
This item was submitted to [Loughborough's Research Repository](#) by the author.
Items in Figshare are protected by copyright, with all rights reserved, unless otherwise indicated.

Provision of nuclear information in Malaysia with particular reference to PUSPATI

PLEASE CITE THE PUBLISHED VERSION

PUBLISHER

Loughborough University of Technology

LICENCE

CC BY-NC 4.0

REPOSITORY RECORD

Samat, Mohammed I.. 2021. "Provision of Nuclear Information in Malaysia with Particular Reference to PUSPATI". Loughborough University. <https://doi.org/10.26174/thesis.lboro.14502030.v1>.

PROVISION OF NUCLEAR
INFORMATION IN MALAYSIA
WITH PARTICULAR REFERENCE
TO PUSPATI

by

Mohd Isa Samat

A Master's Degree Dissertation

Submitted in partial fulfilment of the requirements for the awards
of Master's of Science degree in Information Studies of the
Loughborough University of Technology.

September, 1982

Supervisor,

Miss Stella Keenan, M Phil, ALA, F I Inf Sc

Senior Lecturer, Dept of Library and Information Studies

TABLES OF CONTENTS

	<u>Page</u>
Title Sheet	i
Table of contents	ii
List of abbreviations	vi
List of maps	xi
List of graphs	xii
List of illustrations	xiii
List of appendix	xvi
Acknowledgement	xvii
Abstract	xix

CHAPTERINTRODUCTION

	xx
1 <u>BACKGROUND ON MALAYSIA AND PUSPATI</u>	2
1.1 Information sources in Malaysia	2
1.2 Scientific and Technical Information Sources in Malaysia	4
1.3 Puspatti history	8
1.4 Use of radio isotopes in Malaysia	9
1.5 The need of nuclear information in Malaysia	12
1.6 References	18
2. <u>DATA COMMUNICATION AND TELECOMMUNICATION NETWORK IN MALAYSIA</u>	19
2.1 Introduction	19

2.2 Malaysia in the International Communication Network	19
2.3 General Survey	24
2.4 Existing network	27
2.5 Dial-up service	36
2.6 High speed and wideband transmission	43
2.7 New overseas service	43
2.8 Future network	44
2.9 Conclusion	46
2.10 References	48
 3. <u>COMPUTERS IN MALAYSIA</u>	 51
3.1 Introduction	51
3.2 Current state of computer technology	58
3.3 Hardware	59
3.4 Software	65
3.5 Personnel and education	71
3.6 Utilization	75
3.7 Application	76
3.8 Trend and future	77
3.9 Conclusion	79
3.10 References	80
 4. <u>INTERNATIONAL NUCLEAR INFORMATION SYSTEM (INIS)</u>	 83
4.1 Historical background	83
4.2 INIS record	100
4.3 INIS activities	102
4.4 Output products and services	110

4.5	Database developments	119
4.6	Future development	120
4.7	Problem	123
4.8	Conclusion	127
4.9	References	129
5.	<u>PLANNING OF GETTING NUCLEAR SCIENCE REFERENCES FOR PUSPATI</u>	132
5.1	Online searching	134
5.1.1	Online searching in Malaysia	147
5.1.2	Online searching to overseas	149
5.2	Manual searching	150
5.3	Batch processing	153
5.4	Telex	155
5.5	Cost comparison on obtaining the references	163
5.6	References	175
6.	<u>DOCUMENT DELIVERY AND INFORMATION TRANSFER</u>	178
6.0	Introduction	178
6.1	Courier system	178
6.2	Carrier system	179
6.3	Mail system	181
6.4	Telephone	182
6.5	Facsimile system	183
6.6	Cost comparison by obtaining the original document	187
6.7	References	191

7.	<u>SUMMARY, RECOMMENDATION AND CONCLUSION</u>	192
7.1	Introduction	192
7.2	Puspati	192
7.3	Malaysian government	198
7.4	References	205

ABBREVIATIONS

AABC	Australian Atomic Energy Commission.
ADP	Automatic Data Processing.
AGRIS	International Information System for the Agricultural Sciences and Technology.
ALGOL	Algorithmic Language.
ANN	Asean News Network
APL	A Programming Language.
APL EPLAN	APL-Econometric Planning Language.
ARPANET	Advanced Research Projects Agency Network.
ASEAN	Association of South East Asia Nation.
ATMS	Advanced Text Management System.
BASIC	Beginner's All-Purpose Symbolic Instruction Code.
b.p.s.	bit per second.
CA Search	Chemical Abstract Search.
CCITT	International Consultative Committee for Telephone and Telegraphs.
CICS	Customer Information Control System
CMS	Conversational Monitor System
COBOL	Common Business Orientated Language
COTAC	Asean Committee on Trade and Transport.
CPU	Central Processing Unit
DB	Data base.
DBMS	Data base management system.
DC	Data communication.

DEVSYS	Development of Sciences Information System
DIALOG	Dialog Information Retrieval Service.
DID	Drainage and Irrigation Department.
DMS	Data Management System.
DOS	Disk operating system.
EDP	Electronic data processing.
ESA	European Space Agency.
EURATOM	European Atom.
EURONET	European Network.
FAMA	Federal Agricultural and Marketing Authority
FAO	Food and Agriculture Organisation.
FAX	Facsimile
FIMA	Food Industries of Malaysia
FORTRAN	Formula Translation
FRI	Forest Research Institute
GH	General Hospital
GIS	Generalised Information System
HDV	Header, Directory, variable
IAEA	International Atomic Energy Agency
IBM	International Business Machine Corporation
IDD	International Direct Dialling
IIASA	International Institute of Applied Systems Analysis.
IMR	Institute of Medical Research
IMS	Information Management System
INIS	International Nuclear Information System
INMARSAT	International Maritime Satellite System

INTAN	Institute Tadbiran Awam Negara
INTELSAT	International Telecommunications Satellite Organisation
INSPEC	Information Services for the Physics and Engineering Communities
IOCOM	Indian Ocean Commonwealth Submarine Cable System
IPSS	International Public Switching System
IRS	Information Retrieval Service
ISD	International Subscribers Dialling
ISIS	Integrated Set of Information Systems
IVR	Institute of Veterinary Research
JTM	Jabatan Telekom Malaysia
JSTIC	Japan, Scientific and Technical Information Center
K.L.	Kuala Lumpur
LEN	Lembaga Letric Negara (National Electricity Board)
MAJUIKAN	Fisheries Development Authority of Malaysia
MAJUTERNAK	National Livestock Development Authority
MAIMARC	Malaysian Machine Readable Catalogue
MAMPU	Malaysian Administration Modernization and Manpower Planning Unit
MARDI	Malaysian Agricultural Research and Development Institute
MAS	Malaysian Airline System
MB	Megabits
MRI	Mines Research Institute
NICT	National Institute of Computer Training
NIH	Not invented here
NLDC	National Load Despatch Centre
NRZI	Modified non return to zero
NSDIC	National Scientific Document and Information Centre

NSRDC	National Scientific and Research and Development Council.
OANA	Organisation of Asian News Agencies
OCR	Optical Character Recognition
OS	Operating system
PE	Program element
PETRONAS	Petroleum Nasional
PJ	Petaling Jaya
PL/I	Programming Language I
PLANCODE	Planning, Control and Decision Evaluation System
PMD(JPM)	Prime Minister Department
PORM	Palm Oil Research Institute Malaysia
PROJACS	Project Analysis and Control System
PSDN	Public Switch Data Network
PSTN	Public Switch Telephone Network
PUSPATI	Pusat Penyelidikan Atom Tun Ismail
PWD	Public Works Department
QBE	Query by example
RJE	Remote job entry
RPG II	Report Program Generator II
RRIM	Rubber Research Institute, Malaysia.
SAS	Statistical Analysis System
SCI	Science Citation Index
SDI	Selective Dissemination of Information
SEACOM	South East Asia Commonwealth Undersea Cable

SEARCC	South East Asia Regional Confederation Conference
SIRIM	Standard Industrial Research Institute, Malaysia
SPINES	Science Policy Information Exchange System
SPSS	Statistic Package for the Social Sciences
STAIRS	Storage Information Retrieval System
STATLIB	Statistical Library
STD	Subscriber Trunk Dialling
TRN	Temporary Reference Number
TROLL	Time Shared Reactive online laboratory.
UH	University Hospital
UKM	University Kebangsaan Malaysia
UM	University Malaya
UNISIST	Universal System for Information in Science and Technology
UPM	University Pertanian Malaysia
USA	United States of America
USM	University of Science, Penang
USSR	United Socialist Soviet Republic
UTM	University of Technology, Malaysia
VINITI	Referativnyi Zhurnal Fizika
VM	Virtual Machine
VSI	Virtual Storage I
WATS	Wide Area Telephone Services.

LIST OF MAPS

		<u>Page</u>
Map 1	Peninsular Malaysia	1
Map 2	Malaysia in the International Communication Networking.	21
Map 3	The connection of earth satellite stations from Kuantan and Malacca to INTELSAT Satellite for link to Vienna, London and U.S.A.	22
Map 4	Tymnet - initial implementation	114
Map 5	Network configuration.	116

LIST OF GRAPHS

		<u>Page</u>
Graph 1	Growth of data circuits.	25
Graph 2	Growth of facsimile circuits	29
Graph 3	The growth of computers in Malaysia.	62
Graph 4	The growth which has taken place in the number of participating centres since INIS began.	94
Graph 5	The amount of output produced by INIS since 1970.	95
Graph 6	Cost per search for searching INIS from Malaysia.	166
Graph 7	Cost per search for searching INIS databases from overseas.	167
Graph 8	Cost per search for searching chemical abstract.	168
Graph 9	Cost per search for searching Science Citation Index.	170
Graph 10	Cost comparison on sending or obtaining the original document.	190

LIST OF ILLUSTRATIONS

	<u>Page</u>
1. List of radio isotopes proposed to be produced by PUSPATI And applied in the field of medicine, agriculture and industry.	11
2. Type of information provided by INIS and type of information required by Puspati.	14
3. List of organisation which will need the information on nuclear field.	16
4. Information exchange between Puspati with national, inter- national and private organisation.	17
5. Characteristic of communication satellites.	21
6. Growth of the data circuits.	24
7. Data circuits by categories of business.	25
8. Growth of facsimile circuits.	28
9. Point to point configuration.	31
10. Multipoint configuration.	31
11. Multipoint configuration - star network.	32
12. Example of star network in Europe.	32
13. Data network as 31.12.1976.	33
14. Data network as end of 1980.	34
15. Data transmission through dial up public switch telephone network (PSTN).	38
16. Growth of computers by number of installations.	61
17. No. of computers by supplier, memory size and percentage	63
18. List of computers in government or semigovernment.	64
19. List of software available in the computer centre, Prime Minister's Department, Kuala Lumpur.	67

20.	The development of INIS in chronological order.	85
21.	INIS subject scope.	88
22.	The INIS philosophy.	90
23.	INIS section in IAEA.	92
24.	INIS section.	93
25.	List of INIS Seminar, workshop, training and online training.	99
26.	Flow chart of the INIS computer processing - I.	107
27.	Flow chart of the INIS computer processing - II.	108
28.	Overview of INIS operation.	109
29.	Arrangement sequence for obtaining online service to the INIS database in Vienna.	112
30.	Cumulative connect times for January-November 1980 to INIS database by external users.	113
31.	Document delivery online.	117
32.	Document delivery off line.	118
33.	Electronic publishing.	122
34.	Language problem	126
35.	Language problem (search software).	126
36.	Typical start up expenses for online searching.	140
37.	Recurring cost for online searching.	142
38.	Cost comparison in obtaining the references from different places.	165
39.	Method of doing online search from Puspati.	172
40.	The rank on the cost per search in doing the literature search.	173

41.	The several types of 3M machines.	186
42.	Cost comparison in obtaining the original document.	187
43.	Cost comparison on searching or obtaining the original document by different methods from Puspatri to U.K.M., Kuala Lumpur and Penang.	188

LIST OF APPENDICES

A	INIS Member States and Organisations.	207
B	List of INIS Information Officers.	208
C	INIS worksheet - bibliographic and indexing data.	212
D	INIS worksheet - Abstracts.	213
E	LOGGING on procedure for searching INIS database.	214
F	Database usage charges per connect hour on DIALOG system which will be used by PUSPATI.	220
G	Cost related to several methods of obtaining nuclear references.	221
H	Cost related to several methods of obtaining the original documents.	240
I	Letter from Singapore Telecom.	255
J.	Letter from Inspec.	261
K	Letter from Puspati.	262

ACKNOWLEDGEMENTS

The author wishes to express his sincere thanks to:

1. Miss S. Keenan and Mr. Smith for his helpful suggestions and supervision of this work.
2. Dr. Mohd Othman, Electrical Engineer, Telecommunication Department Malaysia for help providing information.
3. Dr. Ghazee Ismail, Electrical Engineer, University Science Penang for helping in providing information.
4. Mrs. Dr. Ghazee, Computer Scientist, University Science, Penang.
5. Dr. Ahmad Tajuddin Ali, Deputy Director Operational, Tun Ismail Atomic Research Centre for providing information.
6. Brother Mashuq Ally, Islamic Foundation for proof reading and correction.
7. Brother Omar Ya'acub, Computer Centre, Prime Minister's Department, Kuala Lumpur for providing valuable information.
8. Sister Sharifah Muzlifah for checking and correcting the article.
9. The Malaysian government, Puspatri, IAEA and British Council for providing the scholarship support without which this thesis would not have been possible.
10. My parents for patient support and encouragement.
11. Last, but not least, my wife deserves particular mention for bearing with fortitude the trials and tribulations of authorship. My wife, in particular, not only gave me encouragement and support but also typed and proof read the various drafts and the final copy. I am deeply

grateful. THANKS TO ALLAH.

12. Mrs. Hollingworth for typing this thesis.

ABSTRACT

PUSPATI or Pusat Penyelidikan Atom Tun Ismail (Tun Ismail Atomic Research Centre) in Malaysia is a government body and plans to establish a library and information unit. One of the problems facing this unit is the acquisition of nuclear information from within Malaysia and from the literatures available in this world. Secondly the problem of how Puspatti could perform his duty to disseminate this information to the users and to collect the information related to the nuclear field available in Malaysia in order to prepare for the INIS input processing and also for the preparing of INIS bibliography in Malay language. It is the purpose of this dissertation to look into the availability of scientific and technical information sources in Malaysia; to explain the situation of data communication and telecommunications in Malaysia; to discuss the availability, utilization, hardware and software of computers in Malaysia; to show the operation and services provided by INIS to its members; to propose several methods of undertaking literature search either by manual, online, batch processing and telex; to discuss what are the methods available to acquire the original documents; and to compare the estimate cost on each method in order to conclude upon the most economical method of obtaining nuclear information.

INTRODUCTION

In order to centralise and co-ordinate nuclear information within Malaysia, the Malaysian government established an Information Science Division in Tun Ismail Atomic Research Centre in 1977, otherwise known in Malaysia as Pusat Penyelidikan Atom Tun Ismail, commonly referred to as Puspati, a term which will be used throughout this dissertation. Information Science Division in Puspati consists of library, technical information, publications and computer unit. Since its inception one of the fundamental problems impeding the fulfilment of Puspati's function is its inability to acquire nuclear information which is available both at the national and international levels in order to help Puspati Research and Development Project.

In recognition of this basic problem, it is the purpose of this dissertation to identify the methods available whereby literature search, either manually, online, batch processing or telex system, can be undertaken; and suggest how such methods can be used to obtain the information on references, after taking into account the availability of data communication in Malaysia such as telecommunications and computer facilities as well as the availability of databases related to the nuclear field.

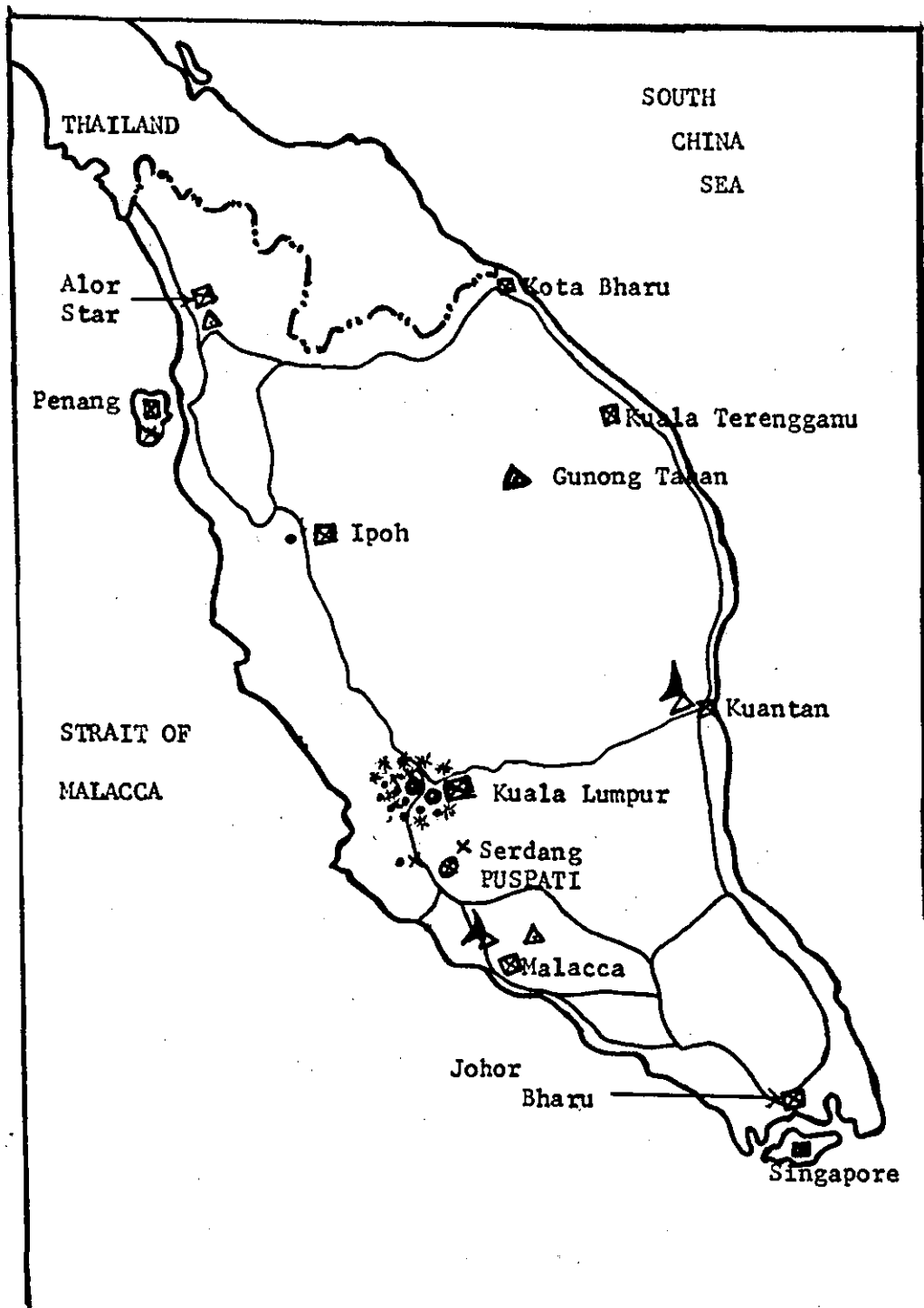
After introducing Malaysia and locating it in relation to its neighbouring countries and after describing the scientific and technical information sources available in the country, a short

history of Puspatti will be given, its objectives and what type of radio isotopes it produces; and the kind of organisations likely to draw upon Puspatti for information. With Malaysia being relatively new to data communication and telecommunications a general survey of the conditions of lines, data network and existing networks in Malaysia will be undertaken. We will then proceed to discuss the current state of computer technology in Malaysia; software and hardware available; personnel and training; and back up services for computer operations. It should be noted that the utilization of computer facilities is still very low in Malaysia even though large and sophisticated mainframes have been installed in so many organisations.

In addition, since the INIS (International Nuclear Information System) under the IAEA (International Atomic Energy Agency), located in Vienna, feeds all the nuclear atomic commissions in the world with nuclear information, it will be necessary to examine its role and function in relation to Puspatti. Therefore, in this dissertation, we will describe the historical background of INIS and its many functions and services it performs for its Member States.

In conclusion to this dissertation discussion will be made on how to identify the problems of computer utilization, information sources, telecommunication conditions and which method will be an economical way of doing literature search, as well as how to obtain the original documents economically.

