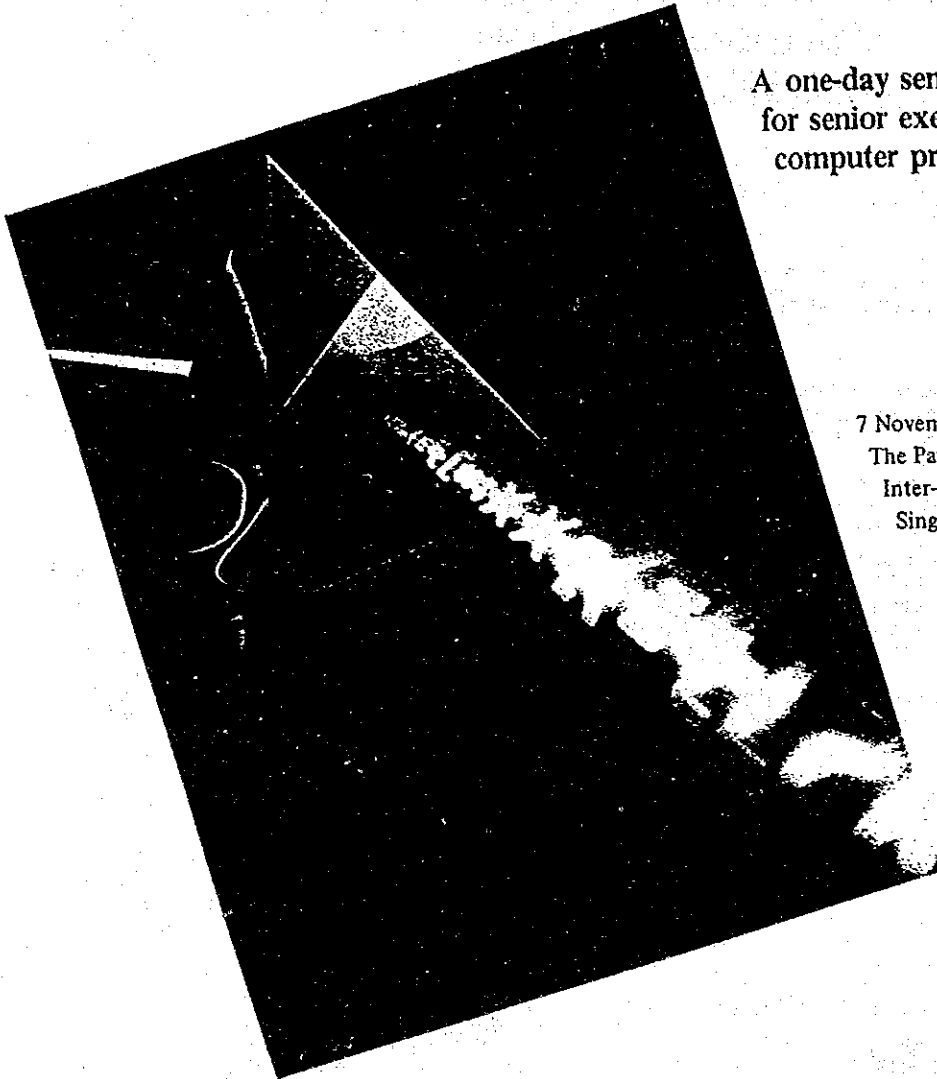Mailing Address: _____

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Advances in Japanese
Information Technology — '85

A one-day seminar
for senior executives and
computer professionals

7 November 1985
The Pavilion
Inter-Continental Hotel
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Organized by:
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ADVANCES IN JAPANESE INFORMATION
TECHNOLOGY '85

TOPICS   * AUTOMATIC INTERPRETING SYSTEM
   * COMPUTER SYSTEM AUDIT
         * INFERENCE MACHINE

SPEAKERS

AUTOMATIC INTERPRETING SYSTEM

This paper introduces NEC's research activities on machine translation and automatic interpretation technologies.

Automatic interpretation must combine many types of technologies such as machine translation (language conversion), speech recognition and synthesis. Communication science or the study of conversational behaviour, is a primal key in realizing an automatic interpretation system, and is considered to be of great help for future global communication beyond the language barriers. It is now in the process of development.

NEC has started multi-disciplinary studies for the communication science under an international collaboration in order to create a new world of communication.
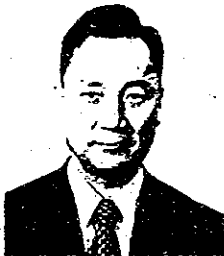
MR YASUO KATO

Mr Kato joined NEC Corporation in 1958 after graduating from the Department of Electrical Engineering of Tokyo Institute of Technology. Mr Kato has extensive research experiences in speech recognition, speech and video signal processing/communication. He is presently the General Manager of C&C (Computer & Communication) Systems Research Laboratories, NEC.

Mr Kato is a member of the Institute of Electronics and Communication Engineers of Japan, The Acoustical Society of Japan and The Information Processing Society of Japan.

COMPUTER SYSTEM AUDIT

No one would argue with the fact that the role of computer in business communities and other social activities is ever-increasingly important and far-reaching. Nowadays 'System Contingency-Measures', 'breach of personal privacy' and 'computer crime' are familiar terms for all EDP practitioners. The need for computer systems, particularly those for important functions, to be adequately reviewed/audited is clearly essential.

This paper describes the present state of the art of Computer Auditing in Japan and the likely approaches/trends in the foreseeable future.

MR YOSHISUKE INOUE

Mr Inoue has a B.S. degree (1956) in Mechanical Engineering, Waseda University, Tokyo and a M.S. degree (1960) in Instrumentation Engineering, Case Intitute of Technology, Ohio, U.S.A. He joined Yawata Iron & Steel Company Ltd in 1956 as a Control Engineer and is now the general manager of Computer System Centre of Nippon Steel Corporation. Mr Inoue had publications such as "Computer System Used as Production Planning Tool at Yawata Work" (1965) and "Practical Management and Control in the Steel Industry" (1982). He is a member of Japan Society of Mechanical Engineering.

INFERENCE MACHINE

Recently, Artificial Intelligence (AI) has drawn attention not only from computer scientists but also from entrepreneurs and people in various disciplines. AI researchers consider 'inference' capability as the most typical feature distinguishing AI from non-AI information processing. This paper will first discuss the general aspects of AI and then describes a number of important 'inference' topics being studied (in the Nippon Telegraph & Telephone Corporation Laboratories) such as machine understanding of continuously pronounced speech, natural speech generation from written text, machine understanding of natural language and symbol processing etc.

DR KATSUJI
TSUKAMOTO

Dr Tsukamoto has a B.S. degree in Applied Mathematics and Physics (1965), a M.S. degree (1967) and Doctorate degree in Engineering (1974), all from Kyoto University. He joined NTT (Nippon Telegraph & Telephone Corporation) in 1967 and now has extensive experiences in research and development in switching systems and integrated communication. At present, he is Senior Manager of the Advanced Information Processing Research Group in NTT. Dr Tsukamoto has

received the 1970 award from the Institute of Electronics and Communication Engineers of Japan (IECEJ) and the President Award of NTT in 1981.

Dr Tsukamoto has written a book on "Distributed Processing" and "Communication Protocols" and he has published a series of technical papers on similar topics through the years.

He is a member of the Information Processing Society of Japan and is the Vice Chairman of Computer Technology Study Group of IECEJ.

PANEL DISCUSSION MEMBERS

AUTOMATIC INTERPRETING SYSTEM

Mr William Chan (Panel Chairman)
Director
Systems & Computer Organization,
Ministry of Defence

Dr Tan Hung Pheng
Assistant General Manager
Bank of China

Mr Paul Willemse
Deputy General Manager
United Overseas Bank

COMPUTER SYSTEM AUDIT

Mr Wee Tew Lim (Panel Chairman)
President of Singapore Computer Society
Director of Corporate Services,
Post Office Savings Bank

Mr Chew Teck Soon
Computer Audit Partner
Coopers & Lybrand Associates Pte Ltd

Mr Andrew Woo
EDP Audit Manager
Price Waterhouse Management Consultants Pte Ltd

INFERENCE MACHINE

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Department of Information Systems and
Computer Science,
National University of Singapore

Dr Chew Tat Leong
Software Engineer
Systems & Computer Organization,
Ministry of Defence

Prof. Teh Hoon Heng
Department of Mathematics
National University of Singapore

FOR WHOM

Senior computer professionals, data processing managers and senior management associated with information technology industry.

VENUE

Pavilion Inter-continental Hotel, Singapore
7 November 1985.

FEE

S$120 per participant (inclusive of seminar materials, refreshment and lunch)

REGISTRATION

Fill in the registration form and send it with a crossed cheque payable in Singapore dollars to the "Japan-Singapore Institute of Software Technology" by 2 November 1985.