MAP 1: PENINSULAR MALAYSIA



— · — · — · —	International Boundary
~~~~~	Road
☒	City or town
×	Universities
•	Research institutes
◦	Hospital
*	Government departments
⊗	PUSPATI
▲	Satellite Earth Stations.
△	Mountains

Sources: Philip, The International Atlas. George Philip, London (1969), 104.

## CHAPTER 1

### BACKGROUND ON MALAYSIA AND PUSPATI

This chapter of the dissertation will survey the information sources that are available in Malaysia as well as giving a short history of Puspati.

Malaysia, formerly known as Malaya, consists of 13 States. It lies at the heart of South East Asia and surrounded by the neighbouring countries Indonesia, Singapore, Thailand and Philippines. It occupies two distinct regions which are separated by about 400 miles of the South China Sea. Peninsular Malaysia extended from the Kra Isthmus southwards to the Straits of Johore. To the East, the second region is the Western coast of Borneo or Kalimantan, where the states of Sabah and Sarawak are. The country covers an area of about 130,000 square miles, and located between latitude  $1^{\circ}$  and  $7^{\circ}$  North and longitude  $100^{\circ}$  and  $199^{\circ}$  East. It has a monsoon climate prevailed by the Southwest and Northeast monsoons. The time difference from the Greenwich line during the summer time is about 7 hours.¹

#### 1.1 INFORMATION SOURCES IN MALAYSIA

The sources of information in Malaysia can possibly be classed into the following groups:²



1. Libraries, documentation centre and archives, such as National libraries, university libraries, special libraries and National Archives, Kuala Lumpur.
2. Information centres: Tourist Development Board (TDC), City Information Centre.
3. Government information sources - regional and local administration unit and foreign embassies.
4. Societies such as Chemical Society of Malaysia, Malaysia Computer Society, Malaysia Institutes of Engineering.
5. The publishing and printing industry: newspapers and magazines, professional publications, book publishers and printers.

I will only discuss group number one here since most of the scientific and technical information sources in Malaysia are available from the libraries especially from the special libraries and the academic libraries.

These libraries which are attached to government departments or statutory authorities and are financed wholly or partially from the federal or state government funds. The existing libraries and information centres, with very few exceptions, are playing a passive role in the information field. They are contented with a passive, repository function. The service element which should in fact dominate the library operation seems to have been sadly neglected. Library development is generally unplanned, unco-ordinated and is developing in isolation.³

The present tendency of expanding existing libraries and information centres and creating new ones is no solution to the need for properly organised and systematised information which is a pre-requisite to the effective transfer of knowledge. The ideas of sharing, combining and co-ordinating available resources for the greater benefit of all which is the basic philosophy of the librarian's creed is noticeably overlooked. There is obviously an urgent need to have a plan for a complete restructuring of the existing libraries on a sound foundation. This could be in the form of a network consisting of existing agricultural, educational, industrial and medical agencies and institutions as well as those to be established, aiming at providing information rapidly and efficiently, by co-ordinated and co-operative efforts at national level, and also at international level by developing links with international information services such as INIS and AGRIS.

## 2.2 SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

The availability of the scientific and technical information in the Malaysian libraries can be conveniently studied under the following categories:

- (a) Agricultural research libraries.
- (b) University libraries.
- (c) Medical libraries.
- (d) Industrial libraries.
- (e) Mining and geological research libraries.
- (f) Miscellaneous libraries.

In spite of the rapid industrialisation that Malaysia has achieved since independence, agriculture still remains the mainstay of its economy, contributing about 25% of the Gross National Product, employing two-fifths of the labour force and earning 50% of its foreign exchange. It is therefore not surprising to find that agricultural research is heavily subsidised by the government and that libraries in this field constitute the largest group of special libraries.

The libraries categorised under this group are Rubber Research Institute (RRIM), Ministry of Agriculture Library, Malaysian Agricultural Research and Development Institute (MARDI) library, Fisheries Development Authority Malaysia (MAJUikan), Federal Agricultural and Marketing Authority (FAMA), Food Industries of Malaysia (PIMA), Forest Research Institute (FRI), Institute of Veterinary Research in Ipoh (IVR) and Palm Oil Research Institute Malaysia (PORIM). Of these libraries, only Rubber Research Institute Library has a complete collection of bibliographical tools such as abstracts, indexes, proceedings and reports.

None of the above libraries has any patents literature. Most of the above libraries subscribe to periodicals but only Rubber Research Institute, Ministry of Agriculture Library and MARDI subscribe to more than 1,000 periodicals titles annually.

There are five university libraries in Malaysia:

- (a) University of Malaya.
- (b) National University of Malaysia.
- (c) University of Technology Malaysia.
- (d) University of Agriculture, Serdang.
- (e) University Science Penang.

Most of these university libraries have quite an adequate quick references materials depending on the specialisation of their teaching purposes. Three out of the five above libraries have science and technology collections and are grouped around the Kuala Lumpur area which is about 20 miles from PUSPATI Sites, while the University of Agriculture Library is 8 miles from Puspati and University of Science Penang is the furthest about 234 miles from Puspati. Most of these libraries have Chemical Abstract, Physic Abstract but only the University of Technology Malaysia has Science Citation Index and it is the only one in Malaysia. None of these libraries have technical reports and patent. All the library collections are classified under Library of Congress Classification Scheme and catalogued in card form except University of Science Penang which has introduced a new microfiche catalogue based on the MAIMARC (Malaysian Machine Readable Catalogue) system.

Since only two Universities in Malaysia conduct medical courses, at the University of Malaya and the National University of Malaysia,

only the University of Malaya, Medical Library possesses the largest collection with about 50,000 volumes and over 1,000 current serials.⁴

Apart from these two universities the Institute Medical Research (IMR) also has a small Medical Library, situated in the area of Kuala Lumpur city.

Industrial libraries are found mostly in the Industrial Estates Areas, such as Sungai Way Free Trade Zone, Petaling Jaya, Datok Keramat Industrial Estate. These libraries are small and have collections pertaining to their manufacturing interests and subscribe to not more than 50 journal titles. Other libraries which are classified under Industrial Libraries are Rubber Research Institute (RRI) and standards for Industry and Research Institute of Malaysia (SIRIM). SIRIM libraries is located in the Shah Alam and is about 37 miles from Puspati. This library possesses all the standards, mostly British Standards and Canadian Standards.

The two types of government libraries which are involved in mining and geological research are the Mines Research Institute (MRI) in Ipoh which is the Research Division of the Mines Department, established in 1956, and the Geological survey of Malaysia. The collection of Mines Research Institute is very small being less than 2,000 volumes.⁵ However, it subscribes to about 50 periodical titles and possesses a large collection of research reports. The Geological Survey Reference Library in Ipoh possesses about 4,000 books and 40 periodicals subscriptions. Petroleum National Berhad (PETRONAS) in Kuala Lumpur possesses quite a big library collections run by a professional librarian and recently started an information section under the library unit.

The undermentioned libraries provided services to their individual institutions, with the exception of the National Library of Malaysia because they are small libraries. They are from the Public Work Department, National Electricity Board (LIN), Police, Chemistry Department, Department of Irrigation and Drainage (DID) and Meteorological Department. All these small libraries are situated around Kuala Lumpur area and are under the charge of Library Assistants.

Though the National Library of Malaysia is located in the heart of Kuala Lumpur city and possesses a collection of quick references materials on science and technology such as Chemical and Physic Abstracts, it does not have many research reports and no patents.

### 1.3 PUSPATI HISTORY

In 1972, PUSPATI the acronym for Pusat Penyelidikan Atom Tun Ismail or Tun Ismail Atomic Research Centre was set up under the Ministry of Science, Technology and Environment.⁶

It is charged with the following objectives: to operate and maintain a research reactor; to undertake research and development in science and technology; to conduct training courses concerned with nuclear radiation; to produce some short-lived radio isotopes; to promote and co-ordinate the utilisation of the reactor and its experimental facilities among the various research institutes and universities; to perform personal monitoring and environmental surveillance.

When it becomes operational in 1984, the centre will be run by about 100 professionals including several local nuclear scientists.⁷

An agreement was signed in Vienna on September 22, 1980 between the IAEA, Malaysia and United States of America for the supply to Malaysia of a Triga Mark Two research reactor and 24.760kg of uranium enriched to less than 20% containing fuel elements for the operational of the reactor.⁸

This will be the first Malaysian nuclear research reactor which is supposed to take shape in Sungai Buloh but then moved to Bangi near National University of Malaysia in 1979. The reactor is the Triga Mark II fixed core type. It is a 1 MW watercooled reactor with a built in safety mechanism to prevent uncontrollable nuclear reaction. The reactor uses uranium Zirconium hydride fuel elements.

#### 1.4 USE OF RADIO ISOTOPES IN MALAYSIA

The isotopes produced would be important for agricultural, medical and industrial research uses. The list of radio isotopes proposed to be produced by PUSPATI and applied in the field of medicine, agriculture and industry is given in illustration 1.⁹

In agricultural research, short-lived isotopes as K42 and CN64 could be used in measuring uptake and distribution of materials in plants and also for use to trace elements important to plant life.¹⁰

Other isotopes such as N13 and F18 could be used for medical diagnosis. The centre would also help medical research on cancerous body cells and the study of bone growth and diseases. Nuclear medicine is not new to Malaysia. The application of radionuclides in medicine was first attempted by the Radiotherapy Institute in 1960.¹¹ The medical applications are centred in the General Hospital and the University Hospital. To get a feeling of the amount of radio isotopes involved in medical applications, the General Hospital spent approximately £25,000 in 1977 to acquire the radio isotopes from overseas.¹² The University Hospital also spent about the same amount in the application of radio isotopes for the nuclear medicine treatment.

Industry in general use long-lived radio isotopes. They use high-level sources for processing and low-level ones for process control and gauging. The types of industry already using radio isotopes are those involved in production of electronics components, chip-board, cigarettes, sugar, petroleum mining and general engineering services.

Industries may not be using very much nuclear techniques at present but with the training of more manpower in these techniques by PUSPATI and the realisation of the superiority of these techniques it is envisaged that industrial use of radio isotopes and nuclear techniques will increase.



Illustration 1

List of radio isotopes proposed to be produced by PUSPATI and applied in the field of medicine, agriculture and industry.

Isotopes	Chromium 51	Cobalt 58	Copper 64	Flourine 18	Gold 198	Iodine 125	Iodine 131	Iron 59	Mercury 197	Phosphorus 32	Potassium 42	Rubidium 86	Sodium 24	Technetium 99	Yttrium 90
Chemical Symbol	Cr	Co	Cu	F	Au	I	I	Fe	Hg	P	K	RU	Na	Te	Y
Halflife	d 27.	d 71.	h 12.	M 109	d 2.7	d 60	d 8	d 45	h 64	d 14	h 12	h 15	d 87	h 6	h 64
Medicine	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Industry			✓				✓		✓	✓					✓
Agriculture		✓	✓			✓	✓	✓		✓	✓	✓		✓	✓
Radiography							✓								
Diagnosis						✓	✓			✓				✓	
Radiopharmaceuticals	✓			✓	✓	✓	✓				✓			✓	✓
Radiotherapy	✓				✓	✓	✓			✓					
Dose rates					✓		✓								
Personnel monitoring							✓								
Scientis scanning				✓		✓	✓		✓					✓	
Tracer techniques	✓		✓			✓	✓	✓		✓	✓	✓	✓	✓	
Nuclear magnetic moments		✓							✓		✓		✓		
Radiocardiography														✓	
fishes		✓						✓						✓	✓
soils	✓						✓	✓				✓			
cat scanning			✓											✓	

d = days; h = hours; m = minutes

The major types of radioactive elements used in teaching institutions are low level long-lived type. It is being used for solid states physics, neutron beam experiment such as analysis of crystal structure, fast neutron radiation damage experiment and time flight studies could be performed. Other applications include nuclear chemistry studies of very low concentration solutions, hydrodynamics and mass transfer. So far there are \$15 million (£3 million) nuclear equipment spread all over the country for training purposes.¹³ The government would establish a training school at PUSPATI during the Fourth Malaysia plan to produce skilled personnel in the field of nuclear technology.

#### 1.5 THE NEED OF NUCLEAR INFORMATION IN MALAYSIA

In order to obtain and to disseminate nuclear information in Malaysia, Puspatti should set up an information centre. This information centre must have a close relation with INIS. Thus, in 1978, Puspatti joined INIS and became the INIS centre for Malaysia. The objectives of this information centre are: to obtain and to disseminate the information related to the nuclear fields; to assist the Research and Development project in Puspatti by providing information such as ideas on hypothesis, manual, analysis of data writing reports and references. Also to assist the Malaysian Institutions in applications of radio isotopes in industry, agriculture and medicine; to help Malaysians in propagating the information work and lastly to act as the Malaysian centre for INIS. In this situation, it is the duty of Puspatti to collect any information available in Malaysia

which is related to the application of nuclear technique and to input the data to the INIS centre in Vienna. On the contrary, Puspatti also has the task to distribute any information which falls under the INIS subject scope to the Puspatti users. See illustration 2 as a comparison on what information provided by the INIS subject scope and what is the information required by Puspatti.

Illustration 2

Types of information provided by INIS and the types of information required by Puspatti.

INIS subject scope	Puspatti subject scope
Physical sciences	
(i) General Physics	No
(ii) High energy physics	No
(iii) Neutron and nuclear physics	Yes
Chemistry, materials and Earth Sciences	Yes
Life Sciences	Yes
Isotopes and radiation application	Yes
Engineering and technology	
1. Engineering	Yes
2. Nuclear Reactors	No
3. Specific reactor types their associated plants.	Yes
4. Instrumentation	Yes
5. Waste Management	Yes
Other aspects of nuclear energy	
1. Economics	Yes
2. Nuclear law.	Yes
3. Nuclear documentation	Yes
4. Safeguards and inspection	Yes
5. Mathematical methods and computer codes	No
6. Miscellaneous:	
- general relevant documents	Yes
- progress reports	Yes
	Library
	Information Science
	Computer
	Management Training

Most of the users are situated around Kuala Lumpur and for about 20 miles north of Puspatti building. The nearest users are National University of Malaysia, Mard and Agriculture University of Malaysia which is about 3, 8 and 10 miles north of Puspatti sites. The furthest is Penang located at the north of Malaysian Peninsula. The distance from one user to the other Puspatti users are shown in the illustration 3 and map 1. The list of organisations which will need the information on nuclear fields; the facilities available on those organisations and the information exchange between Puspatti with the national, international and private company all are illustrated in illustration 3 and 4. Puspatti will disseminate the information which fall under the INIS subject scope, to the Universities, hospitals, research institutes, industries, government bodies and to the Puspatti staff itself. In order to obtain the nuclear information, Puspatti will make a contact with IAEA for INIS or FAO for AGRIS. Since Puspatti is also conducting research related to agriculture, AGRIS databases is also required to be retrieved. Outside from the INIS or AGRIS subject scope, any information needed by Puspatti will be retrieved through DIALOG for the online search method. Australian Atomic Energy Commission (AAEC) in Lucas Height is the other source for getting information since it was established quite a long time ago. AAEC is also having relation with Puspatti in the area of inter-library loan, recruiting Puspatti staff and supervising the administration of library and information unit.