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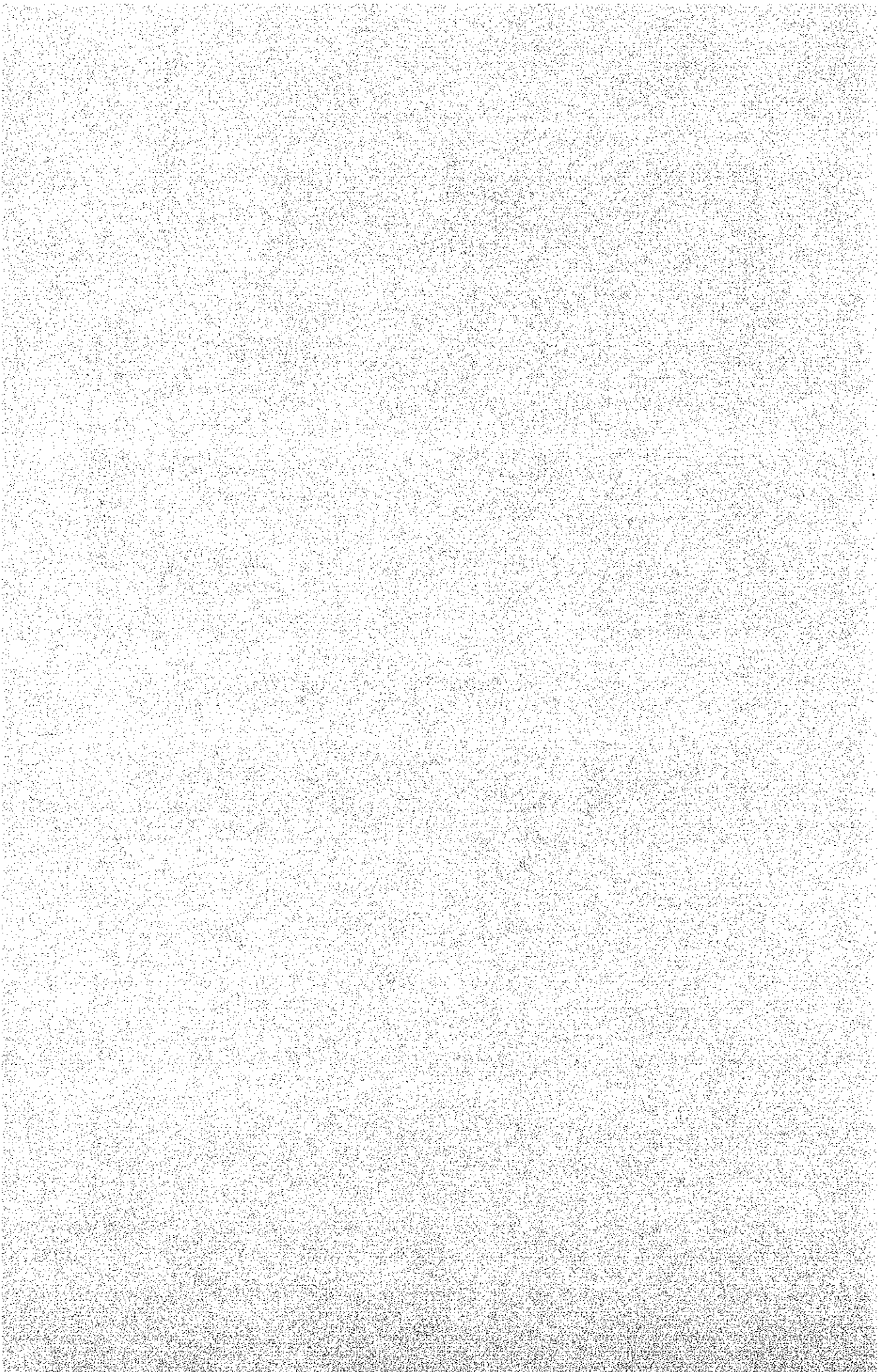

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7-7 NCBパンフレット

NCB

CONTENTS

NCB

CHAIRMAN'S REVIEW

1985 was very much the beginning of a watershed period for the NCB, as it was for the nation. Economic adversity has slowed down the rapid growth which the computer services industry had grown accustomed to. While taking heart to the fact that an economic slowdown meant a revenue growth of 18% instead of the 29% in 1984, we lost no time in rethinking our strategies and to look for new opportunities.

We are certainly in a stronger position today, compared to the situation in 1981 when the National Computerisation Drive was launched with the establishment of the NCB. The Civil Service Computerisation Programme (CSCP) now operates computerisation projects in various Ministries and Organs of State. This ambitious programme, staffed by 340 information systems professionals, has to date delivered 59 application systems to the government users. As we approach the completion of the first five year plan for the CSCP, several Ministries and departments are completing their phase I computerisation programme. The new systems for which new computers were acquired during the year are noticeably more complex than those introduced earlier. These included the Computerised Command and Control System for the Singapore Police Force and the Singapore Fire Service, the Computerised Mapping System for the Ministry of Law and the Appointment Scheduling System for the Ministry of Health.

While information systems are being developed for individual Ministry and department, the development of Civil Service-wide systems for financial and personnel management were initiated to ensure integration in the management of these resources. Policies on the administration of data to ensure Civil Service-wide data sharing, protection and standardisation were developed and implemented through Data Management Committees. The Establishment Data Management Committee was set up during the year to manage data on businesses and companies.

In early 1986, a new concept of electronic document processing was introduced to enable the public to use their word-processors, microcomputers or computer terminals for dial-up access to government databases. The successful implementation of this concept for the Registry Of Vehicles' database gave an indication of the benefits of allowing private sector access to government databases.

In response to the government's new economic direction and the emerging consciousness of the potential impact of the CSCP within and beyond the Civil Service, a new long range plan was formulated for the CSCP. The ten strategic thrusts of the CSCP Long Range Plan constitute the determination of the Civil Service to further exploit Information Technology and for the private sector, in particular the computer services industry, to share in the benefits and experience of the CSCP.

Significant progress was made in the area of applied research and development through the Joint Software Engineering Programme (JSEP), a joint effort between the NCB and MINDEF's Systems and Computer Organisation. This programme has extended the organisation's technological repertoire into new areas like knowledge systems, the design of software development tools, and computer networking for office automation.

The R&D work on knowledge systems included the development of a Container-ship Planning System jointly with the Port of Singapore Authority (PSA), and an expert system shell called RUle Based Inference CONsultant (RUBICON), developed for the purpose of expert system promotion and education. Several software development tools, designed to increase the productivity of computer professionals during the system development cycle, are being integrated into a software package called Picture Oriented Software Environment (POSE). A pilot Office Automation network had been established to link the NCB HQ with the Computer Information Services Departments of the Ministries. The experience gained from operating this Office Automation (OA) system will pave the way for the development of a Civil Service-wide OA network.

In March 1986, NCB announced the establishment of the Information Technology Institute (ITI). The ITI will consolidate the work done under JSEP and take on the additional responsibility of collaborating with the computer services industry and the university to develop IT products for the local and international markets.

The year's economic slowdown is a timely reminder of the urgent need to develop export markets to ensure the long term growth of our computer services industry. The NCB has stepped up its effort to assist the local computer services industry in venturing into new markets. The NCB led a mission comprising members of the Singapore Federation of the Computer Industry (SFCI) to the People's Republic of China in December 1985. Software Technologies (Singapore) Pte Ltd (SOFTECH), a consortium of 7 local companies, will be formed in July, 1986 to participate in bilateral business cooperation programmes with companies in other countries and to seek new market channels for the export of computer services.

To enhance the technological and development capability of the IT industry, financial incentives were given to local companies for product development. Several local companies were awarded Product Development Assistance Scheme (PDAS) grants to develop software products.

Another milestone in the industry development activities of the NCB was the establishment of its first overseas office in Boston, USA, in August 1985. This office enabled the NCB to intensify its investment promotion drive to get more U.S. computer corporations to use Singapore as a base for their Asia-Pacific operation and software development centres. Financial incentives and other assistance were given to overseas companies wanting to set up software development facilities in Singapore. New software development centres were established by Burroughs-Cyberware and NEC during the year.

The event with significant long term impact was the joint effort of the NCB and the other public sector organisations with major interest in Information Technology — the Economic Development Board, Telecoms and the National University of Singapore — to formulate a National IT Plan. This framework of seven interlocking strategic building blocks — IT APPLICATION, IT INDUSTRY, IT MANPOWER, IT CULTURE, INFORMATION COMMUNICATION INFRASTRUCTURE, CLIMATE FOR CREATIVITY & ENTREPRENEURSHIP, and CO-ORDINATION & COLLABORATION — represented a total Singapore drive to get the most out of Information Technology. This effort proved timely in that it coincided with the deliberations of the Economic Committee to chart a new economic direction for the nation. The Economic Committee dedicated a chapter of its report to the importance of IT and tasked the NCB with the responsibility to spearhead the implementation of the National IT Plan. Information Technology, encompassing computer, telecommunication and office system technologies, had been recognised as a tool for increasing competitiveness and productivity in every sector of the economy, in addition to being an industry with tremendous export potential in its own right.

This new responsibility will pose a challenge to the NCB, a comparatively young organisation with a history of only five years. The coming year will see organisational changes and exciting new initiatives to launch the National IT Plan. Our achievements and experience in civil service computerisation, industry development, applied R&D and human resource development all stand us in good stead to respond to this new challenge. The excellent spirit of collaboration, which we have fostered with the IT industry and our public sector partners in 1985, must be maintained and extended to ensure success for the National IT Plan.

Philip Yeo Liat Kok
Chairman
National Computer Board

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Mr Philip Yeo Liat Kok

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Curriculum Development
Institute of Singapore

NATIONAL INFORMATION TECHNOLOGY (IT) PLAN

Since 1981, the national computerisation effort directed by the Committee on National Computerisation (CNC), with executive support from the NCB, has created the infrastructure and conditions necessary for Singapore to take advantage of computer technology. The national computerisation effort has served the nation well in promoting computerisation, the training of computer manpower and the development of the computer services industry. The four-fold increase in the number of firms using computers, from about 2,000 in 1982 to over 8,000 in 1985, is a clear indicator of the success of this effort.

The penetration of computer technology into just about every device and equipment, and the interconnection of computers through telecommunication have made it increasingly difficult to consider computer technology in isolation. Indeed, it is often more meaningful to subsume computer technology under the term — Information Technology (IT). Information Technology encompasses all software and hardware used to collect, store, process, package and disseminate information. It has been recognised as the most important technology for nations on the threshold of the Information Age.

Singapore has focused on Information Technology as a creative and strategic tool for improving business competitiveness and economic efficiency, and also as an industry producing goods and services for a fast expanding world market. Just as computers have become inseparable from telecommunication and office system technologies, the NCB needs to strengthen its partnership with other public and private sector organisations to achieve its mission of driving Singapore into the Information Age. An integrated information technology strategy is needed to give all organisations in Singapore a clear view of the potential of IT, so that their collective efforts and energy may be channelled to exploit IT productively, in accordance with Singapore's new economic directions.

Against this background of the increasing strategic significance of Information Technology to the nation, the NCB together with the EDB, Telecoms and the NUS formed a National IT Working Committee in 1985 to work towards formulating a National Information Technology Plan. This plan will transform the national computerisation effort into a new national Information Technology drive to help Singapore achieve its vision of the future.