Illustration 3

List of organisations which will need the information on nuclear fields.

Type	Name of Institution	Code on map	Location	Institutional type	Abbreviation	Distance	Computer	Communication	Library
University	National University	X	Gangi	SG	UKM	3	M	Ti	L
	University of Malaya	X	K.L.	SG	UM	25	S	Ti	L
	University Technology	X	K.L.	SG	UTM	24	L	Ti	L
	University of Agric.	X	Serdang	SG	UPM	8	L	Ti	L
	University Science	X	Penang	SG	USM	270	L	Ti	L
Hospital	General Hospital	o	K.L.	G	GH	24	S	-	S
	University Hospital	o	K.L.	SG	UH	25	S	-	L
Research Institutions	Standard Research Inst.	.	Shah Alam	SG	SIRIM	36	-	-	M
	Rubber Research Inst.	.	K.L.	SG	RRIM	27	S	Ti	L
	Agriculture R & Dev.	.	Serdang	SG	MARDI	8	I	-	M
	Fisheries Dept.	.	Penang	SG	MAJU IKAN	270	-	-	S
	Institute Medical Res.	.	K.L.	G	IMR	24	-	-	S
	Palm Oil Rsh Institute	.	K.L.	SG	PORIM	24	-	-	S
	Forest Research Inst.	.	K.L.	SG	FRI	29	-	-	S
	Veterinary Rsh Institute	.	Ipoh	G	VRI	134	-	-	-
	Mines Research Institute	.	Ipoh	G	MRI	134	-	-	-
	Petroleum National	.	K.L.	P	PETRO	25	M	Ti	S
	Malaysian Airline System	.	K.L.	P	MAS	25	L	Ti	S
	Lembaga Letrik Negara	.	K.L.	SG	LIN	24	L	Ti	S
	Industrial Shipping	.	K.L.	P	MISC	24	-	Ti	S
	Federal Land Dev.	.	K.L.	SG	FELDA	24	M	Ti	S
Government Departments	Ministry of health	*	K.L.	G	MH	24	-	-	-
	Geological survey	*	K.L.	G	GS	24	-	-	-
	Police Department	*	K.L.	G	PD	24	M	-	-
	Chemistry Department	*	K.L.	G	CD	22	-	-	-
	Department of Agriculture	*	K.L.	G	DA	24	-	-	-
	Department of Drainage	*	K.L.	G	DID	22	-	-	-
	Meteorological Department	*	K.L.	G	MD	22	-	-	-
	Public Work Department	*	K.L.	G	PWD	24	S	Ti	-
	Army Workshop	*	K.L.	G	AW	25	-	Ti	S
	Prime Minister's Dept.	*	K.L.	G	JPM	24	L	Ti	M
	National Library	*	K.L.	G	PNM	24	-	Ti	L

Key: K.L. = Kuala Lumpur  
 SG = Semigovernment  
 G = Government  
 P = Private company

	Computer	Library
S = Small	< 256 K	< 100 periodicals
M = Medium	256K-1MB	100-500 periods.
L = Large	> 1MB	> 500 periodicals

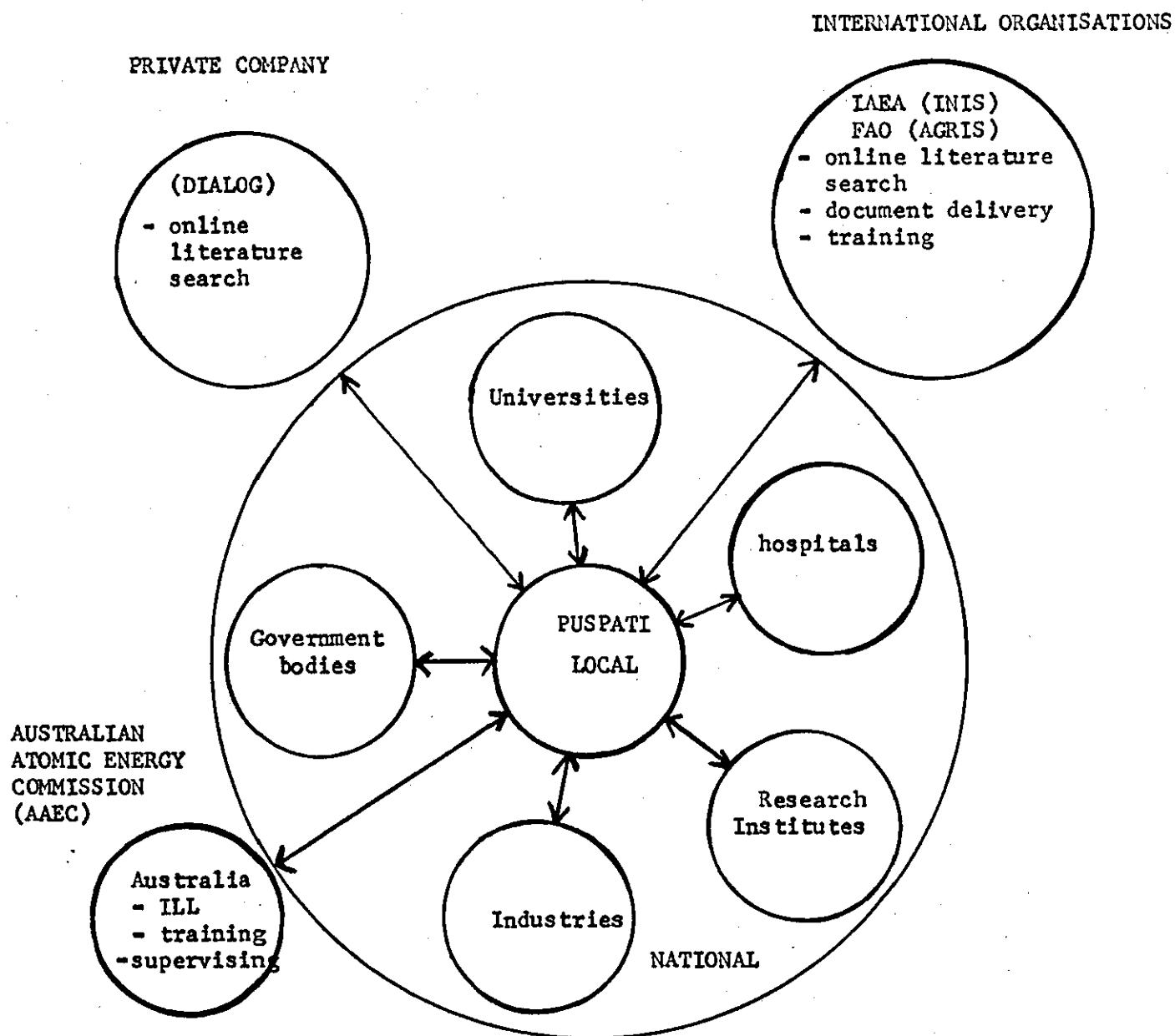
Ti = Telex in institution  
 Ti = Telex in the library

Based on:

1. Tabatan Telekom, Telex Directory (1979).
2. Computer Survey 82/5 International & U.K. List of computers Part P-S 1982, 71-72.
3. List of computers in Malaysia (unpublished reports) by Prime Minister Dept.
4. I.Samat, 'Apakah Puspatti', Pamphlet (1978).

Illustration 4

Information exchange between Puspati with national, international and private organisations.



Based on:

1. I. Samat, Apakah Puspati. Pamphlet, 1978.
2. B. Yatim, What is Puspati? Tun Ismail Atomic Research Centre, Booklet, 1979.

# REFERENCES

1. Kasim, I., Planning for an agricultural information network in Malaysia in the context of AGRIS. Unpublished MIS dissertation, Loughborough University of Technology (1979).
2. Wijayasuria, D.E.K., 'The development of national information systems', Journal of Information Sciences, V.1 (1979), 31.
3. Wijayasuria, D.E.K., LIM HUCK TEE and Radha Nadarajah, The barefoot librarian: library developments in South East Asia with special reference to Malaysia. London: Clive Bingley (1975), 55-60.
4. Ibid., 55.
5. Ibid., 60.
6. M\$4.5 million nuclear reactor to be operational in 1980. Malaysian Digest (31 January 1977), 5.
7. Utusan Melayu 'Pembinaan PUSPATI tergendala hingga 1984' (13 February 1982).
8. 'Perjanjian penting ditanda tangani', Warta Puspatti 3 (4) (1980), 21.
9. Baharuddin Yatim, 'What is Puspatti?', Puspatti, Kuala Lumpur, (1980), 5.
10. Bole, J.B. 'Rational use of fertiliser', IAEA Bulletin 23(3), (1981), 27.
11. 'Nuclear Medicine: its growth and future in Malaysia', Malaysian Digest, (15 September 1980), 3.
12. Baharuddin, op. cit., 8,
13. \$15 million nuclear equipment all over the country, Malaysian Digest (15 May 1981), 5.



## CHAPTER 2

### DATA COMMUNICATION AND TELECOMMUNICATION NETWORK IN MALAYSIA

#### 2.1 INTRODUCTION

Malaysia has two earth satellite stations, one is operating in Kuantan and the other is in Malacca.¹ The one in Malacca an \$18 million station operating via the INTELSTAT (International Telecommunications Satellite Organisation) Satellite over the Indian Ocean.² See map 2. It started operations in August, 1980 to improve communication between Malaysia and a number of countries such as Hong Kong, China, Taiwan, France, West Germany, Saudi Arabia, India, Sri Lanka, Japan, Holland, Britain and Asian countries via the Indian Ocean. To support this station, the station at Kuantan provides a link with the United States, Australia and Korea via the Pacific Ocean.³

#### 2.2 MALAYSIA IN THE INTERNATIONAL COMMUNICATIONS NETWORKING

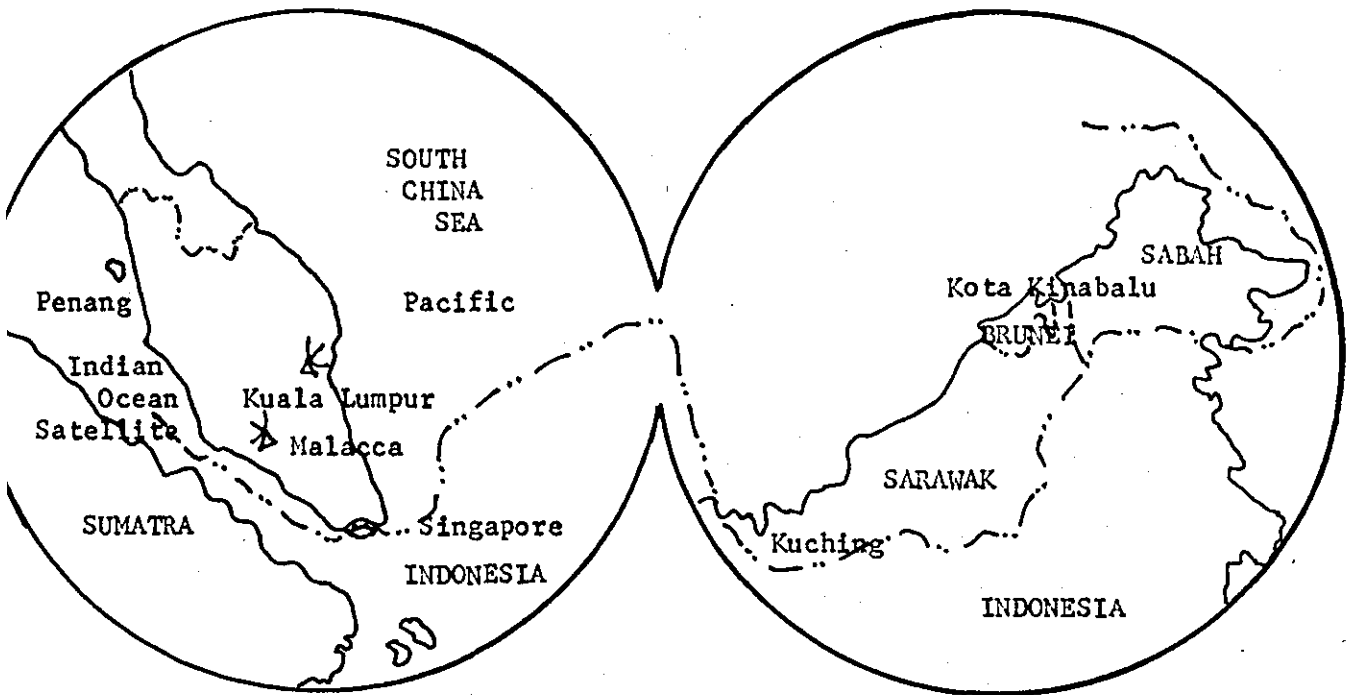
Malaysia has been a member of INTELSAT since 1971 and plays an active role as chairman for 1981-1982. The Malacca earth satellite station will make use of the second INTELSAT V satellite once all tests are completed in middle 1982. The INTELSAT an organisation of 83 nations operates today a global network of satellite communications, connecting satellites on six continents. Seven satellites are in operational use, carrying over 3,500 telephone circuits on a

full-time basis, plus additional telecircuitings and television on an occasional basis.⁴ See map 2. The latest generation of satellites now in use is known as INTELSAT V. INTELSAT V makes use of the latest technology in new 14 and 11 GHz frequency bands and is used by INMARSAT (International Maritime Satellite System) for ship to shore; or ship to ship communications.⁵ It has 27 transponders and can accommodate 12,000 full duplex telephone lines and two television channels.⁶ This satellite, the first of which was launched in 1982, is the seventh in a series of starting with the Early Bird Satellite in early 1965 (Illustration 5).

So far the Telecoms Department of Malaysia is experimenting the use of view data type system known as PRESTEL from Britain which can provide a wide range of information to its users. It would cost about M\$2.5 million (£600,000) to instal a full system in Malaysia.⁷

Existing telecommunications facilities in the Asia-Pacific region are sufficient to cater for the proposed Asian News Network (ANN) service which was launched in Kuala Lumpur in late 1981.⁸ The infrastructure of network was provided by the Organisation of Asian News Agencies (OANA). ANN speeded up the flow of news in the region. The 5 member states of ASEAN will be linked by an undersea cable telecommunications network by the end of 1982.⁹

Map 2

Based On:

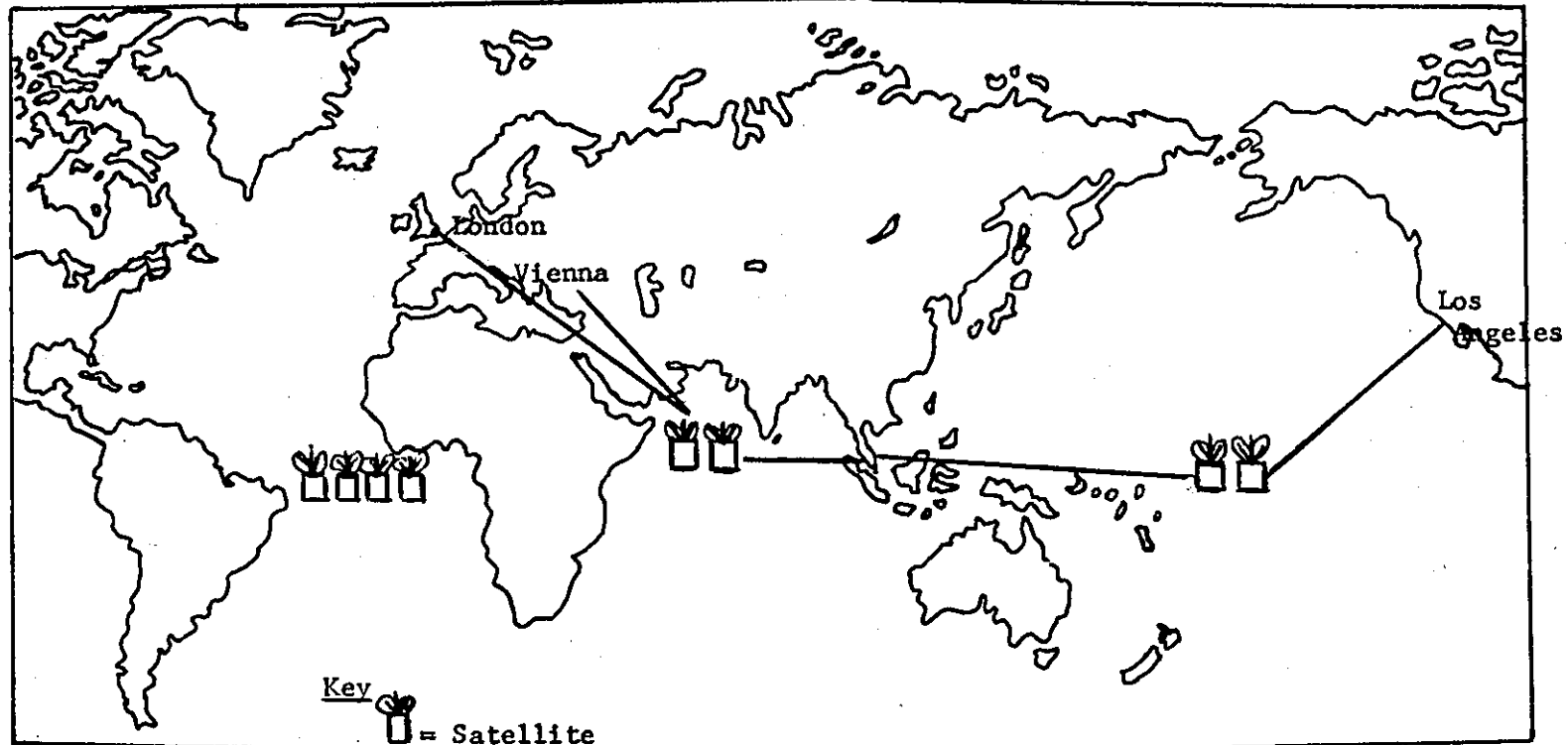
1. Far Eastern Economic Review, ASIA 1982 Yearbook, Hong Kong (1982):195
2. Malaysian Digest (31 December 1981): 7.

Illustration 5: CHARACTERISTIC OF COMMUNICATION SATELLITES

	Intersat I	II	III	IV	V
Year	1965	1967	1968	1971	1974
Weight on orbit	85lbs.	192lbs.	322lbs.	1547lbs.	3,200lbs.
No. of transponder	2	2	2	12	27
Bandwidth total	42MHz	125	450	500	14GHZ
Use of telephones	240	240	1200	5000	12,000

Sources: J. Martin, Communications satellite systems. Prentice Hall,  
London (1978): 10.

Map 3



The connection of earth satellite stations from Kuantan and Malacca to INTELSAT Satellites for link to Vienna, London and U.S.A.

Based on: Martin, J., Communication Satellite System. Prentice Hall, U.S.A. (1978): 5.

Thailand, Malaysia, Singapore undersea project being undertaken through the Asean Committee on Trade and Transport (COTAC) had its Malaysian terminal in Kuantan. Undersea cable projects are currently being undertaken to link Medan in Sumatra to Penang (Malaysia).¹⁰ Up to now Malaysia has made co-operated in the laying down and operation of IOCOM (Indian Ocean Commonwealth Submarine Cable System) and the South East Asia Commonwealth (SEACOM) undersea cable.

On May 4, 1981 Malaysia signed the \$137.7 million Indian Ocean Commonwealth Submarine Cable System (IOCOM) with other commonwealth countries - Sri Lanka, India, Canada, Australia, Singapore and Britain. Malaysia's communication system with the world would be 99.9 percent reliable with the IOCOM system which is backed by the present Indian Satellite system and vice versa. The demand for external communication in Malaysia was growing by about 30 percent per year.¹¹ The IOCOM which is expected to be operational by the middle of 1982 has a capacity of 480 circuits for telephone, telex telegraph and data services with the terminal ends at Kuala Muda, Kedah in Malaysia and Madras in India.

However with the rapid rate of economic development there is a good reason to believe that there will be heavy demands for data communication in a year or two.¹² The data given in this paper were mainly taken from the Telephone Department Journal.¹³

### 2.3 GENERAL SURVEY

The first use of data communication service in Malaysia was in 1973 and the rate of growth in the number of users was slow in the beginning, until in 1976 there was an increase of 317% over the previous year. This big jump was due to the introduction of computer services by the Malaysian Rubber Exchange and Licensing Board to the rubber dealers and installation of a computer in the Prime Minister's Department.¹⁴

Illustration 7 and Graph 1 show the growth of the number of data circuits from 1973 to 1980 averaging more than 100% per annum. The data circuits to overseas countries contributed only 7% of the total circuits, the reasons for this low value will be discussed later.

Illustration 6 indicates the breakdown figure of the data circuit users by the business categories. The major users of teleprocessing are the Government, news service, financial/banking, rubber trade and transport companies.

Illustration 6  
DATA CIRCUITS BY CATEGORIES OF BUSINESS

Year	Government	News	Finance	Firm	Rubber	Petroleum	Transport	Others	Total
1973							2		2
1974				1		1	2	1	5
1975				1		2	2	1	6
1976	9			3	5	2	4	2	25
1977	12	4	4	4	5	2	7	3	37
1978	18	8	9	9	9	4	9	3	69
1979	25	18	18	8	16	4	14	5	109
1980 ^a	42	22	27	8	29	4	24	5	161
%	26	13.66	13.66	4.96	18.01	2.48	15	3.1	100%

^a Projection

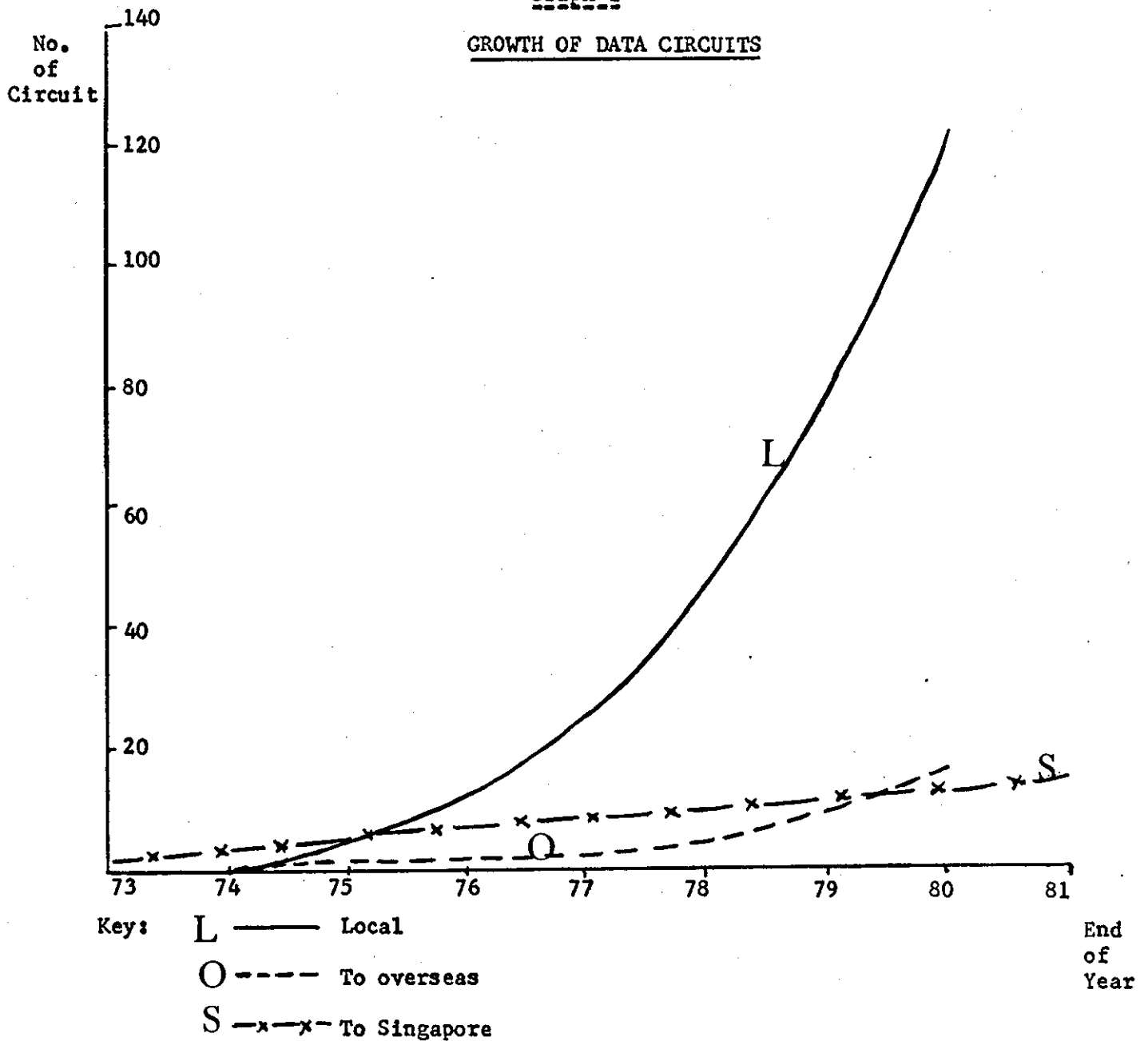
Sources: Mahmud, 'Data Communication in Malaysia', KAWAT, 1980, 12.

Illustration 7GROWTH OF THE DATA CIRCUITS

Number at the end of the year

Year	Local	Statewide	To Singapore	To Overseas	Total	Annual % increase
1973			2		2	
1974			4	1	5	150
1975			5	1	6	20
1976	16		8	1	25	317
1977	25	1	9	2	37	48
1978	49	3	11	6	69	86
1979	80	6	13	10	109	58
1980@	120	9	14	18	161	48

@ Projection

Sources: Mahmud, 'Data communication in Malaysia', KAWAT, 1980, 6-13.Graph 1GROWTH OF DATA CIRCUITS

It is estimated that there are about 420 general purpose computer installations in Malaysia,¹⁵ but less than half have been utilised in networking, for example having remote terminals. Hence there are still a lot more computing power to be tapped.

All data subscribers are from Peninsular Malaysia. The first data transmission link in Sabah and Sarawak was implemented in 1980 linking the Shell Sarawak computer in Lutong, Sarawak, to its base in Labuan.



Data communication has very close contact with a telephone network because it depends mostly on how advanced and comprehensive the telephone network is. It can be generally concluded that Malaysia is only at the basic stage in the general use of data communications. Not all the telephones in Malaysia are in the Subscriber Trunk Dialing (STD) or Direct Dialing network yet. In conjunction with the National Day Celebration on August 31, 1980, Prime Minister Malaysia launched a direct dialing telephone system to Sabah and Sarawak in East Malaysia.¹⁶

Since facsimile (FAX) service is associated with the data network, it is shown in Graph 2 and Illustration 8 the slow growth of the FAX subscribers consisting of news media companies.

#### 2.4 EXISTING NETWORK

Generally data transmission networks are built up from existing public telephone lines, so that envisaged configurations are bound to the availability and routing of these circuits. Ordinary public telephone lines may be roughly characterised as having useable band extending from 300Hz to 3,400Hz.¹⁷ Full duplex lines can transfer information simultaneously in both directions; while half duplex lines can transfer informations non-simultaneously in both directions at a time; and simplex operation transfers informations in one direction, between transmitter to receiver only.

Facsimile (FAX) has been used in Malaysia since 1963 by the newspaper agency Reuter and followed by BERNAMA.

### Illustration 8

#### GROWTH OF FACSIMILE CIRCUITS

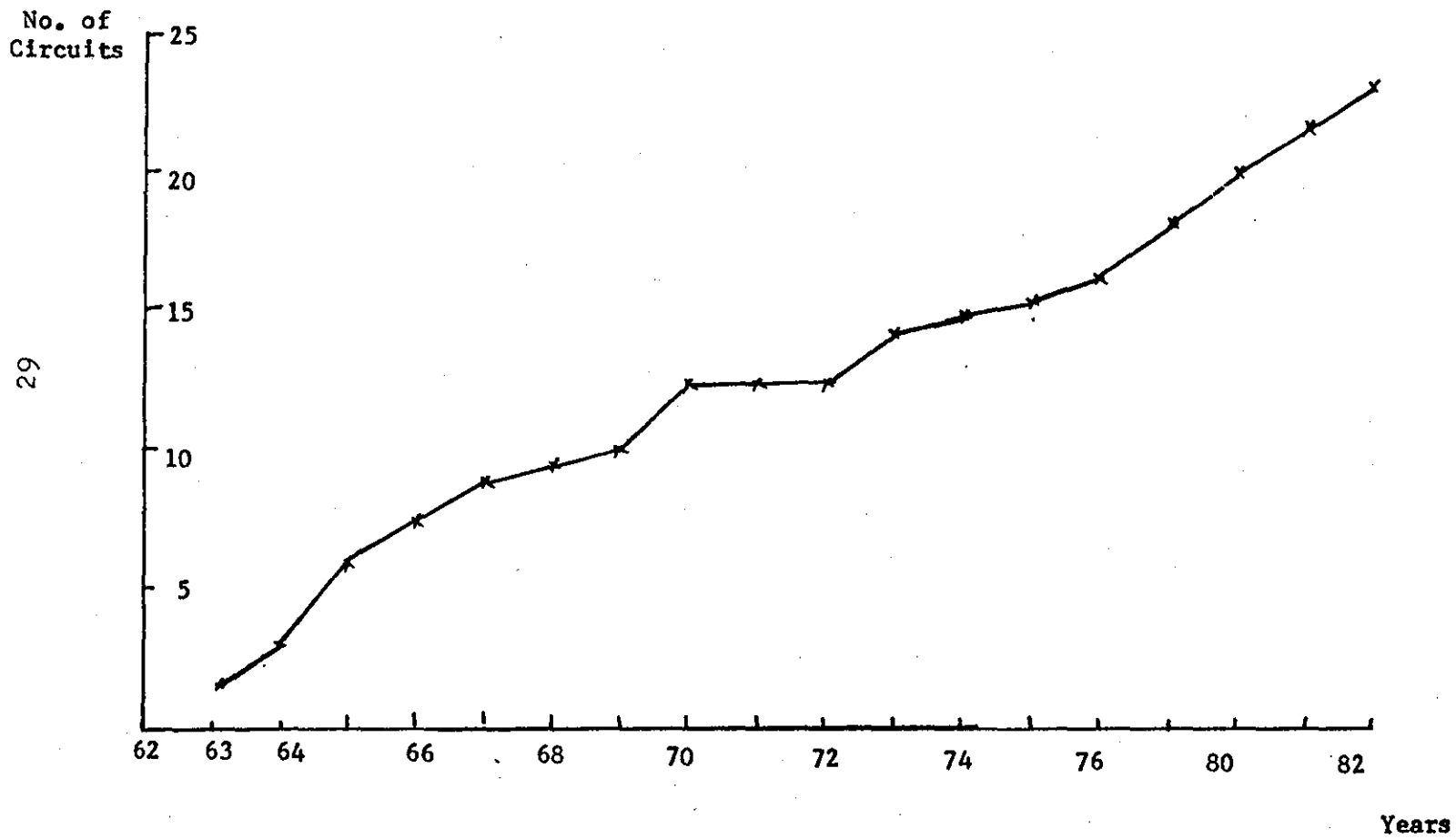
Year	No. of Circuits	% of annual increase
1963	1	-
1964	3	280%
1965	6	100%
1966	7	16.6%
1967	9	28.5%
1968	9	0%
1969	10	11.1%
1970	12	20%
1971	12	0%
1972	12	0%
1973	14	16.66%
1974	15	7.14%
1975	15	0%
1976	16	6.66%
1977	18	12.5%
1978	21	16.66%
1979	22	4.76%
+1980	23	4.545%

+ Projection from the graph

Sources: Mahmud 'Data Communication in Malaysia', KAWAT, 1980, 14.

Graph 2

GROWTH OF FACSIMILE CIRCUITS

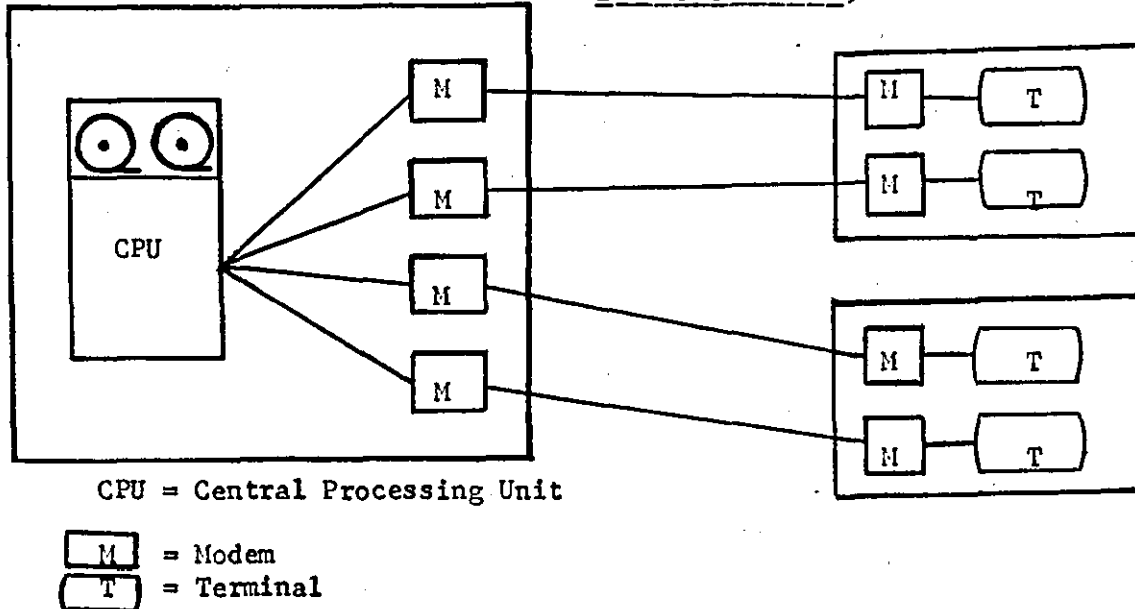


At present the Telecoms Department is providing limited services on data and facsimile transmission. The department is merely providing a point to point connection as a leased circuit between the data users. The users have to supply, install and maintain the modem which have to be approved by the department.¹⁸

The possible configuration for data transmission networks consisting of a CPU and one or more terminals are:

- (a) Point to point configuration is a link between two terminals or a CPU and a terminal. Illustration 9 shows such a system. It consists of 2 terminals and the connecting transmission line, which can be fixed or a dial up route via telephone exchanges.¹⁹

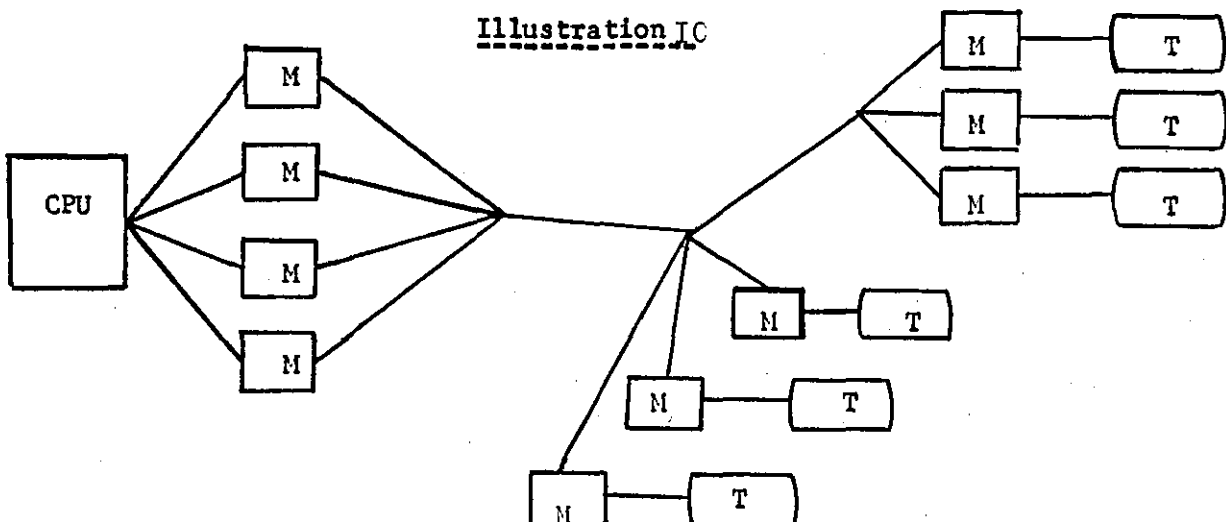
Illustration 9



- (b) Multipoint configuration.

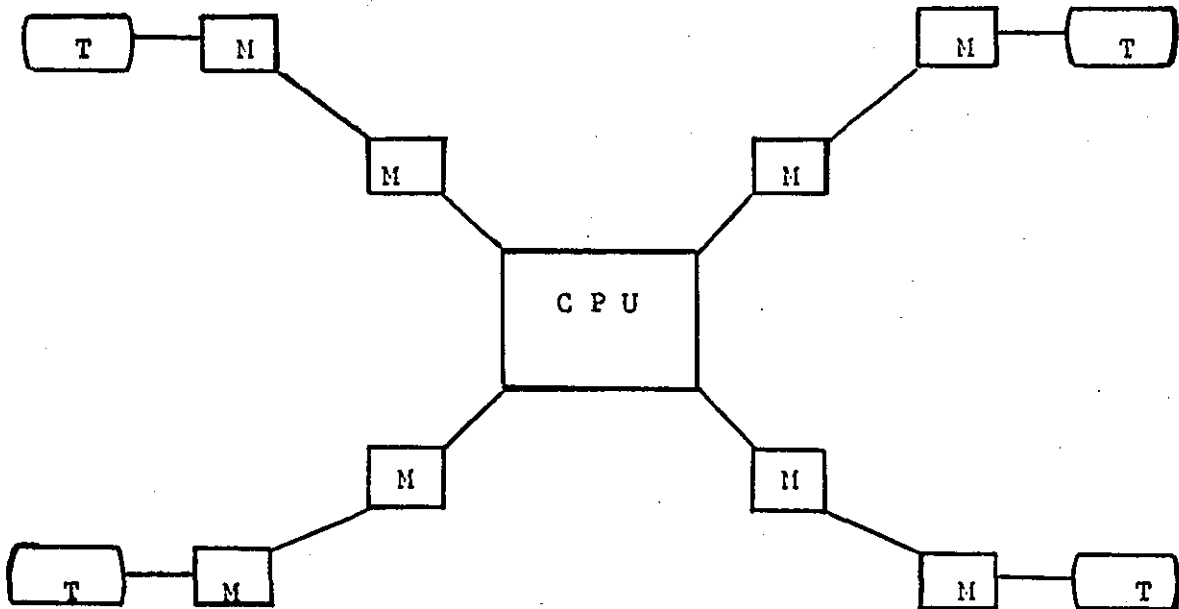
A multipoint network provides links between more than 2 terminals. Illustration 10 shows such a system. This type of network is limited to the use of dedicated lines but savings in line costs compared to point-to-point configuration since saving of costs can be obtained by increasing the number of terminals connected.²⁰

Illustration 10



Another type of multipoint configuration is shown in Illustration II. This configuration is called a starnet. This network can provide for both dedicated and dial up connections.

Illustration II: multipoint configuration: star network



A combination of party lines and star network is possible, and this is for instance the case in Illustration I₁²¹ or the case of ESA/RECON network in illustration I₂.²²

Illustration I₂

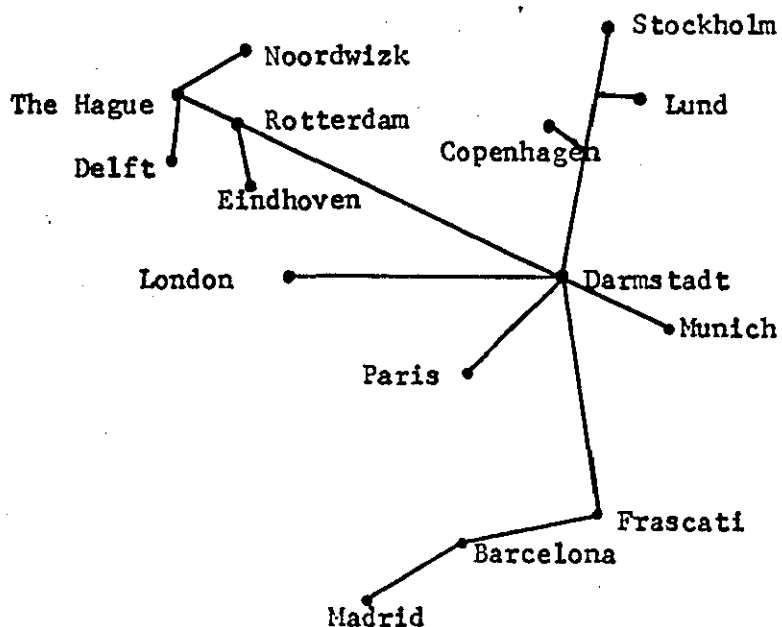
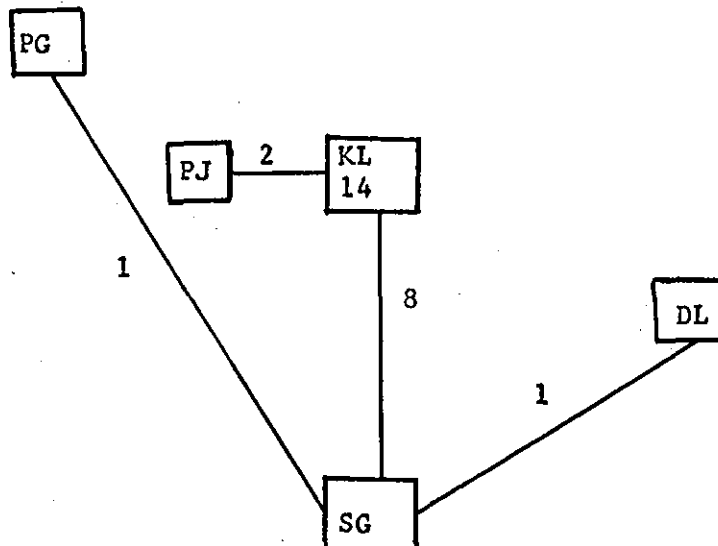


Illustration I3 shows the data network as in 1976 and the present network is shown as in Illustration I4

Illustration I3: DATA NETWORK AS 31.12.76



ABBREVIATION:

PG = Penang

KL = Kuala Lumpur

SG = Singapore

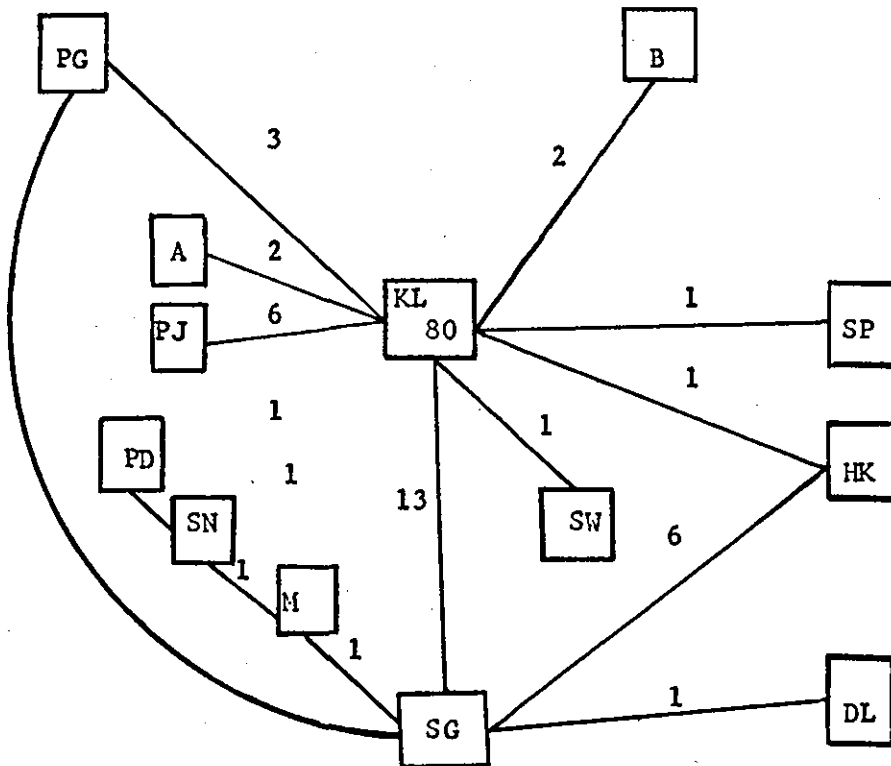
PJ = Petaling Jaya

DL = Dallas, U.S.A.

The data network in illustrations I3 and I4 is the leased line used by the private company. For example leased line between Singapore and Dallas (USA) is being used by the Texas Instrument in Kuala Lumpur in order to connect their computer in Texas Instrument Office, Dallas.²³

# Illustration 14

## DATA NETWORK AS AT END OF 1980



Sources: Mahmud.²⁴

### ABBREVIATION:

PG = Penang

M = Malacca

B = Bangkok

SG = Singapore

A = Airport

DL = Dallas (USA)

PJ = Petaling Jaya

SW = Sarawak

KL = Kuala Lumpur

HK = Hong Kong

PD = Port Dickson

SF = San Francisco (USA)

SN = Seremban

### Quality of Lines

The quality of lines provided by the Telecoms are the normal telephone lines belonging to the telephone network. Since the lines are not conditioned to CCITT M1020 recommendation, there are restrictions



on the speed of the data transmission. Even though the lines are unconditioned it is good to note that at least there are 3 subscribers transmitting at the rate of 9,600 bps and 2 more subscribers sending at 7200 bps. But the majority of the users are transmitting at 4800 bps and 2400 bps. Telecoms provide leased lines of voice grade quality and do not guarantee the speed of transmission of data.

An important method of increasing the efficiency with which lines are used is to connect them together to form a multipoint or multidrop circuit. This connects a number of geographically separated terminals.

Tariff for data communication by leased line.

For a leased line provided by the Telecoms Department, tariffs are categorised into 3 types.

(i) Local lines

Exchange rate £1 = M\$4.5

For first half mile £21.3 = M\$96. p.a.

and for every next quarter or part of £5.3 = M\$24 p.a.

(ii) Trunk lines with Malaysia and Singapore