Strategic Framework

The result of this collaborative effort to set the directions for a national effort to exploit IT has been incorporated as a chapter in the Economic Committee Report, a recognition that IT is a key technology for Singapore's economic development. The dual roles of IT — as a productivity tool for every economic sector and as a sectoral industry capable of generating national wealth in its own right — can be achieved through a strategic framework of seven interlocking building blocks. These are:

IT Application — We want to promote widespread and effective IT application in the manufacturing, service and other sectors of the economy. This will lead to a more efficient business environment and better quality of life in the country.

IT Industry — We need to foster the growth and technological sophistication of our local IT industry to support the extensive and innovative exploitation of IT in the country, and the export of competitive IT products and services. Singapore needs a strong IT industry to support economic growth and to win a share of the fast expanding world IT market.

IT Manpower — We need to develop a corps of IT professionals with the right blend of skills for extensive and innovative exploitation of IT. Our IT professionals must keep up with the fast advance of this technology to be effective in applying it and to be capable of contributing to its development.
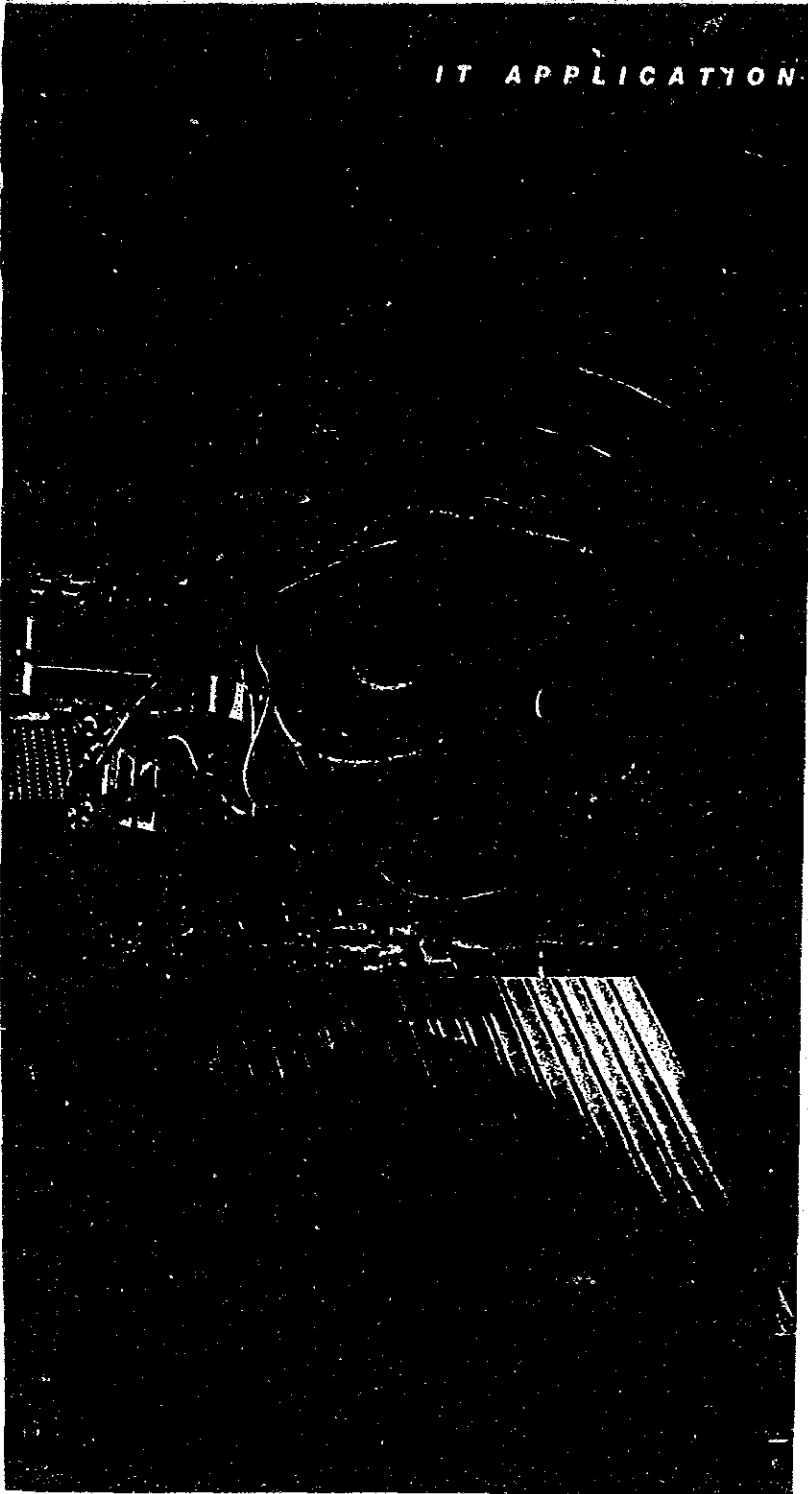
IT Culture — To cultivate an understanding and appreciation of IT among Singaporeans, we need to dispel any unjustified fear that may accompany the introduction of new information technologies, and promote an understanding of the value of information.

Information Communication Infrastructure — Information infrastructure will enhance the usefulness of IT devices and increase their value to the marginal users. We must build an efficient information communication infrastructure and promote its creative and widespread use.

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The report of the Economic Committee has highlighted IT as a new growth industry. The manufacture of high value-added IT products, the new telecommunication services such as value-added networks, and the development of application and system software and the services associated with them all offer opportunities for Singapore to exploit.

Climate for Creativity and Entrepreneurship — The application and market potential of IT are only limited by our imagination and drive. We need to nurture our indigenous IT development and marketing capability to the level of international competitiveness.

Co-ordination and Collaboration — Our ambition need not be constrained by the small pool of IT manpower and limited local market at our command. By making the most out of our limited resources through co-ordination and judicious specialisation, we can create a significant impact.

An Expanded Role for the NCB

The government has given the NCB the responsibility for implementing the National IT Plan, and this will lead to an expanded role for the NCB. With the National IT Plan, professionalism takes on a new dimension for the NCB staff.

The mastery and application of technology must now be carried out under a more pressing economic and social imperative. As an organisation, NCB must extend its partnership with other public sector agencies to achieve a co-ordinated approach to IT infrastructure development. It also has to develop new partnerships with private sector organisations to promote IT applications through the country.

COMPUTER SERVICES – THE KEY TO A VIBRANT IT INDUSTRY

*T*he report of the Economic Committee has highlighted IT as a new growth industry. The manufacture of high value-added IT products, the new telecommunication services such as value-added networks, and the development of application and system software and the services associated with them all offer opportunities for Singapore to exploit.

Although smaller in terms of revenue generation when compared to IT hardware manufacturing and telecommunication services, computer services is the key to a vibrant indigenous IT Industry. It is our software capability which will enable us to go beyond hardware manufacturing to the manufacturing of systems, and to progress beyond the provision of telecommunication services to the development of value-added networks. The development of a strong computer services industry has been the objective of the NCB's industry development efforts. These efforts have paid off in the form of a vibrant, though fledgling, computer services industry, ready to fulfil its role in the National IT Plan.

Whilst the promotion of Singapore as an investment base for international IT companies continued in FY85, equal attention was given to helping local companies develop an export capability.

Industry Performance 1985

Revenue from the computer services industry in Singapore grew by 18% from $474 million in 1984 to $561 million in 1985. Although less impressive compared to the 29% growth registered in 1984, it was still a creditable performance in the light of the general economic slowdown in 1985. Sales to users outside Singapore led the growth, registering a 38% increase from $90 million in 1984 to $125 million in 1985, with hardware sales growing at 47% compared to 46% in the previous year. The bulk of the sales were by multinational companies using Singapore as a regional base. Software and service export, however, did not increase substantially. Revenues rose by only 5% from $20.3 million in 1984 to $21.3 million in 1985. The market for software and services outside Singapore had softened last year with the declining economic growth experienced by our neighbouring countries.

Locally, the revenue from computer services increased from $383 million in 1984 to $435 million in 1985. The decline to a 14% growth rate (half of the growth in 1984), was due very much to the slowdown in the purchase of hardware. In 1984, although the growth in mainframes sales slowed to 6%, minicomputers and microcomputers sales grew at impressive rates of 27% (for microcomputers) and 42% (for minicomputers). In 1985 however, the growth rates for minicomputers and microcomputers retarded to the same level as that of mainframes which remained at about 6%.
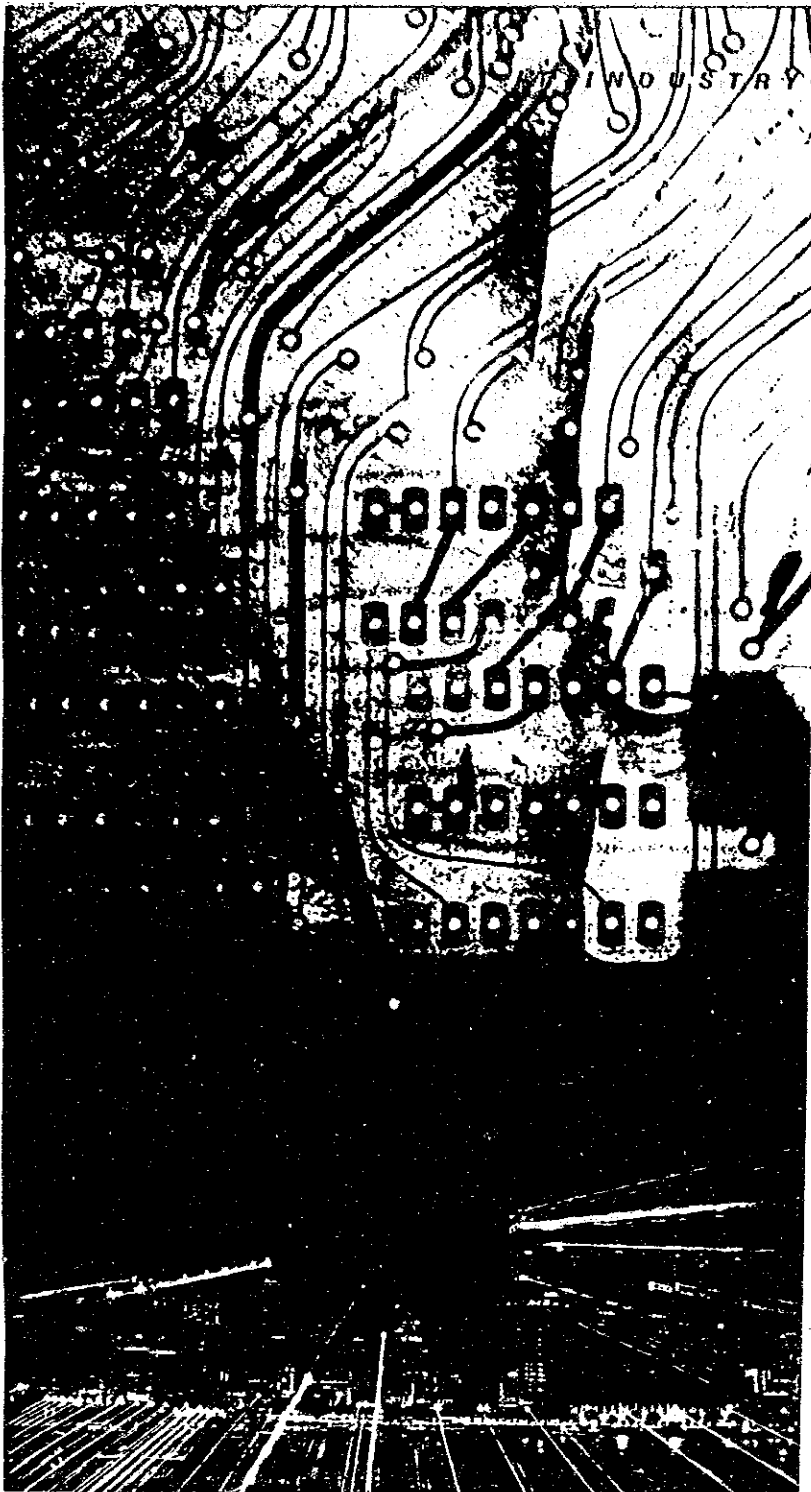
e need to foster the growth and technological sophistication of our local IT industry to support the extensive and innovative exploitation of IT in the country, and the export of competitive IT products and services. Singapore needs a strong IT industry to support economic growth and to win a share of the fast expanding world IT market.