Point to Point £38.8 = M\$175 per radial mile p.a.

Multidrop £46.6 = M\$210 per radial mile p.a.

(iii) International

Zone 1 0-1200 miles (e.g. Indonesia) £32,000 p.a.

Zone II	1200-4800 miles (.e.g Hong Kong) £44,800 p.a.
Zone III	4800- and above (.e.g. U.K. and USA) £64,000 p.a.

The above rate is applicable to the Malaysian and only.²⁵ A similar arrangement has to be done on the other end. Full time rental and an initial period of one year lease is allowed.

#### Shortcomings of leased circuit

The growth in international leased circuits is very slow and as in mid-1979 the international circuit comprised 7% of the total circuits. The policy of full time rental and the high rental cost deprives the small volume users of data the opportunity to make use of the facilities. The majority of the Malaysian business does not require a high volume of teleprocessing from overseas computers.

The firms which rent the international circuits are the heavy users and they fully utilise the circuits by sending data at higher rate (9600 bps) using multiplexing technique at the terminals.²⁶

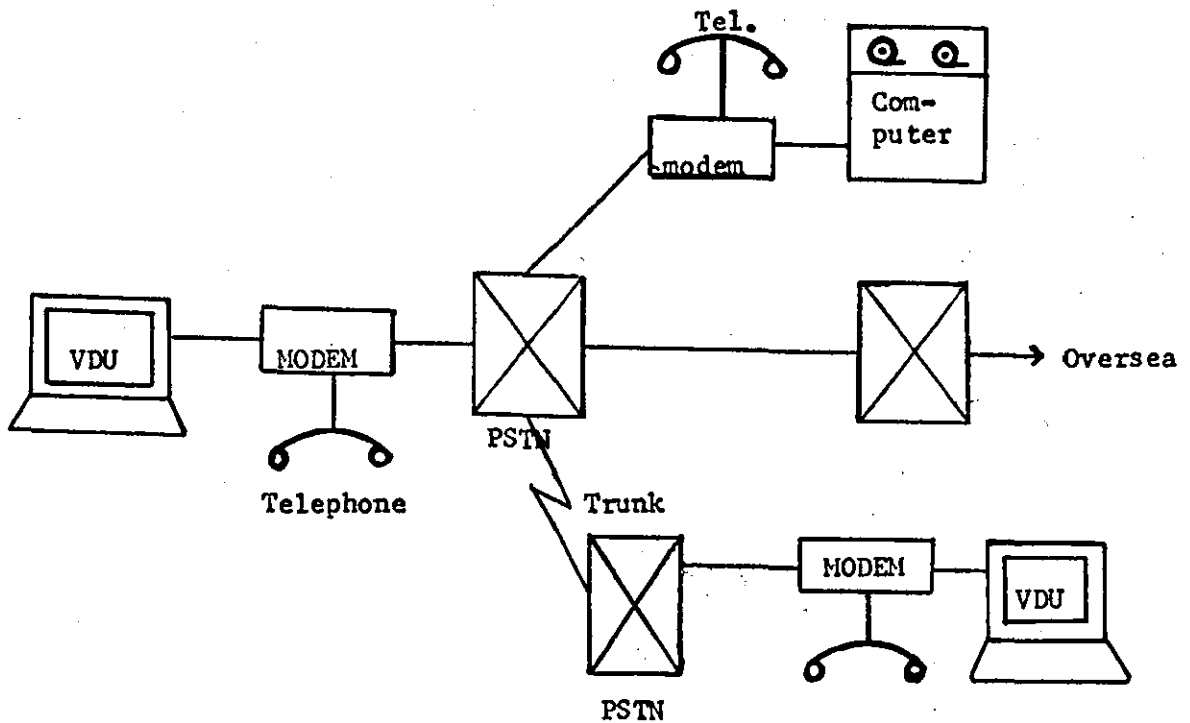
## 2.5 DIAL UP SERVICE

After considering the problems involved in the provision of existing network using leased circuits, the Telecoms Department is planning to implement very soon an economical way of providing data and facsimile services using the existing capability in the

existing telephone network. Since the telephone service is more than 90% automatic and has a wide coverage in this country, the introduction of data and facsimile transmissions through dial-up in the existing Public Switched Telephone Network (PSTN) is the best solution.²⁷

Every data subscriber must have a telephone. A modem is connected to the telephone and the data terminal is connected to the modem. The selection switch on the modem should be on the telephone when not in use. After dialling the called party and when conversation is taking place, both parties must switch the selection to data so that the data terminal is then connected to the line for data transmission.

Illustration 15 shows the dial-up service set up.

Illustration 15DATA TRANSMISSION THROUGH DIAL-UP PUBLIC SWITCHED TELEPHONE NETWORK (PSTN)

The international Consultative Committee for Telephones and Telegraphs (CCITT) has issued several recommendations regarding the use of modems for data transmission over the public switched telephone network (PSTN).²⁸ They are:

V21 200/300 bauds p.s.

V23 600/1200 bauds p.s.

V26bis 2400/1200 bits p.s.

V27ter 4800/2400 bits p.s.

With the existing capability of the PSTN, it is recommended that the maximum speed of transmission to be not more than 2400 bps.²⁹

Several tests on data transmission using PSTN over several types of exchange period and conditions were carried out at speeds of 1200 and 2400 bps by the Telecom Department such as from Kuala Lumpur to Kuala Lumpur and from Kuala Lumpur to Seremban. From the results of the test it can be concluded that PSTN would be able to carry data traffic with an error rate within CCITT recommendations. It is observed that the older type of exchange, for example step by step, gave more errors due to impulse noise. Several tests on facsimile transmission was carried out and the quality of transmission was satisfactory.

#### Facsimile (FAX) machine

The majority of postal, telegraph and telephone organisations (PTT) administrations in the world rent out the modems to the subscribers and charge on different rates on the speed range of the modems.

In view of the maintenance, supply difficulty and small number of subscribers purchase their own modems/FAX machines. But in the long run the department should plan to rent them. All the modems installed must be of a type approved by the Telecom Department.³⁰

It is the responsibility of the subscribers that their modems are compatible with the modems at the other ends.

In the CCITT recommendation on the use of acoustic coupler type of modem, it is stated that this is to be of use as a temporary nature. In view of the difficulty of controlling the use of these acoustic couplers, it is recommended that the Telecom Department prohibits the use of acoustic couplers and only permits hard-wired connection.³¹

### Tariff by using PSTN³²

The structure of the tariff is divided into 2 parts.

#### (1) Access fee.

In order to connect data modem or FAX machine to the telephone, a subscriber has to pay an annual charge known as an access fee.

The access fee has to be imposed because:

- (a) there is no metering on local calls and subscribers might hold the line for a long period. The amount of access fee will be such that it is more economical for the subscriber to lease a line for local connection.
- (b) the data subscriber shall have first priority in restoring the faulty line.

#### (ii) Call charges.

- (a) Subscriber trunk dialing (STD) calls within Malaysia and Singapore:

Kuala Lumpur to Kuala Lumpur(10 square miles)	2p. per call (peak hour)
KL to Petaling Jaya (10 miles)	2p. per 3 minutes.
KL to Seremban (40 miles)	12p.per 3 minutes.
KL to Bangi (PUSPATI) (22 miles)	6p. per 3 minutes.
KL to Serdang (18 miles)	6p. per 3 minutes.
KL to Malacca (100 miles)	20p.per 3 minutes.
KL to Ipoh (120 miles)	20p.per 3 minutes.
KL to Penang (240 miles)	50p.per 3 minutes.

## (b) International Call

All international connections must be operator assisted except to those countries mentioned below where it can be done direct by ISD or IDD.³³

	First 3 mins.	Additional Min.
United Kingdom	£9.	£2.
Hong Kong	£5	£1
West Germany	£9	£2
Australia	£7.5	£1.67
Japan	£7.5	£1.67
Switzerland	£9	£2
United States of America	£9	£2

## (ii) Business Telephone.

In addition to the above the subscriber has to apply for a separate business telephone (£80 per annum).

Potential users

The news that the Telecoms Department is planning to introduce the dial-up service has created great interest amongst potential data users. Many companies whose head offices are located overseas have applied for this service. It is anticipated that the following groups of organisations will be making use of this data service:

- (i) Government departments with branches, i.e. Felda, TDC, RRI and PUSPATI.
- (ii) Banking, i.e. First National City Bank, Bank Bumiputra and Chartered Bank.
- (iii) Computer Bureau.
- (iv) Transportation, i.e. airline companies, shipping companies and containers.
- (v) Trading room.
- (vi) Big firms with branches i.e. ICI, Dunlop, Unilever, IBN and NCR.

In the case of facsimile service through dial-up it would be of interest to these organisations:

- (i) Postal.
- (ii) Freight/shipping.
- (iii) Police.
- (iv) Consultation firms.
- (v) Telegraph office.

#### Shortcomings of dial-up service

The use of leased circuits rather than dial-up (switched) brings a number of advantages:

- (a) reduces the chance of misconnection.



- (b) the circuits are always ready for use because delays due to dialing and connection are avoided.
- (c) the parameters of each leased circuit are much more constant, while the switched circuit are not because of the different paths used.
- (d) the impulse noise associated with switched is greatly reduced.
- (e) higher speed of transmission is possible.

## 2.6 HIGH SPEED AND WIDEBAND TRANSMISSION

With the introduction of the Computer Network and Distributed Processing the Telecoms Department should consider the introduction of conditioned lines to carry data transmission up to 9600 bps. Given sufficient notice the department is capable of providing wideband data throughout Malaysia. All major towns in Malaysia are linked by the microwave routes. At present the department and a local newspaper publisher are actively preparing to implement a wideband facsimile transmission from one newspaper printing plant to another.

## 2.7 NEW OVERSEA SERVICE

There are several data services which the Telecom Department should consider for implementation overseas; for example data base access and facsimile. Any telex subscriber in Malaysia by becoming a subscriber to the data base companies in USA will be able to call a certain number and have access to one of the USA Tymnet or Telenet Network.³⁴

By installing a high speed facsimile machine at the Kuala Lumpur Telegraph Office, anybody can hand over the documents to the Telegraph Office and through facsimile service the copies can be produced at the overseas end, such as USA or Hong Kong. The transmission time of this facsimile is below 1 minute.³⁵

## 2.8 FUTURE NETWORK

After acquiring sufficient experience and new technology available through the existing network and dial up services, the Telecommunications Departments of Malaysia (Jabatan Telekom Malaysia of JTM) will continue a further expansion of its telecommunications services under the Fourth Malaysia Development Plan (1981-1985).³⁶

This expansion will interalia:

- (i) increase the capacity of its telephone network to provide service to a total of 1.2 million subscribers which represents a telephone density of 8 telephones per 100 population by 1985.
- (ii) increase the capacity of its telex network to provide service to 20,000 subscribers, which represent a telex density of 12.0 stations per 1,000 population by 1985.
- (iii) to establish a Public Switch Data Network (PSDN) to provide data communication services so as to cope satisfactorily with rapidly growing demand for such services, under the impact of Malaysia's economic and social development.

Recently, Telecommunications Department have decided to use packet switching for the data network.³⁷ There are several reasons why packet switching has been chosen rather than message switching.

Unlike message switching, which has a history going back forty-five years or so to torn-tape telegraph switching systems, packet switching was first proposed by Baran.³⁸ His paper describes the basic idea of packet switching, which is to modify a message switched network by dividing each message into packets or blocks of fixed length and to route each packet from its origin switching node to its destination switching node independently.

A packet-switched network, as contrasted with a message switched network, can handle several different types of traffic concurrently. This includes high throughput traffic, for example the transmission of large data files between computers for which accuracy and high average data speed are the most important performance requirements.

Secondly, low delay traffic, for example interactive communication between a person at a terminal and a remote computer, for which accuracy and low average message delay are important.

Thirdly, real time traffic, for example, packetised speech, for which the performance of a circuit switched connection must be approached by maintaining a relatively constant data speed but for which extreme accuracy is not important owing to the redundancy of the information.³⁹

In all three of these applications, packet switching shares with message switching the advantage over circuit switching, that is,

since a packet is stored temporarily at each node, its format, code or speed may be changed before it is retransmitted. The first two types of traffics are common in practical packet-switched networks whereas packetised speech is still under study.

Subsequently, packet switching was embodied in the ARPANET⁴⁰, operated for U.S. government agency, and it has also been applied in EURONET.⁴¹

## 2.9 CONCLUSION

Telecommunication may be considered as the link between two or more parties at a distance via the use of information technology.⁴²

Data communication means the transferring of data via telecommunication facilities. Telecommunications in Malaysia have permitted the transmission and integration of information processes over wire, via wireless, satellite, optical fibers and lasers.⁴³

The growth of data communication and telecommunication between East and West will be tremendously improved with the use of new technology. Meanwhile a small fishing village in Pulau Aman in Province Wellesley in Penang with only 212 residents made history by becoming the first village in Malaysia to have a solar powered telephone system.⁴⁴

The use of Palapa Satellites owned by Indonesia at the longitude 77°E and 83°E, which was launched in 1977 and 1976 with the up or down band of 6/4 Ghz,⁴⁵ for the regional domestic use, will help data communication to develop faster in Malaysia. With the launching of

INTELSAT V-3 in 1980, the data network and data communication between Western Countries and Malaysia will be much efficient.⁴⁶ Since theoretically we only need 3 satellites to cover the global information network, these three satellites will cover the communication flow in the Atlantic, Indian and Pacific regions.⁴⁷

With the great economic development in Malaysia and Kuala Lumpur becoming an important trade centre between the East and West, we can foresee the growth of data services from a modest scale to a big jump in the very near future.

# REFERENCES

1. Towards worldwide communications. Malaysian Digest (30 June 1981), 3.
2. Malaysian steps up international telecommunications. Malaysian Digest (31 December 1981), 7.
3. Utusan Melayu (20 June 1981), 9.
4. Edelson, Satellite Communication for Information Network. Proceeding of the American Society of Information Science 9, (1972), 175.
5. Martin, J., Communication Satellite Systems. Prentice Hall, London (1978), 10.
6. Ibid., 12.
7. British machine for the telecoms department. Malaysian Digest (31 May 1981), 6.
8. Asian News Network due for launching. Malaysian Digest (15 May 1981), 6.
9. News in brief. Malaysian Digest (31 July 1981), 4.
10. Better worldwide links via Satellite. Malaysian Digest (30 November 1981), 6.
11. Nongo, K., 'Kuantan Kucing submarine cable system description' NEC Research and Development (Japan), 60 (1981), 72-7.
12. 'New submarine cable system will keep Malaysian always in touch with the outside world', Malaysian Digest (31 May 1981), 6.
13. Mahmud, 'Data communication in Malaysia', Kawat (1980), 6-13.
14. Personal communication.
15. KHOO HOOK AUN, 'The computer age down'. Malaysian Business, (1981), 11.

16. Direct dialing system to Sabah and Sarawak. Malaysian Digest (15 September 1980), 8.
17. McGregor, P., 'Effective use of data communications hardware' AFIPS conference proceedings, Volume 43, U.S.A. (1974), 565.
18. Telecom Department, Telecommunication Guide (1979), 255
19. Kelenbach, 'Introduction to data transmission for information retrieval', Information Processing and Management, II (5-7), (1975), 138.
20. Ibid., p.144.
21. Personal communication.
22. Kalenbach, op. cit., 138.
23. Personal communication and Thomas Register - 1981 Thomas Register, Thomas Publishing Co. (New York), 2: (1981), 2834.
24. See reference 13.
25. Jabatan Telekom, The Telecommunications Guide. Kuala Lumpur (1979), 226.
26. See reference 13.
27. Personal Communication.
28. Martin, J., Computer Network and Distributed Processing, Prentice Hall, N.J. (1981), 272.
29. Barron, I., The future with microelectronics, The Open University Press, London, (1979), 164.
30. Telecom Department, Telecommunications Guide, op. cit., 225.
31. See reference 13.
32. Telecom Department, op. cit., 280.
33. Ibid., 287.

34. Singapore Telecom, correspondence letter.
35. Personal communication.
36. UNDP, Telecommunication Planning and Development. Continuation Project No. MAL/79/006/A/01/20. (Unpublished reports). (1982), 15.
37. Personal communication.
38. Baran, P., On distributed communication networks. IEEE Transaction Communication Systems COM - 12 (1964), 1-9.
39. Kimbleton, S.R., 'Computer Communication Networks: Approaches, Objectives and performance considerations', Computer Survey 7 (1975), 129-173.
40. Roberts, L.G., 'Computer Network Development to Achieve Resource Sharing'. Proc AFIPS Spring Joint Computer Conference, V.36, (1970), 543-549.
41. J. Martin, Computer Networks and distributed processing. Prentice Hall, N. Jersey (1981), 88.
42. Voos, H., Telecommunications and Facsimile. Special Libraries (1981), 118-120.
43. Personal communication.
44. Yussoff, R., Malaysia Joint the Solar Race, Malaysian Panorama V.10 (3), (1980), 11.
45. Morgan, W.C., Geosynchronous Satellite. Comsat Technical Review V.8 (1), (1978), 219.
46. Trees, V.C., Future Intelsat System Planning (1986-1993). American Institute of Aeronautical and Astronautic. Satellite communicate Future System.
47. Cawkell, A.E., 'Universal communications via Satellite-dream or future reality', Journal Information Science I (1979), 69-75.



CHAPTER 3COMPUTERS IN MALAYSIA3.1 INTRODUCTION

The purpose of this chapter is to learn about the computer technology in Malaysia and the availability which it can be used for online searching. Malaysia is becoming one of the biggest users of computers in this part of the world. Sales of computers are growing as much as 60% annually and in 1978 it was 91.6% (the date in this chapter was taken mainly from the survey made by the Malaysian computers society in June, 1980). In monetary terms, this can be anything from £6 million to £7 million a year. Statistics compiled by 21st Century Research from the International Trade Statistics show that at the end of 1980 Malaysia was ranked among the world's top 30 computer import markets.