Two factors contributed to the low growth rates. Firstly, there was the slowdown in the economy. Companies tended to defer computerisation in view of the difficult times. Secondly, hardware prices had been falling. The number of new installations of minicomputers and mainframes increased by 550 units in 1985 compared to 500 in 1984. In the microcomputer arena, about 19,900 units were sold locally in 1985 compared with 17,800 in 1984.

Software and services sales on the other hand continued to grow strongly by 33%, from $107 million in 1984 to $143 million in 1985. This good performance could be attributed to the increasing demand for software and services from the expanding base of existing users which numbered about 8,000 in 1985 compared to less than 400 in 1980.

1985 was a year of mixed feelings, with the majority of industry members feeling relieved that their business had not fared as badly as feared. The trends indicated clearly that the key to sustained growth lies in the overseas market. Export-oriented operations will have to be made an integral part of business strategy for long-term survival.

People's Republic of China (PRC)

In December 1985, after the Prime Minister's visit to the People's Republic of China (PRC) in September, the NCB organised a follow-up trade mission to PRC with members of the Singapore Federation of the Computer Industry (SFCI).

Discussions held with the PRC Ministry of the Electronics Industry (MEI) led to the signing of a Memorandum of Understanding on a framework for long-term co-operation between the computer industries of both countries. This relationship was reaffirmed in March 1986 with a return visit by a delegation from the PRC MEI to Singapore. A Letter of Intent to establish a joint venture company was signed between the PRC delegation and the SFCI.

Since then, seven local companies have formed a consortium called SOFTWARE TECHNOLOGIES (Singapore) Pte Ltd (SOFTECH) to be the Singaporean partner of the joint venture to be set up in July 1986. The collaborative effort to penetrate the Chinese market by the seven local companies is a step towards Singapore achieving a niche in the export market. More local companies are expected to pool their expertise and resources to secure a place in the international market.

NCB Overseas Office

As part of its programme to encourage leading multinational IT companies to invest in Singapore, the NCB set up its first overseas office in Boston, Massachusetts, USA in August 1985. This office's function is to promote the use of Singapore as a regional base by US IT companies, as well as to encourage them to set up software development facilities in Singapore. The NCB Boston Office is also responsible for gathering information on the latest developments in the IT industry so as to enable planners and implementors to keep abreast of new products and services. The office also helps the NCB in the placement of NCB Scholars through the Industry Attachment Programmes in leading R&D centres of the region. The Boston Centre Director works closely with the various EDB Overseas Offices to co-ordinate the promotion of IT companies in various parts of the USA. It also assists the EDB to promote other potential investors in the New England area to invest in Singapore.

Assistance to Companies

During the financial year, a US company, Burroughs-Cyberware was granted pioneer status to set up a software development facility in Singapore. The company was also awarded an INTECH grant to train Singaporean IT professionals for two years. These professionals were sent to the USA for training in the first year. A Japanese company, NEC was also awarded a training grant by the Skills Development Fund (SDF) to train Singaporean IT professionals for its Software Development Centre.

Two local compaies were awarded Product Development Assistance Scheme (PDAS) grants to develop software products. Radan Systems was awarded the PDAS grant to develop a Computer Aided Design software package. ATS Software was awarded a grant to develop a

series of engineering packages. Both packages are aimed at export markets.

Looking Ahead

1986 will see a closer collaboration between the Economic Development Board (EDB) and the NCB in the use of EDB's worldwide network of offices to widen the spread of industry promotion activities.

Locally, the NCB is playing a more direct role in promoting computer usage. An IT Application Advisory Centre is being set up to provide advisory services to companies that require help in understanding the computerisation who are able to provide the required solutions.

The NCB will work closely with the Small Enterprise Bureau (SEB) of the EDB and the Institute of Systems Science (ISS) to assist small businesses. Trade Associations and professional bodies will also be encouraged to explore how IT can be exploited within their respective industry sectors. By directly encouraging usage, the NCB will also be stimulating demand for IT products and services that can result in more expertise being developed for the export of consultancy services. Local companies can continue to approach the NCB for assistance in developing software products for the export market. Efforts will be intensified to promote technology transfer through establishing Software Development Centres by leading foreign IT companies.

THE CIVIL SERVICE COMPUTERISATION PROGRAMME (CSCP)

*T*he Civil Service Computerisation Programme (CSCP) has the objective of improving the efficiency and productivity of the Civil Service so as to provide better services to the public through the use of computers.

With a corps of some 340 information systems professionals, the NCB today has set up information systems departments supporting the computerisation needs of various government departments and Organs of State. These include departments in the Ministries of Communications & Information, Community Development, Education, Finance, Foreign Affairs, Health, Home Affairs, Labour, Law, National Development, and Trade & Industry. Also covered are the Public Service Commission, the Corrupt Practices Investigation Bureau, the Subordinate Courts, the Registry of Companies & Businesses, the Auditor General's Office and the Singapore Civil Defence Force.

In view of the government's new economic direction and the potential impact of CSCP within and beyond the Civil Service, a new long range CSCP plan was formulated together with senior civil servants. The ten strategic thrusts of the CSCP Long Range Plan constitute a new framework for the Civil Service to further exploit Information Technology. An important role for the Civil Service will be to enable the private sector, in particular the computer services industry, to share in the benefits and experience of the CSCP.

In the past year, the CSCP made good progress, and there was increasing private sector participation for turnkey tenders.

Hardware Acquisition

Three tenders for the acquisition of hardware, system software and application software were awarded under turnkey contract terms in the last year. The total value of turnkey contracts for the financial year was about $14.2 million.

The tender for the Computerised Command And Control System for the Singapore Police Force and the Singapore Fire Service was awarded and the system would be based on Sperry mainframe computers. The Ministry of Health awarded a tender to computerise its Appointments Scheduling System, with 5 IBM minicomputers to be installed at 5 major government hospitals in FY86. The Ministry of Law awarded a tender to automate its Computerised Mapping System on a VAX computer. In addition, the Subordinate Courts' tender for the supply of a computer system to handle front-end processing functions at the courts was awarded.

Three other tenders were also called by the NCB. They were turnkey tenders for the

Computerised Blood Transfusion System and Biomedical Equipment Management System, Ministry of Health; the supply of hardware for the School Link Project, Ministry of Education; and the supply of equipment to upgrade the current computing facilities at the Computer Services Department, Ministry of Finance. Evaluation and award of these tenders would be completed in FY 86.

Systems Development

Twenty-seven new systems were implemented in the Ministries of Community Development, National Development, Home Affairs, Labour, Trade & Industry, Finance (including the Customs & Excise Department), and Communications & Information (Registry of Vehicles and the Meteorological Service).

A number of Ministries were completing their Phase I computerisation programmes. These included the Ministries of Community Development, Communications & Information (Registry of Vehicles), Health, and Finance (Customs & Excise Department). Many of them had initiated Information Systems Planning (ISP) studies to map out computerisation plans for the next phase. Other major ISP studies were carried out for the Registry of Companies & Businesses, Corrupt Practices Investigation Bureau, Economic Development Board, Auditor General's Office and the Singapore Civil Defence Force. The Meteorological Service had implemented all their planned systems and was embarking on new applications and enhancements to provide better services to its users.

The development of the Financial Management Control System (FMCS) and the Central Personnel Information System (CPIS) for the entire Civil Service were initiated. These systems will assist the Government in managing its overall manpower and financial resources and will reduce the duplication of effort in developing similar systems for each Ministry.

A highlight of the year was the introduction of Electronic Document Systems (EDS) and dial-up access to Government databases. The EDS is a process whereby documents may be submitted or accessed electronically using workstations linked to the public telecommunications network. The "dial-up" system introduced by the ROV for on-line retrieval of vehicles' and owners' particulars was one such application. Other Ministries also hope to introduce similar services in the near future.

The total number of applications to be developed under the CSCP continued to grow. In the last FY, 27 application systems were completed. As at the end of the last FY, a cumulative total of 59 applications were completed and another 45 were in various stages of development.

Data Administration Programme

Data Administration aims to manage data as a valuable organisational resource. The Data Administration function develops and administers policies, procedures, and plans for the definition, organisation, sharing, protection, and effective use of data in an organisation. The important benefit of data administration is that the public will save time in filling in data items on government forms while government departments can avoid duplicated data entry.

The Establishment Data Management Committee (EDMC), chaired by the Ministry of Trade & Industry, was recently set up. Initially, it would identify common data needs, their formats and coding structures, and build up an Establishment database of businesses and companies. The Land Systems Committee (LSC) also made good progress in identifying common data items.

Over the next financial year, Data Management Groups (DMG) would be set up in each Ministry to better manage data as a corporate resource within the Ministry. A training course would also be packaged to prepare both users and information systems professionals for their roles in data management in the Civil Service.
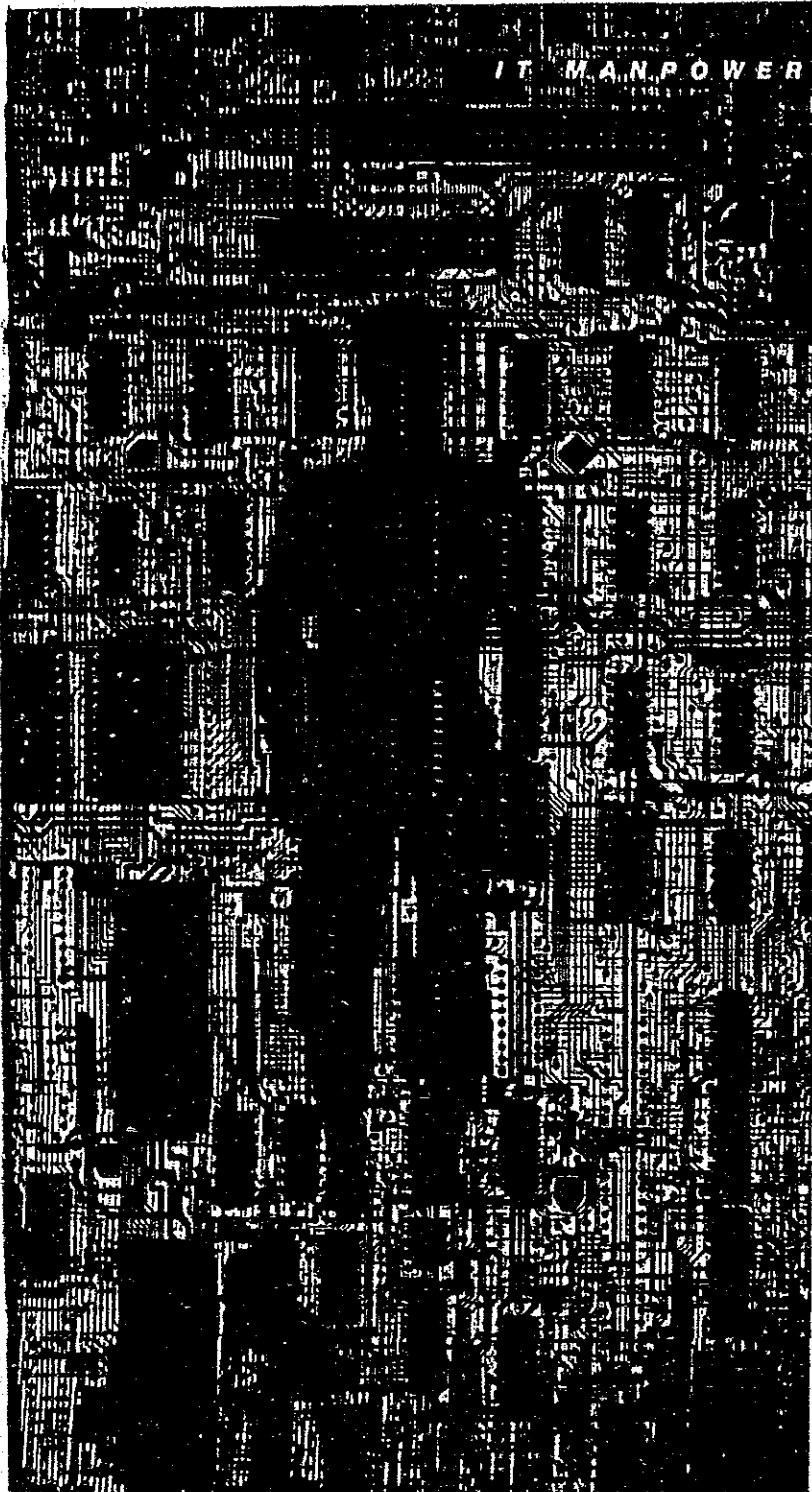
IT MANPOWER

e need to
develop a corps
of IT
professionals with the right
blend of skills for extensive
and innovative exploitation
of IT. Our IT professionals
must keep up with the fast
advance of this technology
to be effective in applying it
and to be capable of
contributing to its
development.

The CSCP will make important contributions to the goals of the National IT Plan. IT is being applied to raise the productivity and effectiveness of public administration. The Civil Service has the additional new role of creating the right conditions for the private sector to become an engine of national economic growth. In response to these challenges, the NCB, together with senior civil servants, had identified ten new strategic thrusts for the CSCP.

Office Systems

An Office Systems Programme was launched with the aim of introducing technology to increase the productivity of office workers at all levels.

The NCB workstation project came into operation in September 1985. An office automation system was installed at the Computer Services Department, Ministry of Finance to support a network of some 33 workstations. Communications between the NCB HQ and its staff at the Ministries became easier and more effective. A similar network to link up all departments under the Ministry of Finance was also introduced at the same time.

User Education

The NCB launched a User Education Programme (UEP) in FY 84 to introduce computer concepts, systems development methodologies and user roles to the civil servants in the CSCP. Last year, 18 courses were attended by 352 top and middle level managers. So far, 565 civil servants had attended the programme.

At the same time, the NCB information systems professionals continued with their in-house user training programmes. Information Centres were set up at the Ministries of Education, Finance, Home Affairs and Health.

The focus of the 1985 CSCP Seminar was on the future direction of CSCP. Highlights of the seminar included forums on trends in Information Technology (IT) and various approaches in managing IT to maximise productivity gains. About 230 senior government officials attended the seminar.

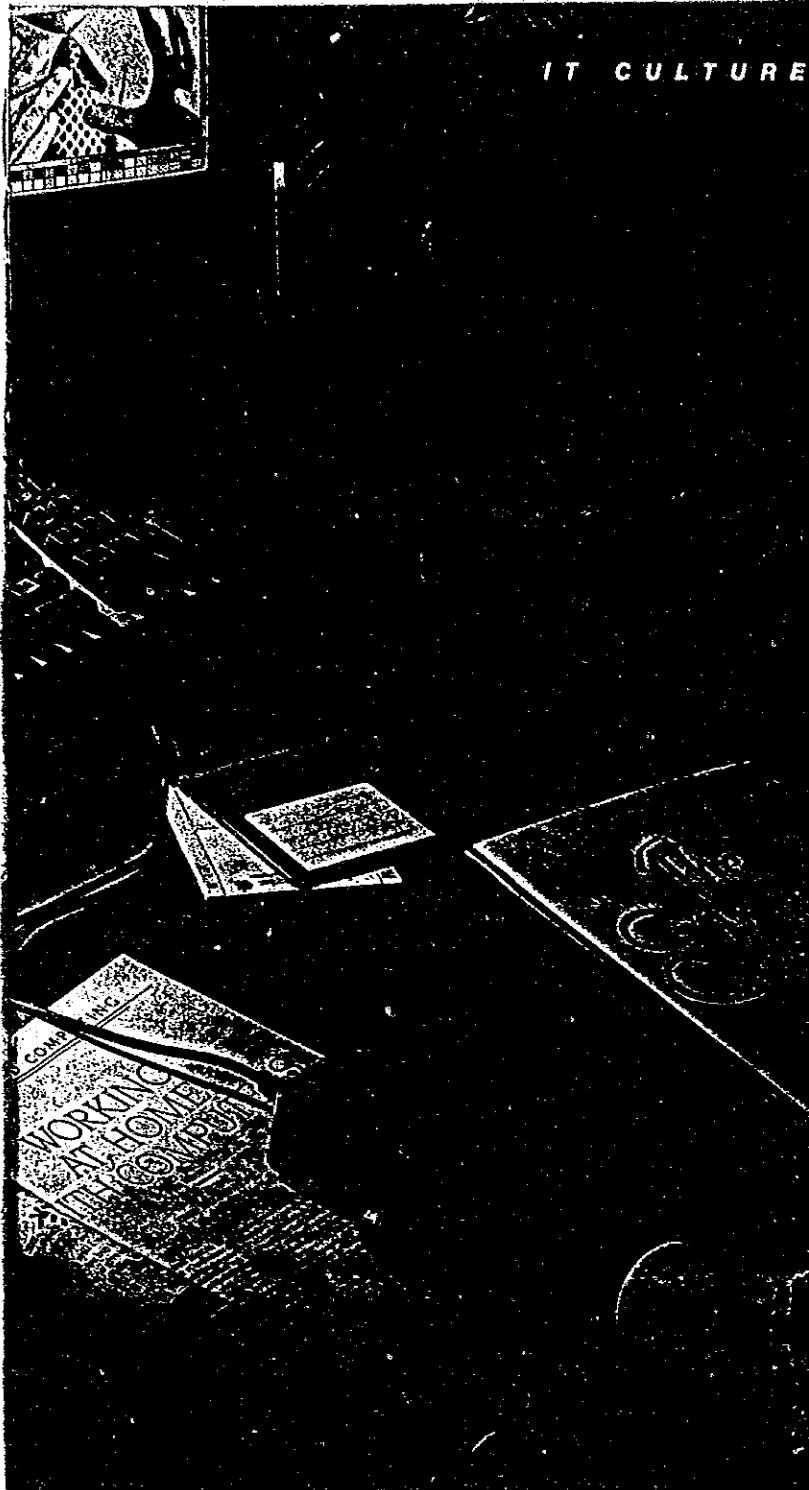## Civil Service Information Network (CSNet)

First proposed in 1984, the CSNet was to lay a network infrastructure for electronic information flows within and between Ministries, as well as between the Civil Service and the public. The study on a framework for the CSNet was a collaborative effort of Telecoms, Management Services Department (MSD), and NCB. Its immediate task was to link together computer systems at the various ministries. To gauge the overall requirements, a survey of network requirements of the Ministries was conducted. A paper on the concept of CSNet, its impact on the Civil Service and the public, and its implementation strategies was endorsed by the Committee on National Computerisation (CNC).