The growing market in Malaysia is partly due to the fact that old accounting machines of the electro-mechanical type are being phased out and are replaced by electronic micro-computers. Another reason is that computer prices are always dropping so that they are now within reach of smaller organisations that could not afford to buy them a few years ago. Each year faster and better computers with vastly improved capabilities are being introduced at much lower prices. The price drop ranges from 20% to 25% annually and demand is increasing as managements realise how computers can help in the

decision making process.

The commercial sector has been active in setting up computerised systems to keep up the standard of efficiency to customers while many government departments have been installing computers to keep pace with their increasing workload. The National Electricity Board (LIN) set up the first computer in the country in 1965 with IBM 1440. Up to the end of 1978, the number of computer installations has grown to more than 200.¹ Most of them are in the Federal Territory or in Kuala Lumpur city where governmental and semi-governmental bodies use them for accounting, research, monitoring and other forms of analytical work. The majority of computer users, however, are in commerce and industry. Computers were initially used for accounting. Since then it has been put to use for the purposes of costing, budget planning, marketing and sales, management, cash-flow management and now stock brokerage and stock invoicing.

Data processing is also used for scientific and engineering studies, surveys and even for the online reservation of airline tickets.² At the Malaysian Airline System (MAS), information about reservations is readily available as its computer is able to take care of passenger needs from the time a booking enquiry is made, to checking relevant information on individual passenger's needs. Computers are also used to operate steel mills, the railway and oil refineries. They help farmers improve agricultural productivity. At Malaysia's biggest rice bowl, the Muda River area, which is located in the North West of the Malay Peninsula, the irrigation network is computer controlled. Water levels are controlled from the information gathered through the computer.

Among statutory bodies, the LIN is one major user of computers. Under its customer enquiry system, a consumer has to wait only six seconds for a check of his accounts. Planned energy transmission at the National Load Despatch Centre (NLDC) adjacent to LIN's head office will be economically effected through the direct application of computers. Estimates indicate a saving of £3 million annually in boiler fuel consumption, through better, fine tuning of energy load despatch, and better optimisation between hydro and thermal generation.³

The LIN assists the Drainage and Irrigation Department in running the flood forecasting programmes of the Pahang River during the monsoon periods. Forecasting has been very accurate and the river levels at Pahang (East of Malaya) can be estimated 24 and 48 hours in advance respectively. In flood forecasting, readings of volume and the intensity of rainfall recorded by equipment, controlled at the various sources of the river are telexed to the DID's head office. These readings are processed by the flood forecasting programmes in the computer which finally gives the expected river levels at the flood prone areas. Another use of computers is the monitoring of city traffic. Kuala Lumpur's City Hall has purchased a £1.5 million computer which will form part of the Second Kuala Lumpur Urban Transport Plan.⁴ The scheme will have traffic lights working on a co-ordinated basis at all the major intersections within the city area and will interlink via computer control centres, at police and fire stations. A miniframe computer has been installed at the Prime Minister's Department to improve the efficiency of the government machinery.⁵ It aims to ensure effective government by reducing

unnecessary bureaucratic procedures. The computer, the largest installed in the country, will make available important information needed for decision making. The computer is used for handling certain tasks, particularly project planning and control, and econometric and financial modelling. The progress of development projects can also be easily tracked to ensure that there are no unnecessary costs over runs and that projects are implemented on time.

The data given in this paper were primarily obtained from the survey undertaken by the Malaysian Computer Society in June, 1980.⁶ The data supplied were collated and various tables and graphs prepared from them.

In the last few years, the growth in computing power as well as the number of installations have been rapid. See Illustration I6 and Graph 3 and hardware in section 3.3

Most users are aware of the potential benefits, computers can provide but few are aware of the pitfalls and difficulties one encounters in the design, implementation and operations of computerised systems. This has sometimes resulted in the first-time users rushing to acquire computer equipment without sufficient justification or prior planning for it. This resulted in the earlier growth of computers taking place in a rather random and haphazard manner, often dictated by computer vendors who assumed the role of know alls and gatekeepers of computer technology, or due to the over enthusiasm of both, the management and his data processing staff. Computer vendors, like other businesses, are primarily profit-oriented marketing concerns. As such, the introduction of equipment by these vendors may not always follow the priority of the overall needs of the user and country.

In the early seventies, there has been very limited study on the computerisation needs and activities of government agencies in this country which could provide the basic information necessary for effective usage of computers. The only available sources of information on computer usage in government agencies in this country were conducted by these authors^{7, 8} at the request of the Malaysian government. Subsequently, this led to the formation in 1976 of the Automatic Data Processing (ADP) Council, consisting of Electronic Data Processing (EDP) experts, University and Centre Agency representatives, which was set up in the Prime Minister's Department, Kuala Lumpur.⁹ A study was also made in 1978 to look at the problems and issues facing the government installations.¹⁰

This was a major step in the right direction to see that the impact of computers does not lead to frantic purchase of computers, and then to computerisation in a haphazard manner. The terms of reference are firstly to serve the government as a source of advice on significant Automatic Data Processing (ADP) issues, having Government wide impact. Secondly, to review, formulate and recommend national goals and priorities, policies and plans in the field of ADP and to propose appropriate actions to be taken by the Government to implement policies. Thirdly, to serve as the review authority for all proposals to introduce or enhance general purpose ADP systems and to make recommendations to the Treasury Public Services Department. Lastly to assist in inter-agency co-operation on ADP matters; including time sharing of computer facilities, co-ordinating efforts to promote maximum progress and standardisation.

The Malaysian Computer Society, on the other hand, began conducting surveys on computer installations in the public and private sector in earnest only from 1978, primarily for reporting on the status of computer technology in Malaysia for the Southeast Asia Regional Confederation Conference (SEARCC).¹¹

Almost invariably, the acquisition process follows the same overall pattern. A potential user organisation asks for a feasibility study to be made. Most of the time the people who conduct the study are the computer vendors themselves. Department staff, MANPU staff and consultants generally determine the specifications. Whether it is

absolutely essential or not, the report of the study would normally recommend that a computer system be acquired for automatic accounting functions, among other things. Following receipt of proposals (based on tender specifications) from various computer vendors, a report is made on the choice of equipment. This report goes to the ADP Council for approval. Modifications are usually made until the ADP council is satisfied that there is a need to purchase a computer of suitable configuration and make, that suitable personnel to run the computer centre are available. Alternatively, the Council might suggest the usage of time sharing or RJE facilities, linking with the computer used by some other government agencies until such time that the need of a computer system of its own is justified. It is only beneficial to those government departments which are located near each other because data transmission in Malaysia still cannot be used on line via ordinary telephone line. This is basically the procedure for all government departments and local authorities who install computer into their locality. For larger system, consultant firms are usually called in to do the feasibility studies and sometimes complete turn key systems. For some potential first time users, who do not have the money or personnel to evaluate proposals from vendors, computer personnel from the universities are called in to help (as the cost of their services is only a fraction of what consultants would charge).

In the private sector, private consultant firms play a major role in the feasibility studies, selection of computer and personnel, and in many cases implementing of turn key projects. The cost of

'groping in the dark', fear of failure and time constraints are probably the main reasons why more and more potential users are turning to consultants. By and large, the vendors still play an important part in influencing the potential users on the choice of computers and peripheral equipments.

### 3.2 CURRENT STATE OF COMPUTER TECHNOLOGY

The impact of computers and the degree in which computer technology has penetrated in Malaysia can be discussed under various topics - hardware, applications, software, education and personnel, government policy in computing, potential impact, trends and the future.

Computers can no longer be considered as prestigious devices in Malaysia, but rather as a tool for social and economic development, necessary for national planning, industry and resource management. These are aptly amplified by the growth rate of computer installations by the conducting of feasibility studies prior to installation. The constant modification of computer educational programs by universities and private colleges, and introduction of computer courses conducted by universities and private colleges, the number of seminars, courses, conducted by professional bodies and the high participation in computer meetings and conferences bear testimony to the impact of computers in Malaysia.

The Malaysian Administration Modernisation and Manpower Planning Unit (MAMPU) of the Prime Minister's Department is embarking on an



ambitious and farsighted computerisation program for the various government departments and agencies, by improving the level of expertise and sophistication of usage to existing installations, and providing guidelines and advice to the many potential users in the government departments and agencies in the acquiring an appropriate utilisation of computers. A seminar entitled 'Towards More Effective Use of Computers in Malaysia' was organised by MAMPU in September, 1980 at Kuala Lumpur. The participants include Heads and Senior Management Personnel of Government and semi-government departments, EDP managers of government installations and invited guests. The topics covered included trends of computer usage - problems and issues, framework and strategies, cost distribution, application packages, manpower/technical staff, recruitment and training. This emphasises the impact of computers and their usage on the government and the seriousness of the attitude of the government in taking to ensure that computers are properly installed and utilised if the acquisition or utilisation of computers by the government departments is deemed essential. It also emphasises that potential users should learn from the mistakes and problems of earlier installations and take advantage of the latest technology and reduction in hardware cost to leap frog into the operational or advanced level of computer development, but ensuring that the competent personnel are also available.

### 3.3 HARDWARE

There are now more than 420 computer installations in Malaysia.¹²

Illustration 16, the growth of the no of computers by size, overall increase and percentage increase from 1973 to August 1980. The arbitrary classification by size of small (256KB), medium (256KB-1MB), and large (1MB) computers is used in this dissertation after taking into consideration the classifications by cost of mainframe mini and micro.

Graph 3 shows the growth of the number of computers. It shows separately the growth of small, medium, large computers, the overall growth and projections for the next two years.

Illustration 17 gives the breakdown of the number of computers by manufacturer or vendor, memory size and percentage as of August, 1980. There are twelve suppliers listed in this illustration although some suppliers market more than one type of computers.

There is no particular supplier dominating the computer scene as far as numbers are concerned, although IBM by far dominates the number of large computers. By and large, the majority of the computers (83.8%) are in the small range.

Illustration 16Growth by number of Installations

Year	No. of Computers by size				
	Small < 256KB	Medium 256 - 1 MB	Large > 1 MB	Overall	% Increase
1973	16	0	0	16	
1974	20	3	1	24	50.
1975	33	7	1	41	70.8
1976	58	7	1	66	61.
1977	92	10	5	107	62.
1978	178	18	10	205	91.6
1979	246	26	15	286	39.5
1980	353	43	24	420	46.9
1981 @	490	65	37	592	41.
1982 @	670	80	52	802	35.5

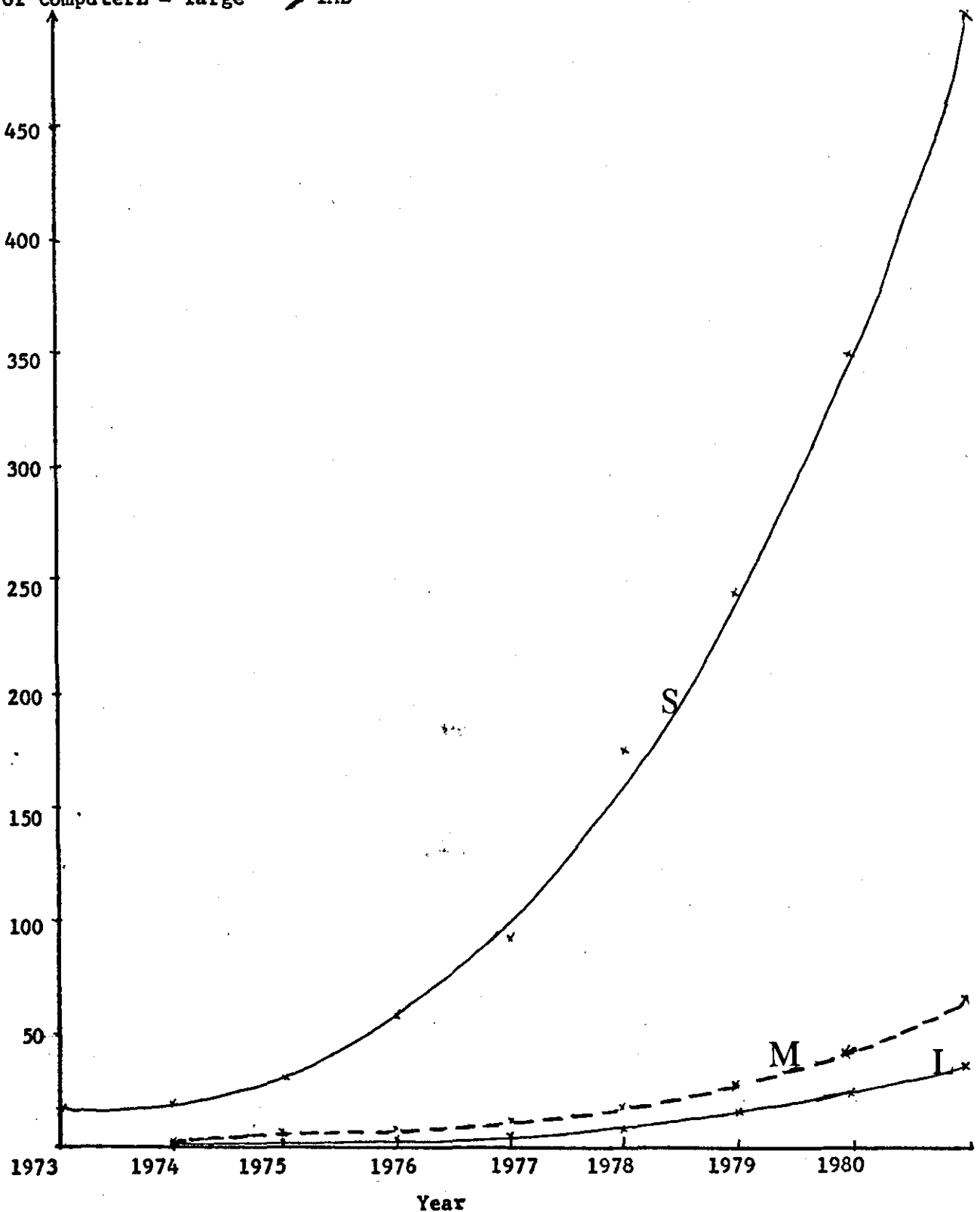
@ Projection

Data taken from graph drawn from graph 3.

Sources of data: MALAYSIAN COMPUTER SOCIETY 'Survey of computer installations and suppliers in Malaysia', June, 1980.

GRAPH 3The Growth of Computers in Malaysia

Key: —S = small < 256kb  
 -----M = medium 256kb - 1MB  
 No. of computer L = large > 1MB

Based on:

1. Malaysian Computer Society, 'Survey of computer installations and suppliers in Malaysia', June (1980).
2. List of computers in the Government Department pamphlet: 61-63.

Illustration I7No. of Computers by Supplier, Memory size and Percentage

SUPPLIER	Large 1 MB	Medium 256KB-1MB	Small 256KB	Total	%
(a) IBM	15	8	46	69	16.4
(b) NCR	2	1	60	63	15.
(c) ODS (DATAPOINT)			59	59	14.4
(d) BURROUGHS	1	2	45	48	11.4
(e) DATA PREP (DATA GENERAL)		11	36	47	11.2
(f) SISTEMAJU (WANG)		1	42	43	10.2
(g) ICI	2	3	26	31	10.2
(h) KSM (DEC/PDP)		3	21	24	5.7
(i) UNIDATA (PERKIN ELMER AMPEX, ZILOG)		4	12	16	3.8
(j) PHILIPS	1	2	4	7	1.7
(k) HEWLETT PACKARD	1	6		7	1.7
(l) PERNAS TRADING (UNIVAC) SEMI	2	2	2	6	1.5
GOVERNMENT					
TOTAL	24	43	353	420	100
% by size	5.8%	10.2%	84%		100%

Illustration I8 lists the type of computers in the Government and semi-government in Malaysia. They are easy to obtain permission to be used by PUSPATI compared to the computers installed in the private sector. Ninety-nine percent of these computers are installed in the Kuala Lumpur and Petaling Jaya area.

### Illustration I8

#### List of Computer in Government and Semi-Government

AGENCY	COMPUTER SYSTEM	MEMORY SIZE K BYTES	MODE OF ACQUISITION
1. Workers Social Security	UNIVAC 1100	864	P
2. Police	ICL 2950	750	R
3. General Hospital KL	CAT SCAN	16	P
4. IMR	NOVA 3/12	64	D
5. Ministry of Public Works	IBM S3/6	16	P
6. PWD	NOVA 840	112	P
7. RRI	HEWPAC 3000		P
8. ICU	IBM 370/158	3072	R
9. Public Service Dept.	BURROUGH B800/C150104/256		P
10. Telecom Department	IBM 370/138	1024	R
11. Statistics Department	ICL 1904A	384	P
	ICL 2956	1536	R
12. Court of Justice	BURROUGHS B800	96	P
13. Meteorological Dept.	ECLIPSE S/200	160	R
14. Ministry of Defence	NCR 8200	64	R
15. DID	NOVA 1220	64	P
16. Survey Department	IBM 1130	16	P
	EAI PACER 100	64	P
17. Treasury	NCR 315	20	P
	IBM 370/115	160	R
	10 BURROUGHS B820	80 or 96	P
18. Examination Syndicate	IBM 360/20	16	D
	IBM 370/138	1024	R
19. Department of Education (several places)	4 BURROUGHS B80	64	P
20. Post Department	NOVA 3/12	48	P
21. National University	IBM1130	16	P
22. University Science	IBM 370/145		
	IBM 370/138	1024	R
23. University of Technology	IBM 370/145		R
24. University of Malaya	IBM 1130	16	P
25. Agricultural University	IBM 1130	16	P
26. Malaysian Airline Sys.	IBM 370/145		
27. Electricity Board (LIN)	IBM 1440	16	P

Note: P = Purchase      R = Rented      D = others like donation.