New Strategic Thrusts for the CSCP

The CSCP will make important contributions to the goals of the National IT Plan. IT is being applied to raise the productivity and effectiveness of public administration. The Civil Service has the additional new role of creating the right conditions for the private sector to become an engine of national economic growth. In response to these challenges, the NCB, together with senior civil servants, had identified ten new strategic thrusts for the CSCP.

1. A Mission Orientation. We need to orientate users to apply IT to achieve the goals of the Civil Service, and not just to improve administrative efficiency.

2. An Extended IT Portfolio. We want to encourage the Civil Service to exploit opportunities created by new technologies while getting the most from mature technologies.

3. Venturism. We want to promote innovation and courage in the use of IT within the Civil Service so that new opportunities in IT, which can bring about large benefits, are not missed for want of foresight or funds.

4. Systems Integration. We can capitalise on IT by interconnecting systems for sharing data and IT resources, thereby providing a simplified interface for the public to tap into the information systems of the Civil Service.

o cultivate an
understanding and
appreciation of IT
among Singaporeans, we
need to dispel any
unjustified fear that may
accompany the introduction
of new information
technologies, and promote
an understanding of the
value of information.

5. IT Culture. We must develop an IT awareness and appreciation so as to dispel fear of technology and encourage change and productive innovation by applying technology.

6. Synergistic Partnership. We need to foster greater collaboration between Ministries and Departments so that information systems that cut across the entire Civil Service are identified, developed and implemented for the benefit of the public.

7. Information Communication Infrastructure. We must put in place an infrastructure to support the implementation of integrated inter-ministry systems as well as to enable controlled public access to systems of the Civil Service.

8. Professional Excellence. We must maintain our vigil on professional standards and raise excellence to even greater heights so that the Civil Service can have the best systems and facilities for its investment in the CSCP.

9. Opportunities for IT Industries. We can help the IT industry to strengthen their expertise base and develop their export potential by providing more opportunities for the private sector to participate in the CSCP.

10. CSCP – A Competitive Advantage. We must use the CSCP to create a competitive advantage for the progress and prosperity of Singapore.

These strategic thrusts constitute a new blueprint for the CSCP and provide the Civil Service with a new mandate to further exploit IT in revitalising our economy and in realising our vision of a better society in the 1990s.

APPLIED R&D IN INFORMATION TECHNOLOGY

*I*n Singapore, several public sector organisations are active in IT applied research. The Institute of Systems Science (ISS) is working on bilingual systems, intelligent public information systems, and office automation (OA). The National University of Singapore (NUS) has research interests in artificial intelligence, local area networks, software engineering, microprocessor applications and semiconductors. The Grumman International NTI CAD/CAM Centre specialises its research in CAD/CAM. Telecoms has important projects in Teleview, Integrated Services Data Network (ISDN) and public OA networks.

Information Technology (IT) Division

Within the NCB, the IT Division continued to make significant progress in applied research and development through the activities of the Joint Software Engineering Programme (JSEP), a partnership programme between the NCB and the Systems & Computer Organisation of the Ministry of Defence. In terms of the National IT Plan's strategic building blocks, JSEP has made contributions to the growth of professional IT manpower, and to the encouragement of creativity and enterprise.

JSEP focused its research efforts on Software Engineering, Computer & Communications, and Knowledge Systems.

1. Software Engineering

Software has emerged as the dominant factor in information system development: software cost has been projected to increase to 80% of the total information system cost by the end of this decade. Software costs are primarily labour-related and there is a worldwide shortage of software professionals, yet the productivity of existing professionals is not rising fast enough. There is an urgent need to inject more technology into the software development process. JSEP's aim was to develop a set of computer-aided tools and techniques to raise the productivity of software development, and to improve the quality of software.

The basic approach was to provide software development tools through an *Analyst Workstation*. They would assist software developers in analysing information, and in documenting deliverables at various stages of the development cycle. The first software development tool, the Data Model Diagrammer, had been released to professional users in the CSCP. They reported significant productivity gains in their software development work as a result of using the diagramming tool. Other software tools are being developed and would be integrated into a package called Picture Oriented Software Environment (POSE). In order to support activities in the implementation stage, software aids are being developed to automatically produce physical designs from logical models, and programmes from specifications.

The important role played by the *Quality Assurance* function is to ensure that an application system being developed will meet the user's requirements. In order to build up our own capability in Quality Assurance, consultants were engaged and a Quality Assurance plan was initiated for the CSCP. A mechanism to co-ordinate the development of Information Systems standards was also established.

A *System Development Methodology* is required to structure and guide the software development process. During the year, system development standards were enhanced, training courses were conducted, and consultancy given to ministries and statutory boards.

The microcomputer had been widely recognised as an important component of the overall computing strategy of any organisation. A *Microcomputing Resource Centre (MRC)* was established to promote and support personal computing in the Civil Service. Training courses on microcomputer software were conducted for senior managers in the NCB and another statutory board. Consultancy services were also extended to the ministries and other government agencies.

2. Computer & Communications

The cost of office workers continued to rise over the years while technological developments steadily reduced the cost of IT. Technology must be harnessed to make office workers more efficient handlers of information. The convergence of data processing, telecommunications, and office technology had made possible integrated office systems which combined various forms of information and facilitate their efficient use. JSEP's aim was to explore the effective use of these technologies to improve the flow and processing of information in and between offices.

A computer network planning and design methodology had been developed and would be tested at computer installations in the Civil Service. A local computer network for the new NCB Building was designed to form the infrastructure for a number of innovative IT office applications. These applications would be the results of ongoing projects in text processing, image processing, voice processing, and resource sharing. For example, a prototype link between a mainframe OA system and the Telebox electronic mail system was developed. Voice interfaces were added to an electronic mail system to allow the retrieval of messages by telephone. A combined text and image handling system is being developed to allow the processing of composite text and image documents.

A pilot office automation (OA) system was implemented for the NCB headquarters and the Computer Information Services Departments in the ministries. The system provided electronic mailing, document transfer, and time management facilities. New services were added, including a news bulletin board, a staff directory, and an online training course nomination service. The workstations were also used for personal computing. The number of users had grown from 40 to about 100, and users included managers, Information Systems Officers (ISOs) and secretaries.

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Knowledge systems enable human knowledge to be incorporated into a computer in a form that makes subsequent manipulation effective and efficient. They also contain powerful inference techniques to reason with the incorporated knowledge, to solve problems not previously within the capabilities of traditional computer software.

3. Knowledge Systems

Knowledge systems seek to model the knowledge and inference techniques of human experts. Knowledge systems enable human knowledge to be incorporated into a computer in a form that makes subsequent manipulation effective and efficient. They also contain powerful inference techniques to reason with the incorporated knowledge, to solve problems not previously within the capabilities of traditional computer software. In JSEP, work on knowledge systems focused on exploring the use of expert system techniques to develop "intelligent" computer applications capable of solving complex problems through expert-like reasoning ability.

One of the major knowledge systems under development was the *Container ship Planning System*, a joint project with the Port of Singapore Authority (PSA). The system would capture the expertise of PSA ship planners in allocating equipment at the Tanjong Pagar Container Terminal and in planning the sequence of work. Its goal would be to increase equipment efficiency while decreasing the turnaround time of containerships. This knowledge system would ultimately give the PSA a significant competitive edge in the region.

The microcomputer-based expert system shell, *RUBICON* (RUle Based Inference CONsultant), was used extensively for promotion and education. It demonstrated the use of rule-based knowledge systems to many government and private sector organisations. It was also used to create a personal investment advisory system developed jointly with a local bank, and a career planning system for reservist personnel developed jointly with MINDEF.

Knowledge Acquisition

The recent years saw the spectacular advance of Information Technology, with most of the breakthroughs taking place in the advanced Western countries. The NCB continued to use its Knowledge Acquisition programme to send its professional staff abroad to keep abreast of technology. Highlights of the past year included a US mission to study the latest office systems products and to visit OA sites, participation at the International Joint Conference on Artificial Intelligence (AI) followed by visits to leading AI laboratories in USA and Europe, and mission trips to vendors and technology centres in USA and Europe to study alternative strategies for the analyst workstation and related projects.

Information Technology Institute (ITI)

With the good progress made by the various research programmes under JSEP, it was timely to evolve JSEP into an institute to consolidate and intensify applied research activities in Information Technology. In March 1986, the formation of an Information Technology Institute (ITI) within the NCB was announced. The mission of the Institute is to be a leader in exploiting Information Technology. The Institute would collaborate with the industry and the university to develop IT applications of commercial value, which would then be marketed internationally by local companies. The ITI will be a key player in implementing the National IT Plan by helping to pave the way for the growth and development of Singapore's IT industry through technology transfer and partnership in R&D.

**INFORMATION
COMMUNICATION
INFRASTRUCTURE**

nformation infrastructure will enhance the usefulness of IT devices and increase their value to the marginal users. We must build an efficient information communication infrastructure and promote its creative and widespread use.

OUR PEOPLE

Our strength lies in our people. Our professional staff comprises about 400 highly motivated individuals who dedicate themselves to the use of Information Technology to further our clients' interests. Ninety percent of our Information Systems Officers hold graduate or postgraduate degrees in IT-related fields with the rest holding professional qualifications from the polytechnics and similar tertiary institutions. Coming from various backgrounds, they provide, as a team, an interdisciplinary perspective to problem solving.

Apart from the small group at the corporate headquarters, three-quarters of our professional staff are deployed to develop the various application systems in the CSCP with the rest involved in applied research in ITI. We work in partnership with our clients and share in the responsibilities for success.

As the corporate recruitment criterion continues to rest on the person's capacity for sustained professional growth within the organisation, only individuals with the prerequisite technical competence, long-term potential, motivation and commitment to excellence are employed. The majority of professional staff are recruited at the entry level and put through intensive technical training programmes and planned assignments on the job in their first two years. This is to provide them with a broad-based foundation for gradual specialisation. Through the direct involvement of many of the younger staff in the development of major application systems over the last five years, we have achieved the desired improvements to the overall expertise profile.

The stringent recruitment criteria combined with a performance-based compensation policy and a philosophy of providing long-term career development opportunities signify our corporate commitment to producing high quality IS professionals. This would be a vital pool of human resources that is capable of providing leadership and services in IT planning and management, project management, application development and specialist areas.

To channel a percentage of the scholastically excellent pre-university students to IT careers, we have continued to award 12 Undergraduate Scholarships annually since the Scholarship Programme was introduced in 1982. The Scholars are sent for Honours and Master degree programmes at leading universities in the USA, UK and Canada. Five Postgraduate Scholarships are also made available to staff and to professionals from the industry to pursue Masters programmes in major areas of the technology. These Scholarships would be extended to Doctorate degrees for the coming year.

A significant realignment of the corporate professional resource management function with the national IT manpower strategy will take place in the next two years. Major improvements to the professional resource planning and development processes as well as an extensive career management programme for both managers and professionals are being planned.

The goal of all our professionals is to transform the national computerisation effort into a new information technology drive to help our nation achieve its vision of the future.

Providing vital support to the corporate endeavour is a 64-man team of administrative, clerical and secretarial staff. Together, they ensure that essential support services in finance, personnel, estate management, public relations, office management and general administration are the unfailing lubrication for corporate implementation machinery.

The unity of our people as a corporate body lies in our common vision of the future and in each one of us sharing and believing in the 'Philosophy of the 3Ps' that prize, above all, the concept of Partnership, Professionalism and People-Orientation.
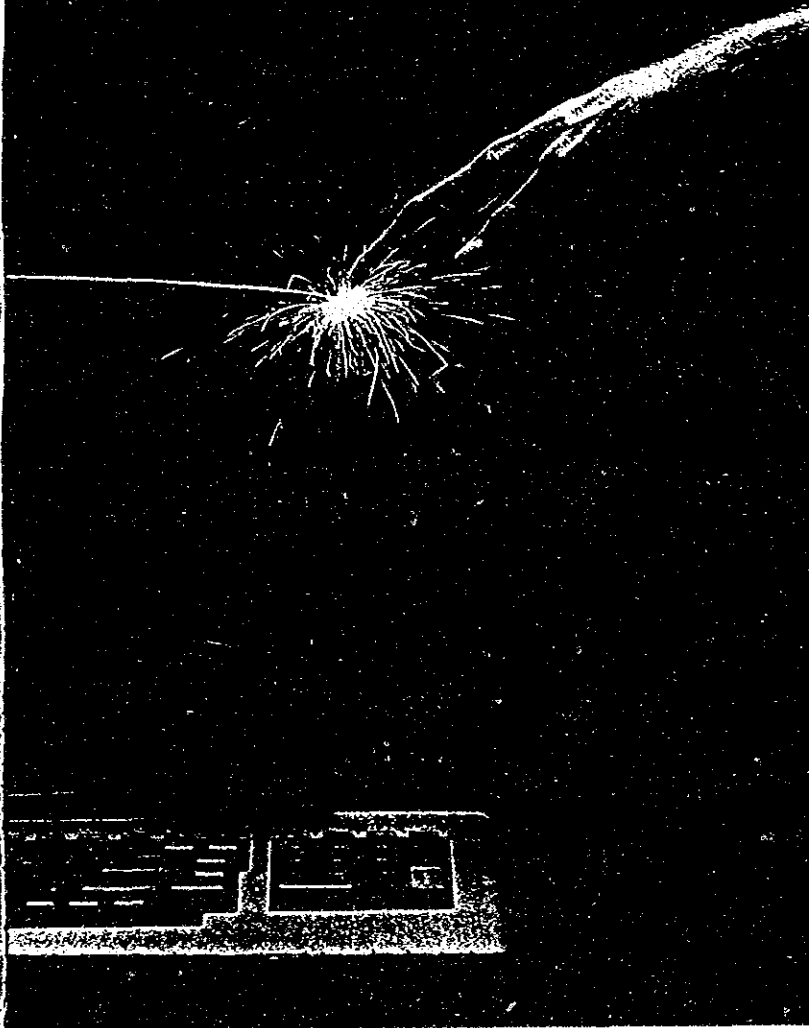
**CLIMATE FOR
CREATIVITY AND
ENTREPRENEURSHIP**

he application and
market potential of IT
are only limited by
our imagination and drive.
We need to nurture our
indigenous IT development
and marketing capability to
the level of international
competitiveness.

The NCB continued to co-ordinate computer education and training programmes run by the various publicly-funded computer training institutions. The ultimate aim is to help ensure that an adequate mix of manpower is produced to meet the demands of the IT industry. The NCB also has a statutory responsibility to establish, maintain and certify professional standards through publicly-held examinations.

COMPUTER EDUCATION AND TRAINING PROGRAMMES

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Institute of Systems Science (ISS), National University of Singapore (NUS)

The postgraduate Diploma in Systems Analysis at the ISS offers computer training for non-computer science graduates. As at August 1985, there were 49 graduating students, with another 50 students forming the new intake of the September 1985 postgraduate diploma programme. The ISS also offers a wide range of programmes to upgrade the skills of computer users and managers.

Department of Information Systems & Computer Science (DISCS), NUS

DISCS expanded its student intake to train more graduates to be systems programmers, information systems specialists and data communication specialists. A total of 130 computer science students graduated in September 1985. The student intake in 1985 was 220. Twelve graduates are presently enrolled in the Masters by Research programme.

Japan – Singapore Institute of Software Technology (JSIST)

JSIST has entered the second phase of its co-operation with the Japanese Government whereby technical assistance in planning and operating the Institute will be provided through the Japanese International Cooperation Agency (JICA). The Institute will be introducing an Advanced Diploma course for graduates of its Analyst/Programmer course, which will cover the scope of the MITI Type 1 Examination. In 1985, 97 students graduated from the two-year Analyst/Programmer Diploma course. Two new classes were started, with 119 students enrolled in 1985.

Centre for Computer Studies (CCS), Ngee Ann Polytechnic

The CCS was the first computer training institute in Singapore to have its courses recognised by the British Computer Society (BCS). The BCS accredited CCS newly introduced Advanced Diploma in Computer Studies (both full-time and part-time) and granted it exemption from the BCS Part II Examination. A total of 208 students graduated in August 1985. In June 85, the CCS admitted 227 students for the Diploma in Computer Studies and 7 students for the Advanced Diploma in Computer Studies.
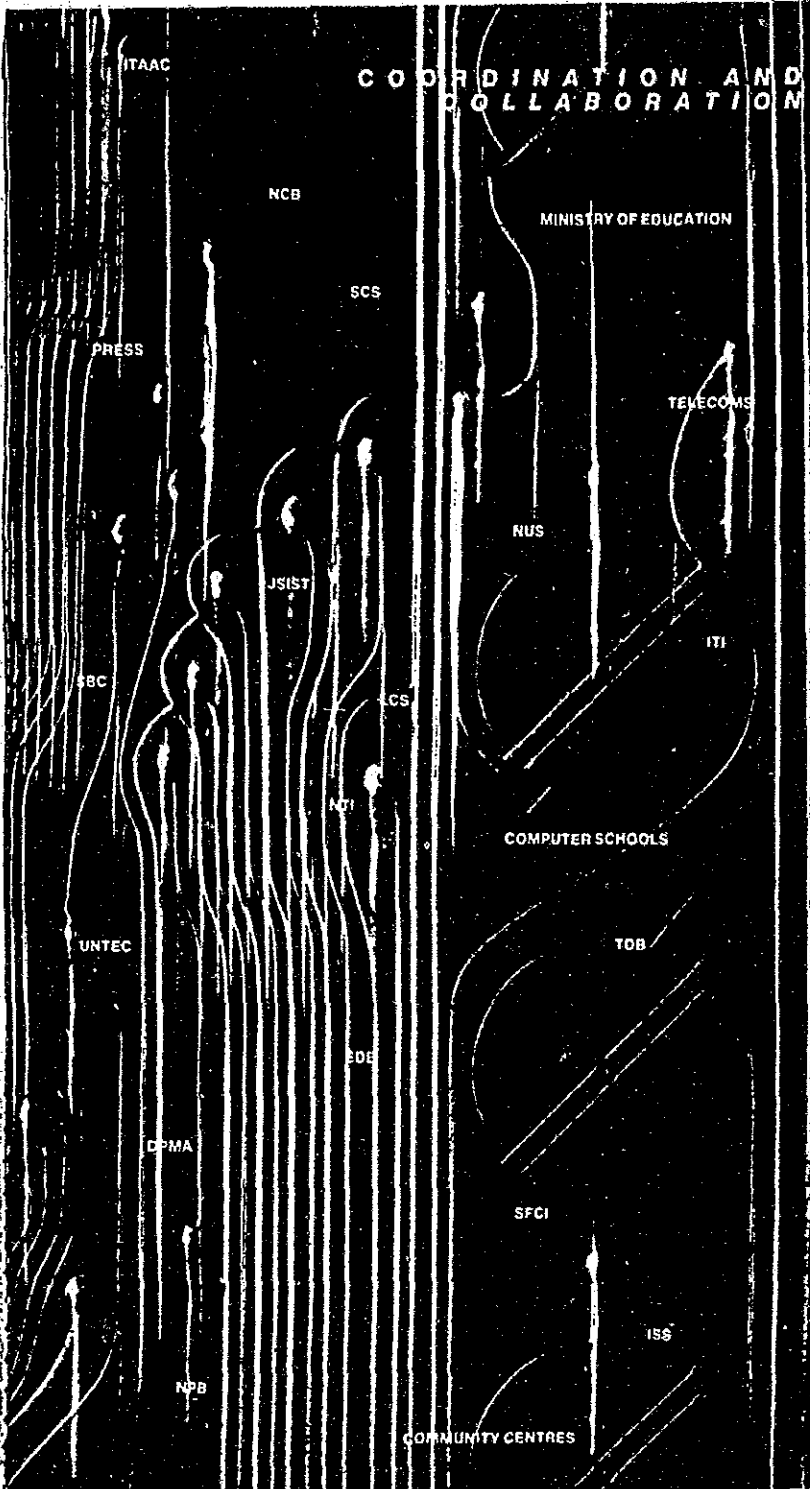
British Computer Society (BCS) – NCB Examinations

Singapore is the largest overseas centre for BCS examinations. The 1985 BCS-NCB Part I & II Examinations were conducted at the Singapore Polytechnic. A total of 674 candidates entered for the Part I Examination, and 106 for the Part II Examination. The candidates' performance would be monitored closely and steps would be taken to assist and advise training institutes preparing candidates for these Examinations.