The choice of hardware in a developing country should be given some serious thought. In order that a computer can serve a viable purpose, four basic requirements must be satisfied. First, adequate stable power supply; secondly personnel to handle the main tasks of operating, programming and managing the installation; thirdly maintenance personnel and facilities must exist to ensure service support to the installation. Various authors have previously discussed the transfer of computer technology to Malaysia and the state of computing in Southeast Asia,^{13,14,15} Since then the computer scene in Malaysia has changed tremendously. There are suggestions of leap-frogging of computer technology by over zealous administrators and management personnel who, by virtue of their administrative stature and their attendances at seminars/conferences, think they know enough of computers without understanding the basic principles of computer science and learning the basic problems encountered by their predecessors.

Ninety-five percent of the installations are located in the capital city of Kuala Lumpur and the satellite industrial town of Petaling Jaya which is about 7 miles away. The use of computers by local state authorities will be on the increase in the next few years if the distributed processing policy is carried out with improved telecommunication facilities.

### 3.4 SOFTWARE

Systems software such as compilers, operating systems, data base management system (DBMS), data communication controllers, utilities

are usually obtained from the hardware suppliers. This is usually the case as they are either supplied 'free' with the hardware or they need less initial expenditure and hence are cheaper than independent proprietary packages. Programming languages have reached a relative level of standardisation and stability. COBOL is still the predominant programming language used in the commercial sector, though FORTRAN and COBOL enjoy almost equal usage in the public sector. Other languages used are RPG, BASIC Assembly Language, PL/I, PASCAL, ALGOL and EASYTRIEVE.

Report generators such as RPG and EASYTRIEVE are also widely used as they are easy to use and require less programming ability. This is a factor that is worth considering in situations where there is a shortage of highly qualified staff. In larger and more advanced installations, application development aids such as ADF and DMS and query languages such as QBE are also being used. Since most of the big computer installations in Malaysia are the IBM 370 type, and INIS magnetic tape are recommended by INIS to be used in the IBM STAIRS software, thus we had better look into the list of software available in the IBM 370 which are located in the Prime Minister's Department. See illustration 19 for the list of software.

BASIC, though relatively new in usage in this country is very popular among the micros and the mini computers. PL/I, PASCAL, AIGOI, among others, have not been used very much. There is a tendency to use interactive compilers such as COBOL and BASIC nowadays as this allows better interaction and faster response. Up till now there has been relatively little utilization in application packages, although



; T=0.01/0.01 13:42:35 Illustration 19  
oftware

## LIST OF SOFTWARE AT JPM

### A. OPERATING SYSTEMS

#### 1. VM/370 - Virtual Machine Facility/370

This is the highest level operating system which controls all other operating systems. This system allows multiple "virtual machines" to be defined sharing real devices. Operating systems can then run on these "virtual machines".

#### 2. OS/VS1 - Operating System/Virtual Storage 1

This operating system runs as a stand alone system or under VM/370, and can handle both batch and on-line applications. It is capable of multiple programming and can handle many applications simultaneously. CICS/VS, IMS/VS, and application programs run under this operating system.

#### 3. DOS/VS - Disk Operating System/Virtual Storage

This is similar but more restrictive than OS/VS1. It requires much less main storage spaces than OS/VS1 but is less versatile. Function wise, it can handle multiprogramming (five partitions), batch and on-line systems. Very rarely used in JPM.

#### 4. CMS - Conversational Monitor System

An interactive operating system for the small user to build up files, write/amend/test programs. Easy to use but not suitable (yet) for large systems.

### B. PROGRAM LANGUAGES

1. PL/I - Programming Language/I
2. COBOL - Common Business Oriented Language
3. FORTRAN - Formula Translation
4. APL - A Programming Language
5. RPG-II - Report Program Generator II

### C. APPLICATION SOFTWARE

#### 1. QBE - Query-by-example (Relational database)

Provides application-oriented end users with the ability to process their application data. The end user perceives this data as tables, with rows and columns of information. All operations (queries)

performed against the data are defined using tables, rows, and columns to refer to the data. Among the processing options are data selection, sorting, summing, counting, averaging, grouping, data definition, and authorization. Runs under CMS.

## 2. PROJACS- IBM Project Analysis And Control System

A set of programs designed to help management control projects which are presented by networks. In addition to the PERT/CPM time analysis, PROJACS provides a resource allocation facility, a cost evaluation facility, and a network preparation facility. Runs under CMS.

## 3. SCRIPT - The Script/370 Text Processing Facility

Has formatting capabilities that make it useful for different kinds of documents such as working papers, program documentation, reports and internal newsletter. Runs under CMS.

## 4. PLANCODE/1- Planning, Control, and Decision Evaluation System

Provides facilities for the rapid construction and implementation of planning models by means of a plan simulation language. Runs under CMS.

## 5. GIS/VS - Generalised Information System/Virtual Storage

Supports database and data communication application. The emphasis is on unanticipated inquiry, and output in the form of printed reports. This system runs in batch mode under OS and can handle IMS as well as conventional files.

## 6. ATMS - Advanced Text Management System

A text entry, edit and formatting system to create text databases. It runs under CICS/VS.

## 7. STAIRS/VS- Storage Information Retrieval System/Virtual Storage

Allows users to:-

- (i) create and store databases,
- (ii) expand existing database(s),
- (iii) retrieve data from database according to specified criteria,
- (iv) have retrieved data displayed at a terminal and/or printer.

Runs under CICS/VS.

## 8. SPATLIB- APL Statistical Library

This library contains APL functions designed for commonly used computations in statistical analysis and linear programming. The statistical analysis includes descriptive statistics, hypothesis testing, confidence intervals, analysis of variance, regression analysis, quality control and reliability

Numerical integration functions of normal, t, f and chi-square are incorporated to assist in the analysis. Runs under CMS.

#### 9. STATLIB2- APL Advanced Statistical Library.

extends the statistical functions available to the APL Statistical Library. The statistical methods consist of topics selected from the fields of multivariate Analysis, Time Series Analysis and Non-parametric Statistics. Runs under CMS.

#### 10. TROLL - Time-shared Reactive On-line Laboratory.

An interactive computer system which provides a comprehensive environment for quantitative research in such fields as econometrics, management science and political science. Runs under CMS.

#### 11. SPSS - Statistic Package For the Social Sciences.

An integrated system of computer programs for the analysis of social science data. Runs under CMS.

#### 12. IMS/VS - Information Management System/Virtual Storage

This IBM software runs under OS and is divided into:

IMS/DB- This part of IMS is a data base management

system that handles data in a hierarchical structure. Information are grouped into segments. Data can be stored/retrieved sequentially or randomly depending on type of access method. Segments can be increased without affecting existing programs.

IMS/DC- This part handles the on-line environment.

Programs can be written to provide for on-line retrieval and update of the database, without having to worry about telecommunication processing problems which are handled by IMS/DC.

#### 13. CICS/VS- Customer Information Control System/Virtual Storage.

A general purpose database/data communication system. It provides support for online systems, and the access methods provide support for batch processing systems. It runs under the control of DCS/VS or OS/VS and uses standard access methods. The environment component serves all users by controlling those elements of the DB/DC system involved in communicating with terminals, accessing database information, and controlling the passing of that information to the application component for processing. It handles multiple application systems. Runs under OS or DCS.

#### 14. APL EPLAN - APL ECONOMETRIC PLANNING LANGUAGE

AN INTERACTIVE PLANNING LANGUAGE BASED UPON APL. IT PROVIDES FEATURES FOR DEALING WITH ECONOMETRIC VARIABLES (PRIMARILY TIME-SERIES), SUCH AS DATA ANALYSIS AND TRANSFORMATION, TABULAR AND GRAPHIC DISPLAY, PARAMETER ESTIMATION, MODEL SOLUTION AND FILE HANDLING.  
RUNS UNDER CMS.

#### 15. SAS - STATISTICAL ANALYSIS SYSTEM

useful for analysis of data from experiments in the physical sciences; social science data; business data; agriculture data; marketing data.  
RUNS UNDER OS AND CMS.

#### 16. EASYTRIEVE

AN EASY TO USE INFORMATION RETRIEVAL AND DATA MANAGEMENT SYSTEM. IT PROVIDES THE ABILITY TO SUPPLY INFORMATION NEEDS IN A SIMPLE MANNER. HOWEVER IT CANNOT BE COMPARED TO COMPLEX PROGRAMMING LANGUAGES NOR WAS IT DESIGNED TO REPLAVE THEM.  
RUNS UNDER CMS.

; T=0.10/0.60 13:42:56

oftware1

#### LIST OF SOFTWARE AT JPM

#### A. OPERATING SYSTEMS

##### 1. VM/370 - Virtual Machine Facility/370

This is the highest level operating system which controls all other operating systems. This system allows multiple "virtual machines" to be defined sharing real devices. Operating systems can then run on these "virtual machines".

##### 2. OS/VS1 - Operating System/Virtual Storage 1

This operating system runs as a stand alone system or under VM/370, and can handle both batch and on-line applications. It is capable of multiple programming and can handle many applications simultaneously. CICS/VS, IMS/VS, and application programs run under this operating system.

##### 3. DOS/VS - Disk Operating System/Virtual Storage

This is similar but more restrictive than OS/VS1. It requires much less main storage spaces than OS/VS1 but is less versatile. Function wise, it can handle multiprogramming (five partitions), batch and on-line systems. Very rarely used in JPM.

##### 4. CMS - Conversational Monitor System

An interactive operating system for the small user to

lately application packages for accounting and auditing, and DBMS are being aggressively marketed by suppliers and software houses or service bureaux. While some form of turn key facilities are usually provided by the suppliers, a number of independent or freelance software groups are being contracted to develop application packages for clients of the suppliers. In view of the high cost of software and the shortage of qualified systems personnel, application packages will grow in importance due to some of the following reasons:

- (a) availability of packages which closely meets the user requirements,
- (b) shorten the implementation time for system application,
- (c) assurance of systems integrity because packages are generally well tested and are in current use in many diverse organisations,
- (d) lack of know-how and expertise in developing complex (commercial or scientific) programs.

However, steps need to be taken into consideration to cut down the cost of acquiring or developing the packages and to share expenses. This is very true for government bodies and agencies where they can form a special user group in common applications such as payroll, inventory control and share programs among themselves free of charge.

### 3.5 PERSONNEL AND EDUCATION

While the number of computers are increasing rapidly, the majority of computers are still grossly under utilized. The major obstacle to better utilization and improved results is the lack of competent

personnel. Added to this is the brain drain and the peculiar recruitment procedures and policies unique of each country.

The shortage of skills can be attributed to a number of reasons. Primarily the educational systems in Malaysia have not been able to meet the demand for personnel so essential for the infrastructure of a developing country. Most of the computer training provided by the universities and colleges is rather theoretical and conceptual in nature with over emphasis in numerical methods or analysis. The instructors available invariably lack the necessary operational experiences as they go straight back to the universities after their post-graduate courses. A number of practical oriented courses included in the syllabus could not be taught as they lack the proper instructors. The universities should modify their educational programs to be more practical oriented to suit the local needs of the data processing industry.

This could be achieved if experienced computer personnel could be attracted to the universities with job satisfaction, incentives, or appropriate remuneration, compared to those offered by the private sector. However, although the short term objective is to satisfy the bread and butter type of needs, the universities should not lose sight of the long term objectives of universities by providing young graduates with the urge and desire for knowledge and research. Apart from the University of Malaya and the University of Science, Penang, and colleges offering computer courses, a

sprinkling of other education sources are available, each trying to meet the specific needs of the market. These basic institutions include computer suppliers, in house education, professional and service organisations, INTAN, private data processing and commercial schools. All these provide some form of computer training which achieve some aspect of importance. In fact, one private data processing school has embarked on the ambitious program of training operators, programmers and programmer analysts in large numbers. It has enrolment of well over 200 students taking the Institute of Data Management (UK) and City and Guilds Computer Programming (UK) courses. It goes to show the demand for the need of computer education. With the growth rate of computers in Malaysia between 35% to 45%, contributed by the continuing improvements in price and performance as well as the proliferation of low valued systems, the demand for computer personnel becomes more acute.

A recent survey on government agencies showed a high vacancy rate of 19% for systems analysts and 21% for programmers¹⁶ and last June, 1981, there were 42 vacancies for system analysts advertised in the newspaper.¹⁷

Many government agencies are in the process of ordering computers even though they have low levels of qualified staff to handle systems operations and development. Meanwhile, the supply of new data processing staff has remained nearly static. The proliferation of computers and growing sophistication of existing applications without a corresponding increase in experienced staff is destined to produce

more under utilized costly machinery. At the same time, because of reducing hardware cost, the private sector can now cost justify much wider use of automation and since they are in a hurry to automate, the obvious solution is to poach and ponch from each other and from the public sector. Because of the private sectors' ability to pay higher wages, it will continue to draw experienced personnel away from government service. There is probably no satisfactory solution to this.

Education is therefore the key to many of the pressing problems within the computer industry in Malaysia. A proper education plan is essential for computer training to meet the demands of the country. There is a need to set up National Institute of Computer Training which will be the single most important education source for professionals in the country. This centre would overcome the current training deficiencies and ensure that training appropriate to the date processing needs of the country be made available. This need is realised by the government of Malaysia and it is heartening to note that a team is already studying the proposal to establish a National Computer Institute. In the meantime, the government should also take steps to recognise courses conducted by the private institutions which are linked with overseas groups, such as those external courses conducted for the examinations of the British Computer Society, the Institute of Data Processing Management and the City and Guilds. Such courses are accepted by the private sector and these courses are more practical oriented in nature. This also should complement the government's training program and overcome the present acute shortage of computer personnel.



### 3.6 UTILIZATION

Many computer systems in Malaysia are not properly managed and grossly under utilized. In the public sector, about 4/5 of the computers have less than 50 percent utilization (these are mainly in the small sized computers).¹⁸ Under utilization of computers is a cause for concern as it means wasteful investment on expensive equipment. Low utilization is generally due to the inadequate staff, low level of qualified staff, and insufficient workload. The present rate of under utilization prompted the issue whether the government should stop acquiring additional computers unless absolutely necessary, and to make use of the existing capabilities available. Another suggestion was to centralise public data processing installations. All these suggestions have their own disadvantages as one could see. However, certain priorities are essential in the context of a particular country's needs.

The need for better data communication facilities is essential if computer sharing and distributed processing are some of the solutions for better utilization. Communication facilities are at present via dedicated leased lines which are expensive. This has been and will be explained in detail in chapter 2 and chapter 5. With better data communication facilities many government agencies with offices distributed throughout the country would improve their utilization. Together with modern teleprocessing techniques, these can play a significant role in the socio and economic development of the country.

Although it is heartening to note that the Telecommunications Department in Malaysia plans to set up a separate data communication network in the country under the Fourth Malaysia Plan (1981-1985),¹⁹ where high speed, quality communication lines would be available at reduced cost, making use of the latest in packet switching telephone network (PSTN).

### 3.7 APPLICATIONS

Most of the computer activity taking place in Malaysia is still for accounting and administrative purposes. Scientific computing is mainly confined to universities, research institutions and petroleum industries. The main applications include accounting, inventory control, order entry, payroll, invoicing and statistics generation. In the government sector, the applications range from simple government payroll processing to the complex planning models being attempted by some agencies. Of late, a lot of interest has generated to have data bases and various management information application implemented. In the private sector a number of banks are already having online facilities to the major towns in Malaysia. Applications in finance, housing, market research and stock brokerage are the next largest group that is moving fairly rapidly in the private sector. With better teleprocessing facilities, more online applications are being pursued ardently.

With shortage of competent personnel many applications could not be carried out. One of the difficulties of many of the applications is

the weakness of the initial data collection phase which could result in a garbage in garbage out situation. Although information based applications related to land administration, development planning, resource management, project control should have higher priority, the lack of personnel, hampers their implementation. As a result, most of the applications are of the routine data processing nature.

### 3.8 TREND AND FUTURE

Graph 3 shows a growth rate of 35% to 40% over the next two years. This could be attributed to several factors. Among these is the increased realization of the government of the need to computerise in order to implement major government projects. This would lead to the expansion of the national economy and the speeding up of the economic development of the country. The continuing declining costs of hardware, the increasing industrialisation of the country, the need to increase efficiency through automation and computerisation in the face of greater competition, and the over aggressiveness of the computer salesmen, all contribute to the greater use and growth of computers, though more so in the small computer range. Due to its low cost, microcomputers will be very attractive to the small business. Large computers will continue to steady with its more sophisticated operating systems, software packages and better price or performance. More data entry and word processing equipments are being used.

More and more sophisticated software will be required to take

advantage of the rapid advances of the hardware technology. With the shortage and high cost of computer personnel, more software packages will be used and there is a need for independent software houses to develop software products for users. In the future we will see more software houses coming up in Malaysia primarily to support the suppliers and their clients, and to modify on the shelf application packages for microcomputer users. Recently, software groups from Japan, New Zealand and Australia have sent out 'feelers' to gauge the potential of setting up software houses in Malaysia either on a joint venture basis or affiliating to existing companies. With more sophisticated systems, software and utilities, large computers will be more fully utilised and online programming is a common feature. More DBMS systems are hoped to be implemented.

Developments in systems software and cost personnel will profoundly influence the nature and cost of application. With price reduction in hardware and better telecommunication facilities, distributed processing, online programming, RJES, will be relatively common features. More management information applications will be developed especially with DBMS packages readily available for mini computers and even for some micro computers. The volume of processing in existing applications will undoubtedly be increased as well. However more service applications and better enquiry facilities should be developed in the service industries and in government agencies dealing with the public.

With the increase in the number of installations to come, more and

more computers personnel, especially programmers, and systems analysts, are required to implement and maintain the systems. Some government agencies are also faced with the peculiar problem of console and key punch operators not willing to work longer hours and night shifts as most of them are women and night shift pose the problem of transport, and the overtime pay is not worth it. This is also one of the reasons given for under utilization of computers in government agencies. For more advanced installations and with online applications, there will be a demand for a new breed of data processing personnel such as information systems analysts, data base designers and administrators, and network administrators.

### 3.9 CONCLUSION

The impact of computers in Malaysia, as in most developing countries, is most felt in commercial applications rather than in science and research.

# REFERENCES

1. LIM, B 'Computers in Malaysia', Malaysian Panorama, V 3 (4), (1978), 18.
2. Ibid., 19.
3. Ibid., 21.
4. Ibid., 23.
5. KHOO, H.A., 'The computer age downs' Malaysian Business (1981), 14.
6. LAU, C.F., 'Computer technology in Malaysia' (unpublished report), Malaysian Computer Society (1980), 1-24.
7. PEACH, P., 'Malaysian Government Computer', Malaysian Government Report (1971).
8. GOLDHAMER, H., 'Survey of computer activities in the government of Malaysia', Malaysian Government Report (1972).
9. MAMPU, 'Problem and issues facing the government installations', Prime Minister's Department, Malaysia.
10. LIM, H.S., 'Transferring computer technology to Malaysia - the first ten years', SEARCC 76, North Holland (1976), 27-34.
11. See ref. 6, 13.
12. See ref. 5, 11.
13. LIM, H.S., op. cit., 27.
14. NG, F.L. and LOY, Z., 'Software technology and South East Asian Countries', SEARCC 76, North Holland (1976), 115-119.
15. LOY, Z., 'The state of computing in South East Asia Survey 1976/77', Proceedings of the International Conference on Computer Applications in Developing Countries, (1977), 65-73.
16. See ref. 6, 11.

17. UTUSAN MELAYU (June, 1981), job advertisement.
18. See ref. 6, 12.
19. UNDP, Telecommunication Planning and Development, Continuation Project for Malaysian Government. Project No. MAL/79/006/A/01/20. (unpublished report) (1982), 15-20.

Other references

1. LEE, H.W., 'Possibilities of employing computer and other technologies to further library and information services in South East Asia in International Communications in library automation'. Network, V 1 (1974), 10-28.
2. International Directory of Computers and Information Service 1971. Europa Publications Ltd., London, (1978).



## CHAPTER 4

### INTERNATIONAL NUCLEAR INFORMATION SYSTEM (INIS)

#### 4.1 Historical background

Fourteen years ago, a small international team of experts worked together for a period of three months at IAEA headquarters to develop a final design for an international nuclear information system. The approach taken by the team was based on an international 'network' concept for the collection and dissemination of information. INIS was planned and is operated by the International Atomic Energy Agency (IAEA) in collaboration with its Member States and co-operating international organisations.¹ The actual development of the system began in 1965 when two consultants (one from USSR and the other from the United States) submitted to the Agency their recommendations on the general outline for the INIS system. The outline was adopted in principle at an international meeting of experts in 1966 and elaborated in greater detail by an INIS Study Team in 1968. INIS was formally approved by the Agency's Board of Governors in 1969.² For development of INIS in chronological order see Illustration 20

Before INIS was proposed, most of the nuclear literature were mainly abstracted in Nuclear Science Abstract and Referativnyi

Zhurnal Fizika. The Nuclear Science Abstracts was instituted in 1948, and is published by the Technical Information Centre of US Atomic Energy Commission. The coverage is about 60,000 items per year. From 1973 there are two volumes per year, with indexes cumulated for each volume.³ The Referativnyi Zhurnal Fizika (VINITI) is issued monthly in 7 parts, of which B deals with Theoretical Physics and Elementary Particles and with E Nuclear Physics. All the world's literature is covered (about one-quarter of the entries are of Russian origin), the abstracts being all in Russian.⁴

Illustration 20THE DEVELOPMENT OF INIS IN CHRONOLOGICAL ORDER: (5) (6) (7) (8) (9) (10) (11)

DATE	ACTIVITIES	NO. OF MEMBER STATES	NO. OF INT. ORGANISATIONS
March-June 1968	A detail systems design for INIS is drawn up - an international study team	-	-
26.2.1969	The IAEA's Board of Governors agrees to the establishment of INIS on experimental basis and with a limited subject scope.	25	6
April, 1970	INIS Atomindex was published the first time. Vol.1, No.1	36	10
May, 1971	Indexing was introduced using a revised version of the existing EURATOM CID Thesaurus for INIS	40	11
January 1972	INIS begin to operate on full subject scope; revised on INIS Thesaurus was introduced. Cumula- tive index was produced.	43	11
January 1973	End of experimental period. Full subject scope coverage compul- sory for all INIS in- put centres.	43	12
September 1973	A subject index is intro- duced in INIS Atomindex.	43	12

DATE	ACTIVITIES	NO. OF MEMBER STATES	NO. OF INT. ORGANISATIONS
January, 1974	Every issue of INIS Atomindex contained a subject index which permitted much more effective manual search.	44	12
September 1975	Gradual introduction of printed abstracts in INIS Atomindex and machine in INIS MAGNETIC TAPE	46	13
January, 1976	(1) Facilities for online access to INIS data base available internally to IAEA staff. (2) INIS became the world's comprehensive abstracting and indexing services in the field of atomic energy. (3) Conference index was first introduced.	49	13
1977	TYMNET established a node in Vienna.	51	13
January, 1978	Establishment of experimental INIS/AGRIS Direct access project.	60	13
November, 1978	Expansion of INIS subject scope to include relevant medical application	60	13
December, 1978	Introduction of special flagging of documents containing numerical data.	60	13
February, 1980	Direct access service formalised.	64	13

DATE	ACTIVITIES	NO. OF MEMBER STATES	NO. OF INT. ORGANISATIONS.
30.3.1980	INIS data base become officially available on IRS network based in Italy.	64	13
1980	17 countries had made direct access to INIS database in Vienna.	64	14+
1982		69	14+

NOTES: + - including IAEA.

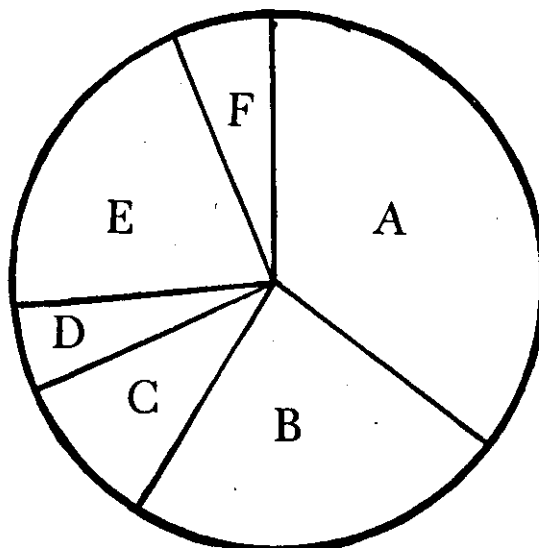
## OBJECTIVES

INIS was created to stimulate greater efficiency in information exchange on nuclear science by improving literature coverage from different countries, by reducing the time taken, the local publication of a particular piece of literature and its reaching a potential user anywhere in the world; reducing the ever increasing burden in terms of labour, the lag and cost imposed on national centres trying to cover the international output; and to achieve compatibility with other existing or planned large-scale systems.¹²

## INIS SUBJECT SCOPE

The subject scope of INIS in 1981, which mirrors the activities of the IAEA, includes information on every aspect of the peaceful user of nuclear science and technology. The Subject Fields covered as illustration 2I.

Illustration 2I



A - Physical Sciences	39.8%
B - Chemistry, Material/Earth Sciences	23.2%
C - Life Sciences	12.9%
D - Isotopes, Isotopes and Radiation applications	2.3%
E - Engineering Technology	18.4%
F - Other aspects	3.5%

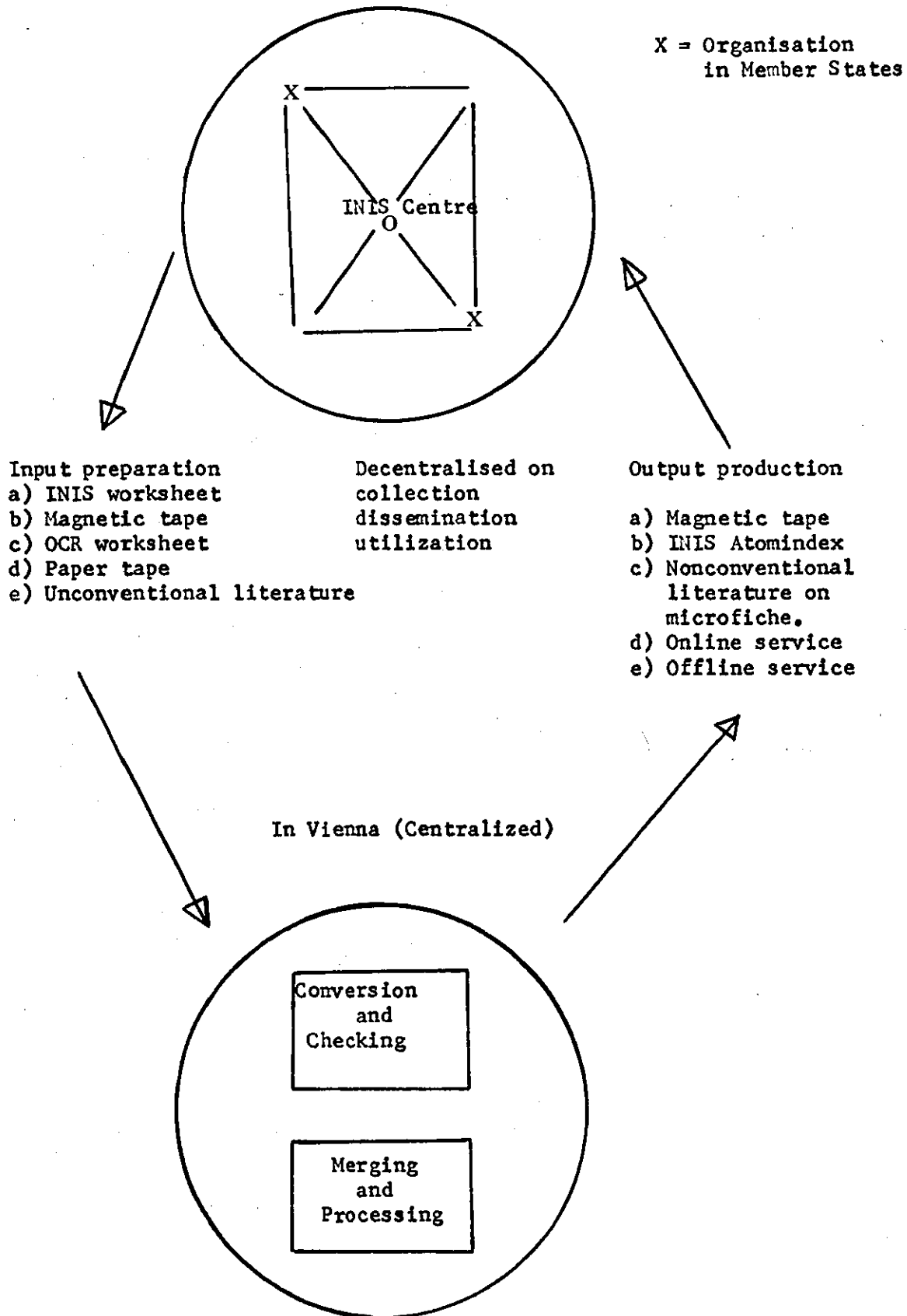
INIS operational philosophy is based on decentralisation and centralisation.¹³ This decentralised approach to input and output was selected because it should potentially result in the most comprehensive coverage of the nuclear literature; provide the most effective method of handling information in different languages; spread the cost of data gathering and processing equitably between large and small producers and users of literature; assist in improving the national information infrastructures in both developed and developing countries; result in the most satisfactory services for users of the information.

Material arriving at the processing centre in Vienna is converted, when necessary, to appropriate machine readable form suitable for computer processing. After appropriate checking and correcting, it is merged to form the output product. This procedure constitutes centralised processing.

INIS is the first international information system in which both the collection of input and the dissemination of output are completely decentralised (see illustration 22).

## Illustration 22

### THE INIS PHILOSOPHY



Sources: Turkov, M., The INIS, first fully decentralized computer based and mission orientated information system. Documentation System and Network, 1st European Congress, Luxembourg, 16-18 May, 1973. CEC (1974): 335.



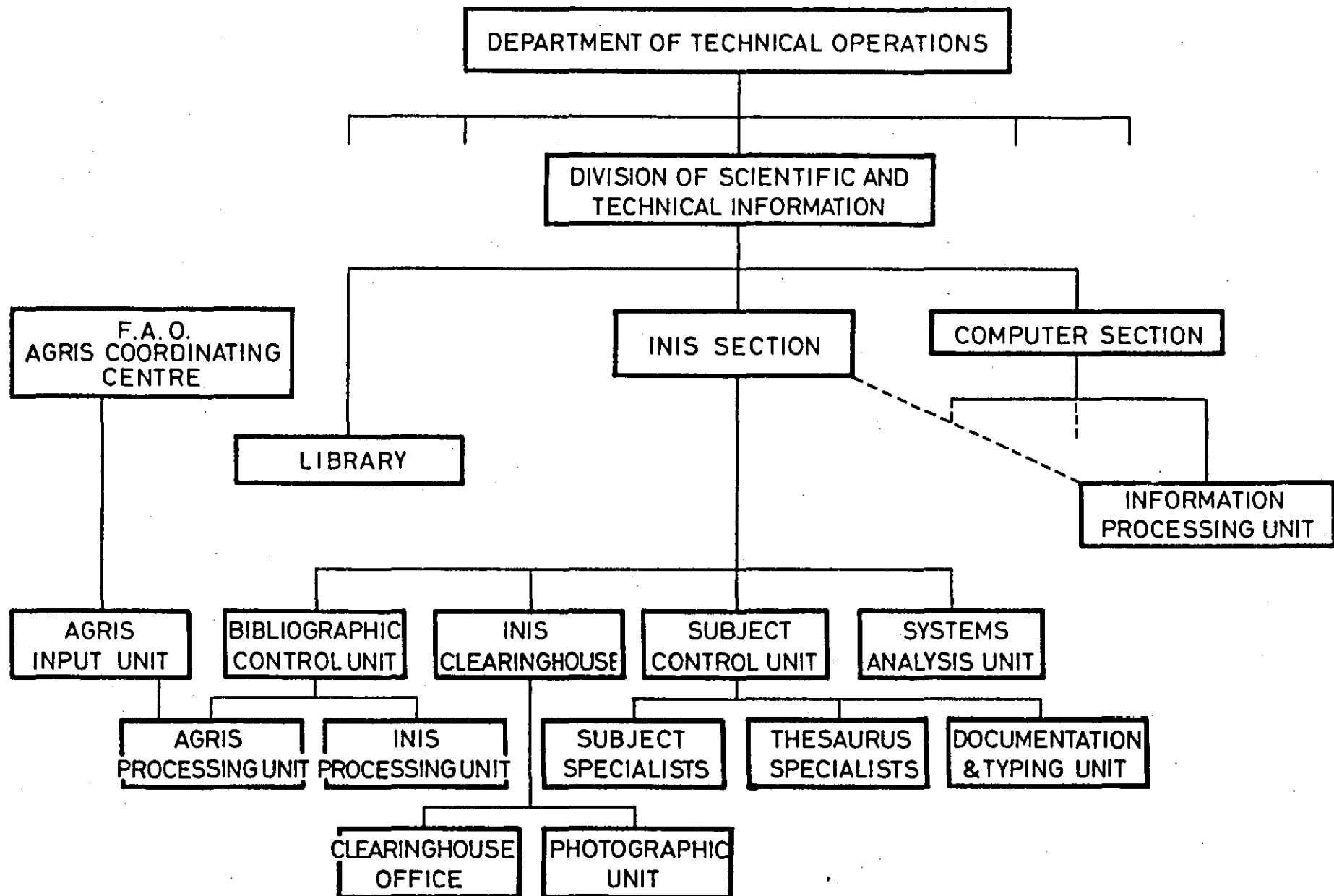
## ORGANISATIONAL STRUCTURE

The present organisation of the INIS section in the Agency is shown in illustration 23.¹⁴ The organisation chart of the INIS staff is shown in illustration 24.¹⁵ In addition to the INIS section staff there is, of course, support from the computer section where the equivalent of about three man-years of system analysis and programming have been devoted to preparatory and operating activities.

## INIS MEMBER STATES AND ORGANISATIONS

Since the establishment of INIS in 1969, there has been a standing invitation to join from the Director General, to the IAEA membership. The initial response was positive and each year has seen an increase in the number of participants. See Graph 4.

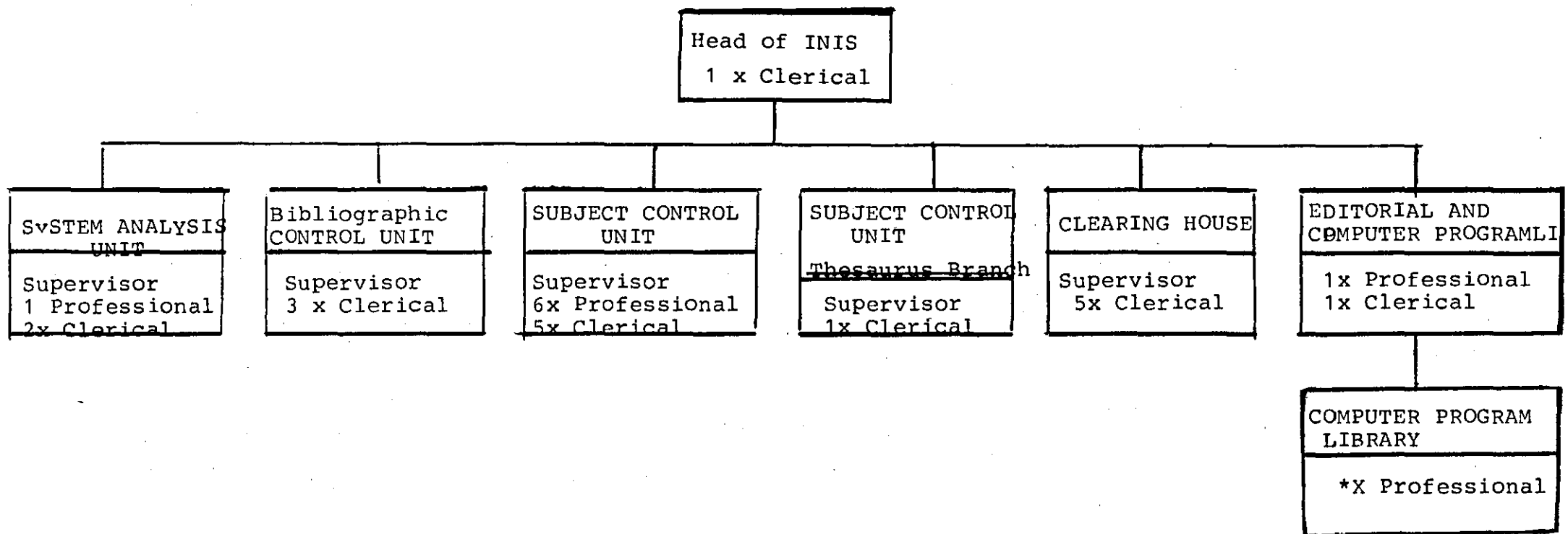
Illustration 22



Sources: IAEA, Orientation manual for INIS and AGRIS, IAEA, Vienna (1979):78

Illustration 24

INIS Section



Sources:

PELZER.C.W.'The International Nuclear Information System'Aslib Proceeding,

V 24,(1972):42

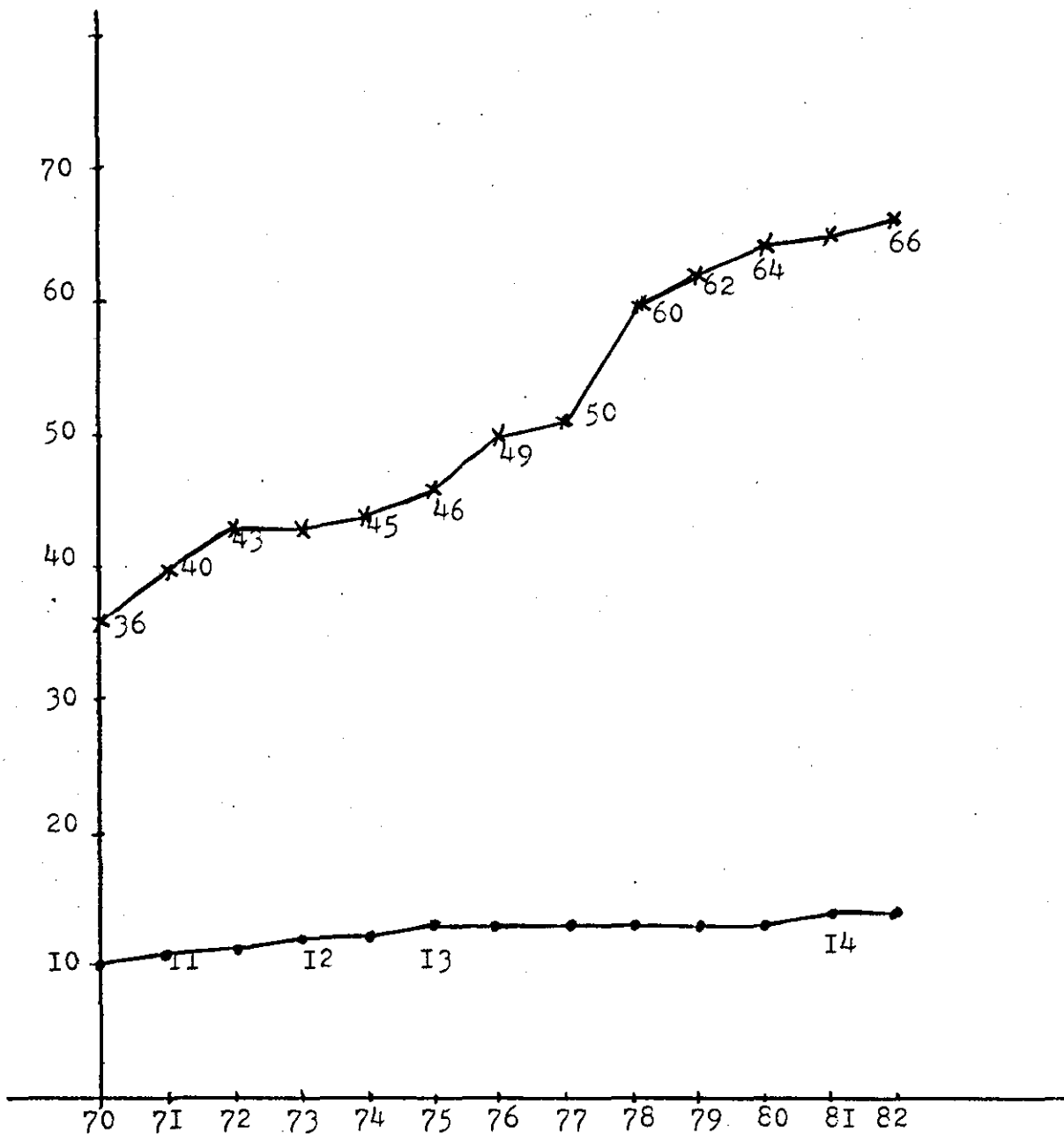
Graph 4

The growth which has taken place in the number of participating centres since INIS began.

✕—✕ Member States

●—● International Organisations

No. of participating centres.



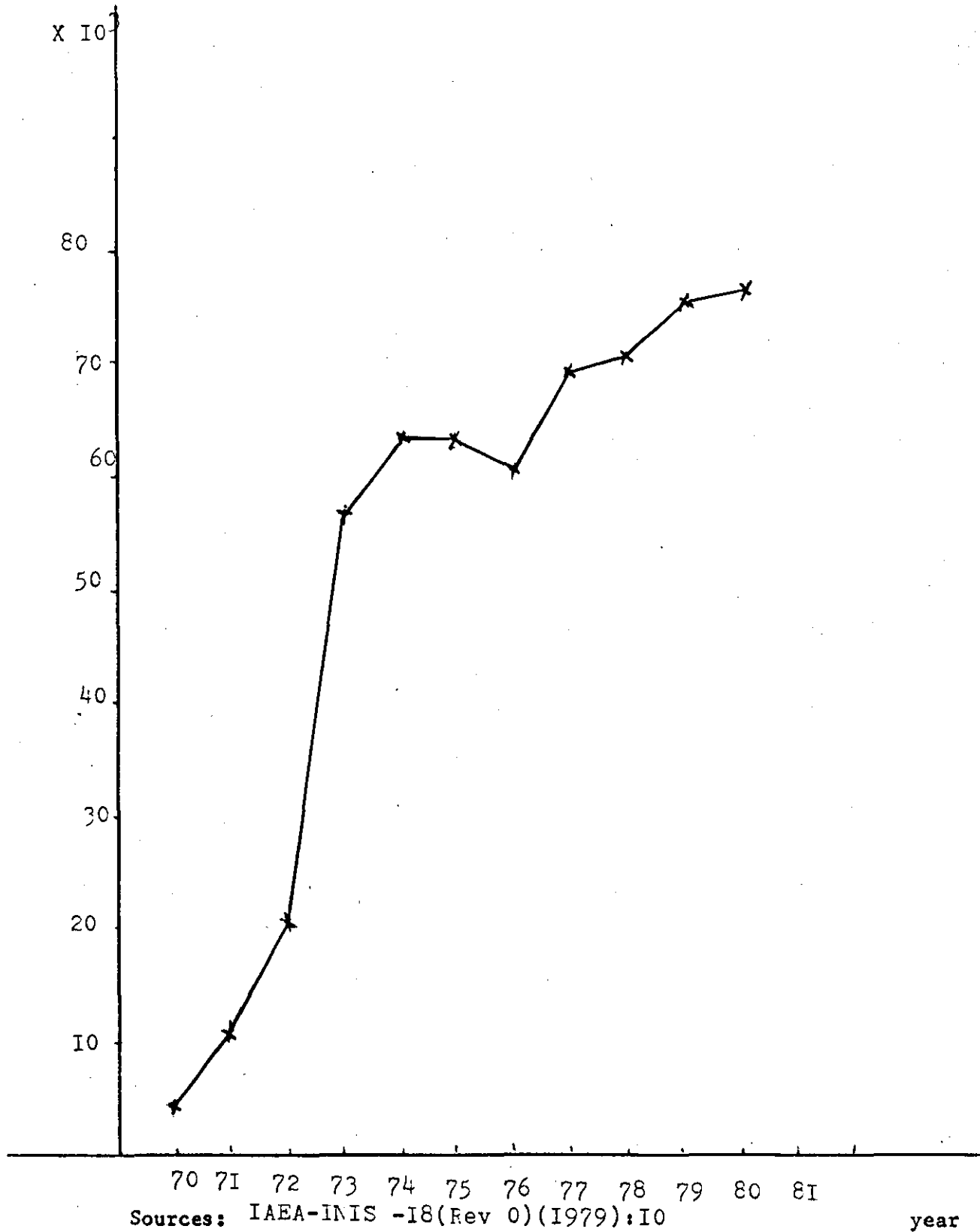
Source: IAEA-INIS-18 (Rev 0), (1979): II

Years

Graph 5

The amount of output produced by INIS since 1970.

No. of items announced -



Year by year more countries have agreed to participate in INIS by sending input to the system and by disseminating its output products nationally. Graph 5 shows the amount of output produced by the system since 1970.¹⁶ In Appendix A shows the list of IAEA Member States and Organisations which participate in INIS.

In 1970, at the commencement of the system, 38 countries had indicated their willingness to participate by contributing information. Now, in the middle of 1980 or ten years later, the number of countries has grown to 64, 13 being from the international and regional organisation.¹⁷ As part of their participation many of the countries have established highly developed national information collecting procedures. For example, in the Soviet Union, which annually contributes approximately 18% of the total information distributed by INIS, the work of collecting the information is assigned to some 18 centres.¹⁸ The activities of these centres are co-ordinated by Atominform Central Research Institute in Moscow.