Institute for Certification of Computer Professionals (ICCP) – NCB Examinations

The NCB conducted two ICCP-NCB Examinations in FY85. Although the number of registrants for these examinations was small compared to the BCS-NCB Examinations, it has been growing gradually. As IT professionals grow in experience, they could take the opportunity to certify their standards through the Certificate In Computer Programming (CCP) for senior programmers and the Certificate in Data Processing (CDP) for business-oriented DP practitioners at the supervisory or managerial level.

COORDINATION AND COLLABORATION

ITAAC

NCB

SCS

PRESS

MINISTRY OF EDUCATION

TELECOMS

SBC

JSIST

NUS

ITI

CCS

NTI

COMPUTER SCHOOLS

UNTEC

TOB

EDB

DPMA

SFCI

ISS

NPB

COMMUNITY CENTRES

ur ambition need
not be constrained
by the small pool of
IT manpower and limited
local market at our
command. By making the
most out of our limited
resources through
coordination and judicious
specialisation, we can
create a significant impact.

Future Plans

With the National IT Plan, the NCB will adopt a national role in the co-ordination of IT education and training to develop and enable our people to exploit IT fully. NCB will formulate policies and strategies to support the IT Manpower and IT Culture building blocks of the National IT Plan.

The IT manpower programme will concentrate on the qualitative aspect of IT manpower development. Careful monitoring of manpower development and projections will ensure that the right type of manpower be developed to meet the needs of the industry. The IT Job Structure Model classifying the various job streams, job titles and job functions will also be revamped with the participation of the industry.

The IT culture programme will consist of a total approach to promote a supportive environment to prepare our people for the Information Age. Appropriate literacy programmes will be recommended and mass media will be used to overcome the people's phobia on technology and raise the level of awareness of our people towards IT.

NCB will work closely with government departments, public and private sector educational and training institutions and the mass media. Whenever possible, the private sector will be encouraged to play an active part in our programmes.
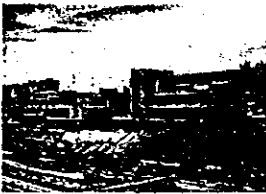
NCB BUILDING

Most of the superstructural work of the building was completed in March, 1986. A "Topping-Up" ceremony, officiated by Chairman, NCB, Mr Philip Yeo, was held on 20 March 1986 to mark the occasion.

The final phase of interior decoration has begun. Some of the major amenities which are being installed include a building automation system for energy and security management; and a Multi-purpose Hall with integrated audio-visual system.

The NCB HQ is expected to move into its new permanent home in early 1987.
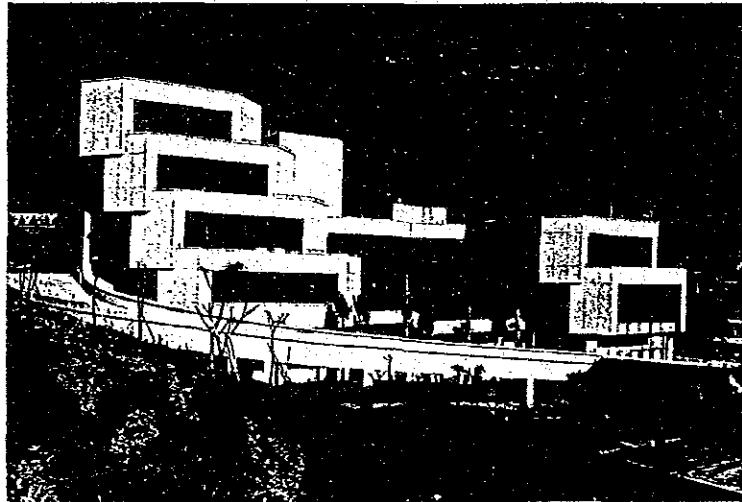
SENIOR OFFICERS OF THE NCB. (with effect from 1 January 1987)

Mr Philip Yeo Liat Kok Chairman

Mr Tan Chin Nam Deputy Chairman

Mr Lim Swee Say General Manager

Mrs Pearleen Chan Deputy General Manager

Mr Goh Ik Hoon Assistant General Manager

SYSTEMS DIVISION
Project Management

Mrs Chong Sor Lin
Director,
Project Management Department/Information
Systems Manager, Ministries of Health &
Home Affairs

Mdm Bebe Heng
Deputy Director,
Project Management Department

Mr Chan Gin Siong
Manager,
Computer Services Department, Ministry of
Finance

Mr Chua Ah Leng
Information Systems Manager,
Ministry of Home Affairs

Mr Goh Kiat Soon
Information Systems Manager,
Ministry of Education

Mr Lee Kwok Cheong
Information Systems Manager,
Ministry of Law and Senior
Project Manager (Land Systems)

Mr Lee Tee Kiat
Information Systems Manager,
Ministry of Community Development

Mrs Lim Siew Bee
Information Systems Manager,
Ministry of National Development

Mr Low Hock Pheng
Information Systems Manager,
Ministry of Labour

Mr Tan Choon Yen
Information Systems Manager,
Ministry of Foreign Affairs and Corrupt
Practices Investigation Bureau

Mr Tan How Choon
Information Systems Manager,
Ministry of Home Affairs

Mr Martin Tsang
Information Systems Manager,
Customs & Excise
Department and National Computer Board
Headquarters

Mr Yeo Lin Soon
Information Systems Manager,
Ministry of Communications & Information

Mr Low Swee Seng
Deputy Director (Technical Services),
Ministry of Trade & Industry

Integrated Information Systems

Mr Ko Kheng Hwa
Director,
Integrated Information Systems Department

Mrs Chen Lai Kiun
Deputy Director,
Integrated Information Systems Department

Mr Chan Kah Khuen
Assistant Director,
Integrated Information Systems Department

Information Systems Security, Professional Standards

Mr Kwok Ying Man
Deputy Director,
Information Systems Security Department and
Professional Standards Department

INDUSTRY DEVELOPMENT

Mr Yeo Khee Leng
Director,
Industry Development Department

Industry Promotion

Mr Edmund Tham
Deputy Director,
Industry Promotion Section

Mr Sushil Chatterji
Centre Director,
Boston Office

IT Application Promotion

Mr Alan Chia
Assistant Director,
IT Application Promotion Section

PROFESSIONAL RESOURCE, INFORMATION TECHNOLOGY MANPOWER, INFORMATION SYSTEMS AUDIT

Professional Resource Management

Mrs Tan Yuke Meng
Deputy Director,
Professional Resource Management
Department

Mr Victor Yee
Assistant Director (Training),
Professional Resource Management
Department

Information Systems Audit

Mr Kwok Ying Man
Deputy Director,
Information Systems Audit Department

Information Technology Manpower

Dr Christopher Chia
Deputy Director,
Information Technology Manpower
Department

Mr Foong Tze Foon
Assistant Director,
Information Technology Manpower
Department

INFORMATION TECHNOLOGY INSTITUTE(ITI)

Mr Lim Swee Say
Director, ITI

Mrs Chia Tahn Joo
Deputy Director, ITI
Research Director (Computer &
Communications Laboratory)

Mr Ang Hoon Kee
Research Director
(Software Engineering Laboratory)

Mr Choo Chun Wei
Manager
(Research Planning)

Dr Christopher Chia
Manager
(Technology Transfer)

Software Engineering Laboratory

Dr Christopher Chia
Programme Manager
(Software Quality)

Mr Lim Seng Ping
Programme Manager
(Analyst Workstation)

Me Seet Chern Hway
Programme Manager
(Software Productivity)

Computer & Communications Laboratory

Dr Francis Yeoh
Programme Manager
(Integrated Office Systems)

Knowledge Systems Laboratory

Mr Lim Joo Hong
Programme Manager
(Knowledge Systems)

CORPORATE

Administration

Mr Seah Kia Ger
Board Secretary and
Director,
Administration Department

Mr Loh Ah Kin
Senior Personnel & Administration Officer

Miss Ong Geok Lwee
Finance Executive

Planning

Mr Wong Seng Hon
Director,
Planning Department

Mr Choo Chun Wei
Deputy Director
(Information Technology Planning)

Mr Loh Chee Meng
Assistant Director
(Information Economy & Society)

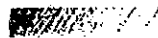Mr Low Huan Ping
Assistant Director
(Information System Infrastructure)

ORGANISATIONAL CHART

CHAIRMAN

DEPUTY CHAIRMAN

BOARD MEMBERS

GENERAL MANAGER

DEPUTY GENERAL MANAGER

ASSISTANT GENERAL MANAGER

SYSTEMS	INDUSTRY	PROFESSIONAL MANPOWER & AUDIT	APPLIED RESEARCH	CORPORATE
Integrated Information Systems Department	**Industry Development Department**	**Information Technology Manpower Department**	**Information Technology Institute**	**Administration Department**
Strategic National Information Systems, Integration of government Information Systems	Investment promotion, local Information Technology Industry development	Development of Information Technology manpower and Information Technology Culture	**Software Engineering Laboratory**	General Administration, Financial Management, Estate Management, Secretarial Services, Public Relations
Project Management Department	**NCB Boston Office**	**Professional Resource Management Department**	**Computer & Communications Laboratory**	**Planning Department**
CSCP project management	International operations, mainly USA East Coast	Professional Staff Recruitment; deployment, career development, organisational development, training, scholarships, library	**Knowledge Systems Laboratory**	Corporate planning, Environment Scanning & Co-ordination of National IT Plan action programmes
Professional Standards Department	**Information Technology Applications**			
Standards and guidelines for Information Systems development, security, project management, etc.	Sectoral studies, small enterprise computerisation programme	**Information Systems Audit Department**		
		Computer audit of Government and Public Sector Information Systems		