Generally, in the developing countries less nuclear information is published. This is partly because these countries do not have a highly developed science journal publication programme. Thus their scientist frequently publish research result in international or foreign journals where they can obtain wider exposure. Their information mostly published unconventional literature - technical reports. The preparation of input to INIS for this material then became the responsibility of the country in which the material is published.

### THE INIS LIAISON OFFICERS

In almost all countries the heads of the national centres who take the responsibility for preparing the input and for distributing the output have been appointed as INIS Liaison Officers by their national governments. The INIS Liaison Officers are responsible for organising the collection of information and the preparation of input on a national level. They are also responsible for setting up and maintaining national information services using the INIS products and for encouraging their utilization. Regular communication takes place by correspondence through the INIS circular letters and INIS Technical Notes and through the annual consultative meetings of INIS Liaison Officers.¹⁹ A quarterly INIS Newsletter also assists in maintaining communication between the Secretariat and the Liaison Officers. Appendix B shows the list of INIS Liaison Officers from IAEA Member States, International and regional organisations.

Malaysia joined INIS in 1978.²⁰ The INIS Liaison Officer of Malaysia is a Puspati staff and was selected by the Ministry of Science, Technology and the Environment.

### THE INIS TRAINING SEMINARS

To assist Member States in developing their own capabilities for disseminating information and to build up national information

structures in accordance with local conditions and needs. INIS conducts training seminars, make available opportunities for fellows and other trainees to receive training at the Agency's Headquarters and provides a technical advisory service for national information centres. See the previous programme of training in illustration 25. Almost 600 people, many of them from developing countries, have undergone some form of INIS training since the system started operating.²¹

All aspects of INIS operation are taught in the seminars and workshops, including descriptive cataloguing, selection criteria, abstracting, indexing and retrieval. On occasion, the INIS training has been organised in co-operation with FAO/AGRIS because of the similarity of the two systems.²²

INIS also makes available to the IAEA Member States technical advice on the establishment, operation and management of modern information systems. It assists national INIS centres in setting up the software necessary to exploit fully the INIS magnetic tapes. One form which this assistance takes is the inhouse training of users or potential users who spend varying lengths of time working in the INIS Section, the Agency's Computer Section or in the library at the Vienna International Centre. Another form of assistance is provided by staff in the INIS Section spending short periods at National INIS Centres to advise on the preparation of input or the utilization of output products.



Illustration 25

## INIS SEMINARS 1970-1976

	Participants	Countries	International Organizations	Additional Information Systems	No. of COURSES						Retrieval Systems	Duration (working days)
					General Indexing	Specialized Indexing	Abstracting	Descriptive Cataloguing	Orientation	Magnetic Tape Users*		
Vienna 1970	28	16	3		1		1	1				15
Bombay 1970	34	8	1		1		1	1				15
Buenos Aires 1971	26	6	1		1		1	1			SID Demonstration	15
Vienna 1972	40	22	6			4						5
Vienna 1973	38	27	5			4					IRMS	5
Luxembourg 1974	34	22	2			4					ENDS and STAIRS	4
Ankara 1975	85	28	6									
INIS	51	26	3	AGRIS	1	4		1	2		IRMS	7
AGRIS	34	13	2					1				5
Vienna 1976	131	46	12									
INIS	80	28	4	AGRIS	1	4	5	1	2	2	IRMS and STAIRS	10
AGRIS	52	31	8					1				7

* Tutorial and Workshop. (Two 1-day courses)

INIS SEMINAR WORKSHOPS 1977  
(Main Inputters ONLY)

Washington 25-29 April	USA. (ERDA)	Subject control and bibliographic control aspects. Problem areas.
Moscow 12-16 September	USSR: (Atominform)	Subject control, including abstracts, and bibliographic control aspects. Problem areas.

## INIS TRAINING PROGRAMME 1977

	Participants	Countries	International Organizations	Additional Information Systems	TRAINING						
					INIS/AGRIS Orientation Course	General Indexing	Specialized Indexing	Abstracting	Descriptive Cataloguing	Computer Aspects	Training
Vienna 1977 INIS	6	6	-								
AGRIS	6	5	1	AGRIS							

INIS/AGRIS ON-LINE TRAINING (Jan.-July 1978)  
(DIRECT ACCESS PROJECT)

Country linked up	Location		Month	No. of participants		Organizations represented		Duration (in days)	
	INIS	AGRIS		INIS	AGRIS	INIS	AGRIS	INIS	AGRIS
Austria	Vienna	-	January	8	-	4	-	2	-
Netherlands	Petten	Wageningen	March	15	6	11	5	2	1
UK	Harwell (England)		April	11	9	11	8	2	2
Scandinavia	Lysebu (Norway)		April	6	3	6	3	2	2
France	Saclay		May	10	3	2	1	2	2
Czechoslovakia	Prague		June	8	1	3	1	2	2
Hungary	Budapest		July	7	3	4	1	2	2
In-House	IAEA		April	13		IAEA	FAO	2	2

Source: IAEA-INIS-I8(Rev 0)(1979):71

## 4.2 INIS RECORD

INIS reporting centres may send their input to IAEA Headquarters in Vienna in a variety of forms, machine-readable or non-machine readable.

Normally, the INIS record for a piece of literature comprises three main components:

1. A bibliographic description, identifying authorship and similar details. This is recorded on the front of the INIS Bibliographic and Indexing Worksheet (see Appendix C).
2. A set of descriptors, identifying the subject content of the pieces of literature. Descriptors are selected from INIS Bibliographic and Indexing Worksheet (see Appendix C)
3. An abstract summarising of the information contained in the piece of literature. This is recorded on the INIS Abstract Worksheets (see Appendix D ).
4. Data flagging.

## TOOLS TO ASSIST IN PREPARATION RECORD

### INIS Descriptive Cataloguing Rules

These are one of several sets of rules for assuring uniformity

of the way in which input is specified and described. The bibliographic description of each item of information submitted is prepared according to the INIS Descriptive Cataloguing Rules. It is a requirement of INIS that literature submitted for inclusion in the system should be analysed down to its smallest bibliographic components. For example, journals are analysed to the level of individual articles; books are generally analysed to the level of chapters; monographic series are analysed to the level of volumes and within this into individual chapters or sections. For each analysed part, full bibliographic information must be given. This includes author, title, edition, identifying numbers, if any, imprint, collation, language and appropriate bibliographic notes.

The purpose of any indexing system is to facilitate the efficient retrieval of relevant information. INIS utilizes both subject categories and subject descriptors in its indexing system.

The terminology of the INIS Thesaurus was derived from the 1969 edition of the EURATOM Thesaurus, but its structure is substantially different, being based on three types of interrelationship between thesaurus term: preferential, hierarchical and affinitive.²³ Preferential indicators identify preferred terms in cases when some ambiguity may exist. For example: 'HAZARDS UP (used for) risks. Hierarchical indicators identify the semantic relationship between descriptors on different levels of specificity in the same hierarchy of concepts.

These are translations of the Thesaurus into French, German and Russian languages and have been published by the IAEA as part of the INIS Reference Series.²⁴

Data flagging and tagging - at its present stage of development, INIS is concerned with the storage and retrieval of available literature in the nuclear field. In other words, INIS is a bibliographic information system, providing references. The demand among scientists is more and more for information systems that provide direct answers to questions, fact or data required from information systems. In 1979, INIS introduced a system of data flagging that indicates both the specific topic for example effect, phenomenon, property on which the documents provides numerical data as well as experimental data, evaluated data and theoretical data.²⁵

It has always been a requirement of INIS that all items reported to the systems should be accompanied by an abstract, starting from Volume 7, 1976, abstracts in the English language have been included in the magnetic tapes and printed in INIS Atomindex.²⁶ For many items, the magnetic tape record contains a second abstract in another language, usually the language of the original documents.

#### 4.3 INIS ACTIVITIES

##### INIS operations

Following the decentralization philosophy, Member States are

responsible for the collection of the nuclear literature published within their borders and for the preparation of the associated input in proper bibliographic and index form.

### INIS Processing

Input is submitted by national INIS centres either in machine readable form or in the form of worksheets.²⁷ A number of different forms of machine readable input can be accepted, provided that their format conforms to the INIS rules as follows: magnetic tape as described in IAEA-INIS-9; paper tape - as described in IAEA-INIS-8; in a form suitable for OCR (Optical Character Recognition) processing.

### INIS Reference Series

In a system such as INIS, for which the input is prepared by information workers in many countries and with varied backgrounds and traditions in bibliography, it is obviously essential to work to precise standards and rules if the consistency on the resulting information files is to be assured. During the development stage of the system, therefore, a series of manuals were prepared known as the INIS Reference Series. Examples are:

**INIS - Descriptive Cataloguing Rules.**

Descriptive Cataloguing Samples.

Subject Categories and Scope Descriptions.

Instructions for Submitting Abstracts.

Terminology and Codes for Countries and International Organisations.

Authority list for Corporate Entries and Report

Number Prefixes.

Magnetic and Punched Paper Tape Codes and Character Sets.

Paper Tape Specifications and Record Format.

Transliteration Rules for Selected Non-Roman Characters.

Magnetic Tape Specifications and Record Format.

Authority List for Journal Titles.

Manual for Indexing.

Thesaurus.

Description of Computer Programs.

Self-Teaching Manual for Descriptive Cataloguers.

Subject Indexing Samples.

First step on STAIRS.

Orientation Manual for INIS and AGRIS (OMINAS).

OCR Input Instructions.

**Document processing**

All full sized copies of item of non-conventional literature submitted by the INIS centres with their input are microfilmed in the

INIS clearing house for distribution in the form of microfiche. A full set of all the microfiche ever made by the INIS clearing house is kept permanently on file, and copies of any of them can be supplied on demand and at a nominal fee.

### Computer Processing

Machine-readable data are converted by program into an internal working format. Each record is split up into two components: bibliographic data and abstracts and subject descriptors. Each component is then processed by the appropriate set of checking programmes. Whenever the computer detects errors in the input these are flagged on a reference list which displays all the records processed.

The data are then stored as three major record types, as follows: Bibliographic type - for each document a record is generated for the bibliographic part of the document, together with any error codes; Abstract type - for each abstracts accompanying a document a record is generated, together with error codes; Indexing type - all descriptors relating to the documents are generated as one record, together with any error codes.

In addition, the TRN (temporary reference number) control record is generated for each document. It contains information relating to each part of the document together with standard information of the

document as a whole. The three different record types are comprised as logical storage units within a physical direct access file with a HDV (Header, Directory, Variable) type structure.²⁸

A flowchart of the INIS computer processing cycle is shown in illustrations 26 and 27.

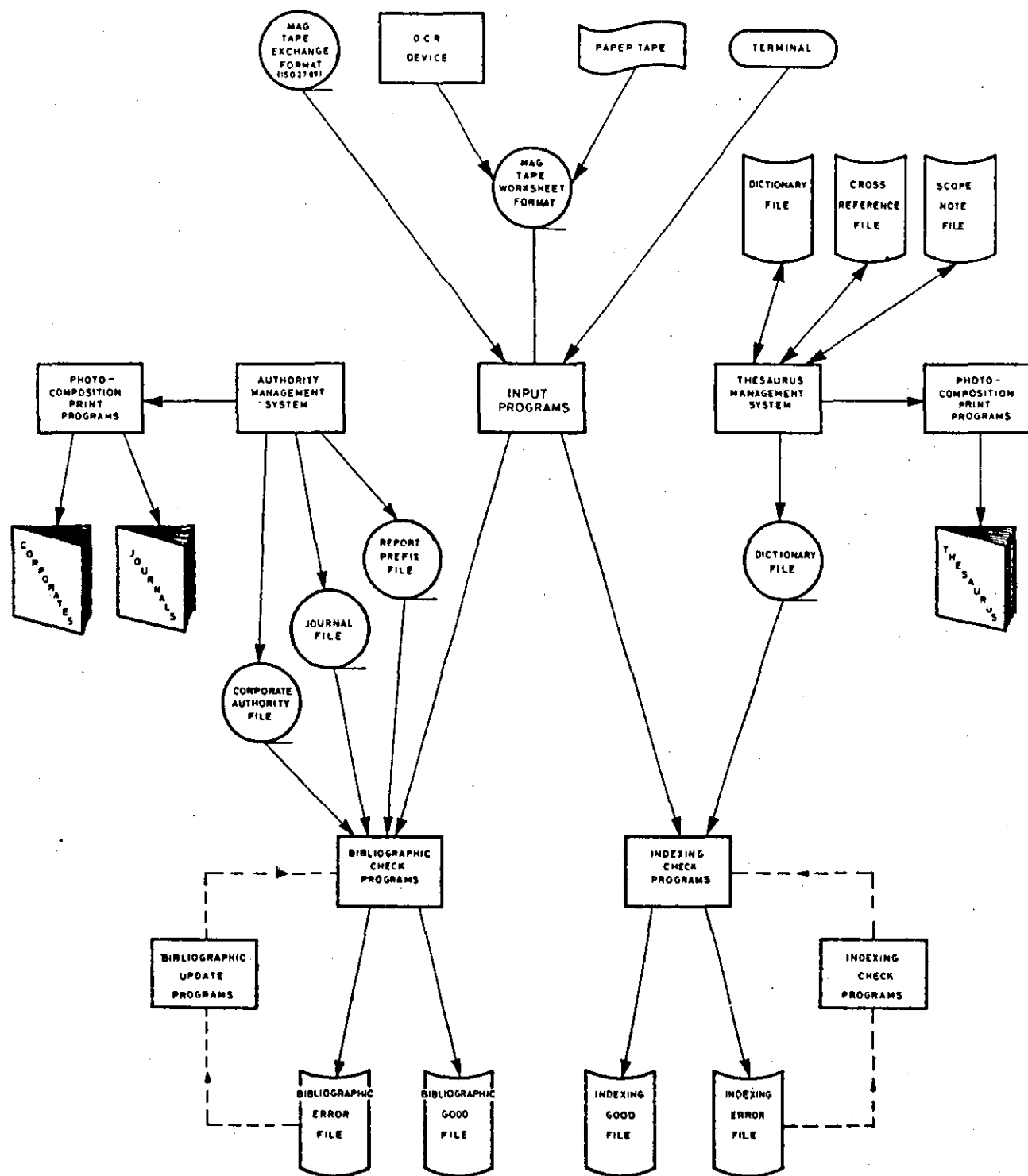
#### Quality Control

The quality and consistency of the INIS products is dependent on a careful application of the INIS rules by the national centres. If systematic errors are found in the input received from a particular country the INIS Secretariat draws this to the attention of the INIS Liaison Officer concerned, so that corrective action can be taken. Such errors are discovered, partly by computer checks, and partly by visual checks. In further effort to ensure consistency of subject indexing the Secretariat of INIS has, in the past, coordinated a number of Indexing Consistency Tests in which most input centres participated. Finally, the INIS Training Programme plays a major role in improving and maintaining the quality of the INIS products.



-Illustration 26

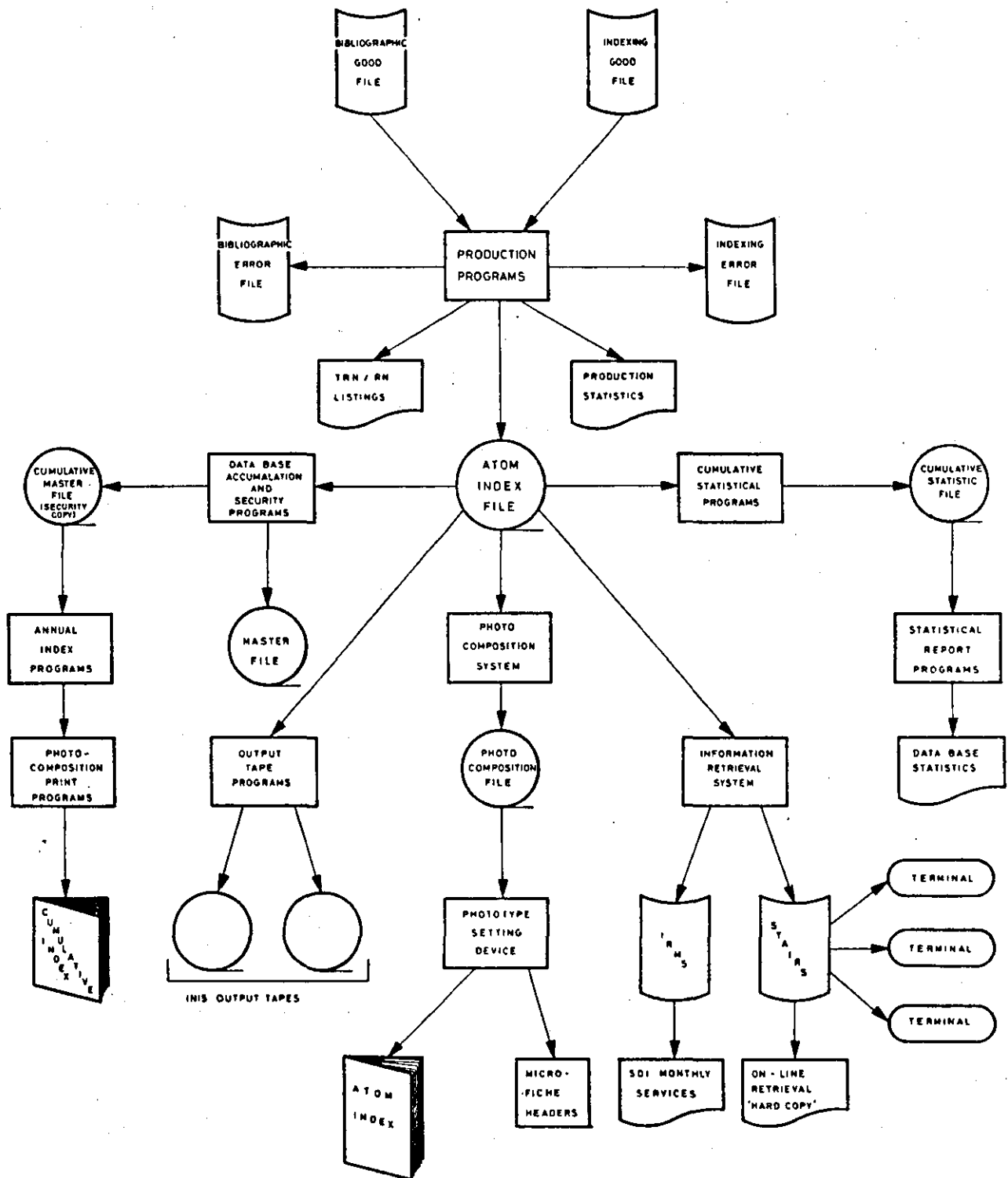
## INIS Computer Processing I



Based on: IAEA 'INIS Today', Vienna, (1982): 34-35  
 IAEA CMINAS (1979): 166

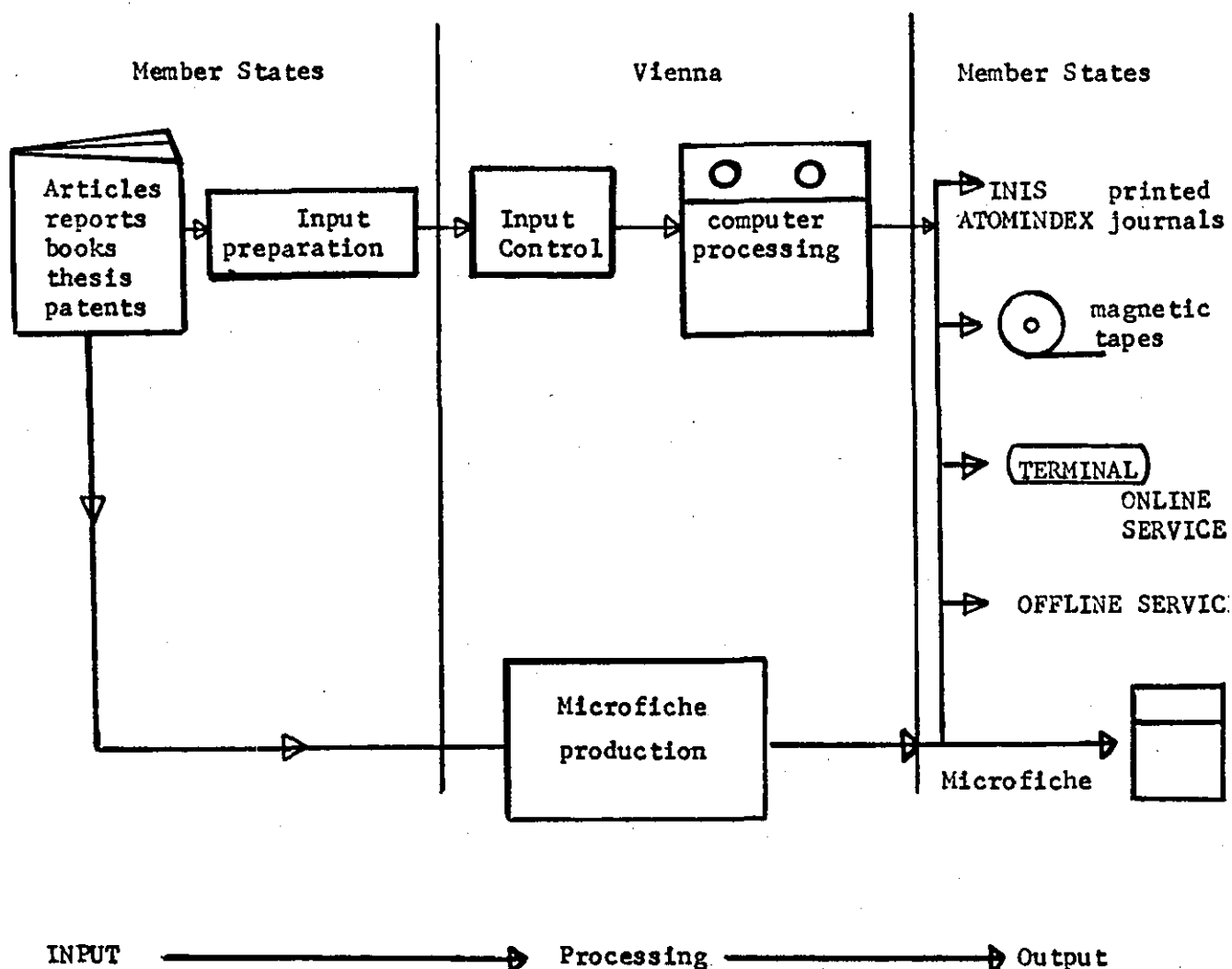
Illustration 27

## INIS computer processing II



The operation of INIS in Vienna in relation to the Member States activities can be overviewed from Illustration 28.

Illustration 28: Overview of INIS operation



Sources: INIS Today, IAEA, Vienna (1982): 12.

#### 4.4 INIS OUTPUT PRODUCTS AND SERVICES

The information collected through INIS is distributed in several forms: magnetic tape, INIS Atomindex, online service and a microfiche service.

##### INIS Atomindex

This is a semi-monthly announcement and abstract journal, available to the public on subscription. INIS Atomindex is prepared, in conjunction with the INIS magnetic tapes, by computer driven photo-composition. The bulk of the information contained in the magnetic tapes is printed in INIS Atomindex. In each issue published, the indexes are provided as follows: personal author index; corporate entry index; subject index; conference index (by date and place); report, standard and patent number index.

##### INIS magnetic tape service

The service provide magnetic tapes containing the checked and processed input submitted to the system by participating centres. Tapes are shipped monthly or bi-monthly, depending upon the desires of the using centre.²⁹

Magnetic tape output is available in a variety of formats, according to the needs of the recipient. Option available include 9-track tapes

(recording density 800 bits per inch, 1,600 bits per inch or 6,250 bits per inch), and 7-track tapes (200 bits per inch, 556 bits per inch or 800 bits per inch).³⁰ Tapes are recorded in NRZI (modified non return to zero) mode except for the high density tapes (over 800 bits per inch) which are recorded in PE (program element) mode. All have odd parity. The agency makes available tapes containing INIS data in a format suitable for searching by the IBM STAIRS or INIS/ISIS software.

National INIS Centres in many countries are utilizing the tapes in the provision of national information services, such as selective dissemination of information (SDI).

#### The INIS Online Service

The INIS online, like the magnetic tapes services, is available only to member States participating in INIS. The basic components of the services are: connect-time for interactive searching of bibliographic data bases; automatic execution of stored search profile, for example selective dissemination of information (SDI) service; automatic mailing of the printed result of searching and SDI execution.

Organisations in member States wishing to utilise the online service must first request authorisation from their national INIS Liaison Officer. The mode of access and arrangement sequence for obtaining online service to the INIS database are shown on Illustration 29.

Illustration 29

Arrangement sequence for obtaining online service to the INIS database in Vienna.

Scope of access	Mode of Access	Liaison Officer approval required	Network connect	User Registration
1. Worldwide	Direct dial, telephone, telex	Yes	PTT	With IAEA
2. Worldwide but only in countries with Tymnet nodes	Tymnet	Yes	Tymnet	With IAEA
3. Member countries with ESA (European space agency)	ESA/IRS	Yes	ESA/IRS	Through ESA rational centre.
4. Countries collaborating with IIASA on networking	IIASA	Yes	IAEA	IAEA

Sources: Zheldev, I., S & R Romanenks. Direct Access to INIS, op. cit., 14.

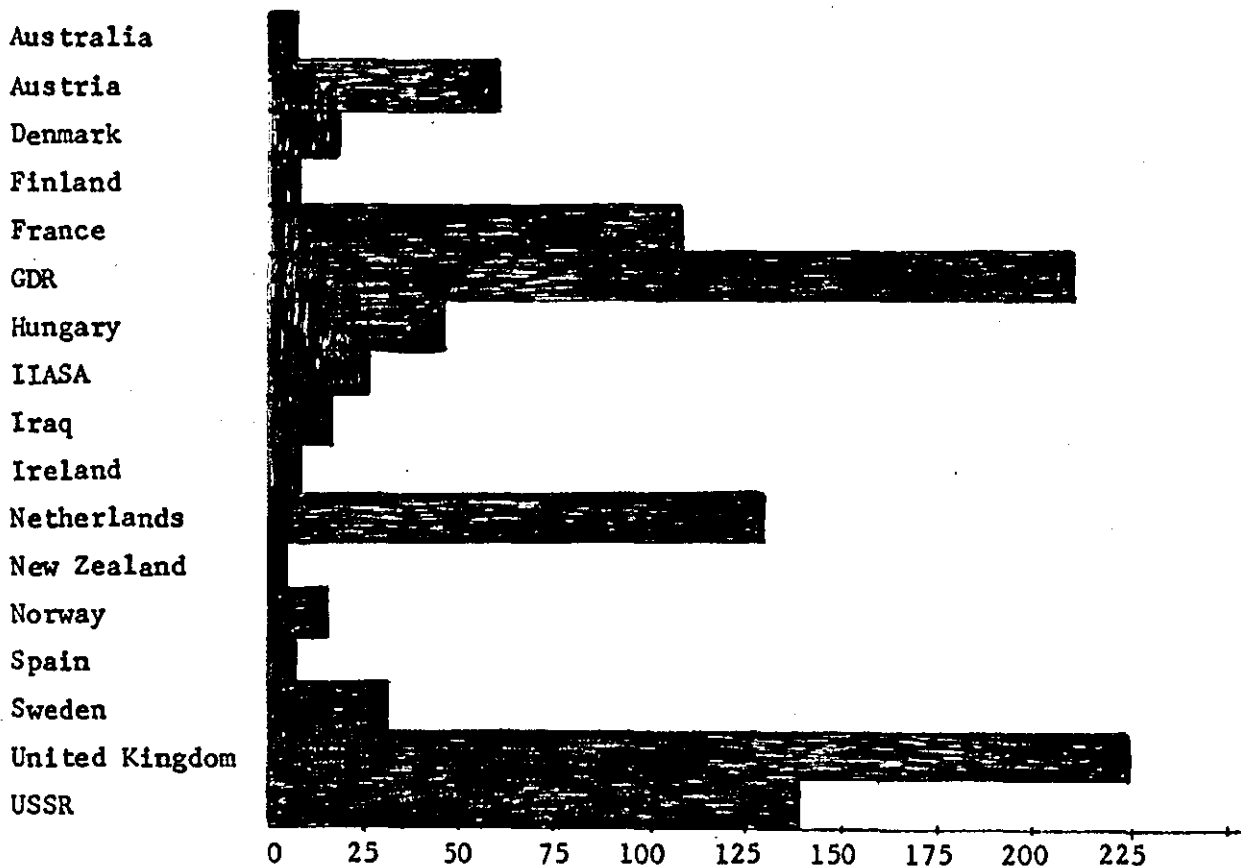
INIS database can be accessed by Member States via EURONET, ESANET/ESA/IAEA/IIASA, IIASA/IIS (Moscow) and TYMNET.³¹ Tymnet is an international commercial network whose major traffic flows in and out of the U.S.A. The IAEA then connect its computer to Tymnet as

a host. A variety of technical and administrative problems have delayed some countries' individual arrangements, but the feasibility of the Tymnet option was proved when successful searches were conducted from terminals as distant as from Vienna to New Zealand.³² This also can be obtained from the cumulative connect times from January-November, 1980 to INIS database as illustrated in illustration 30.

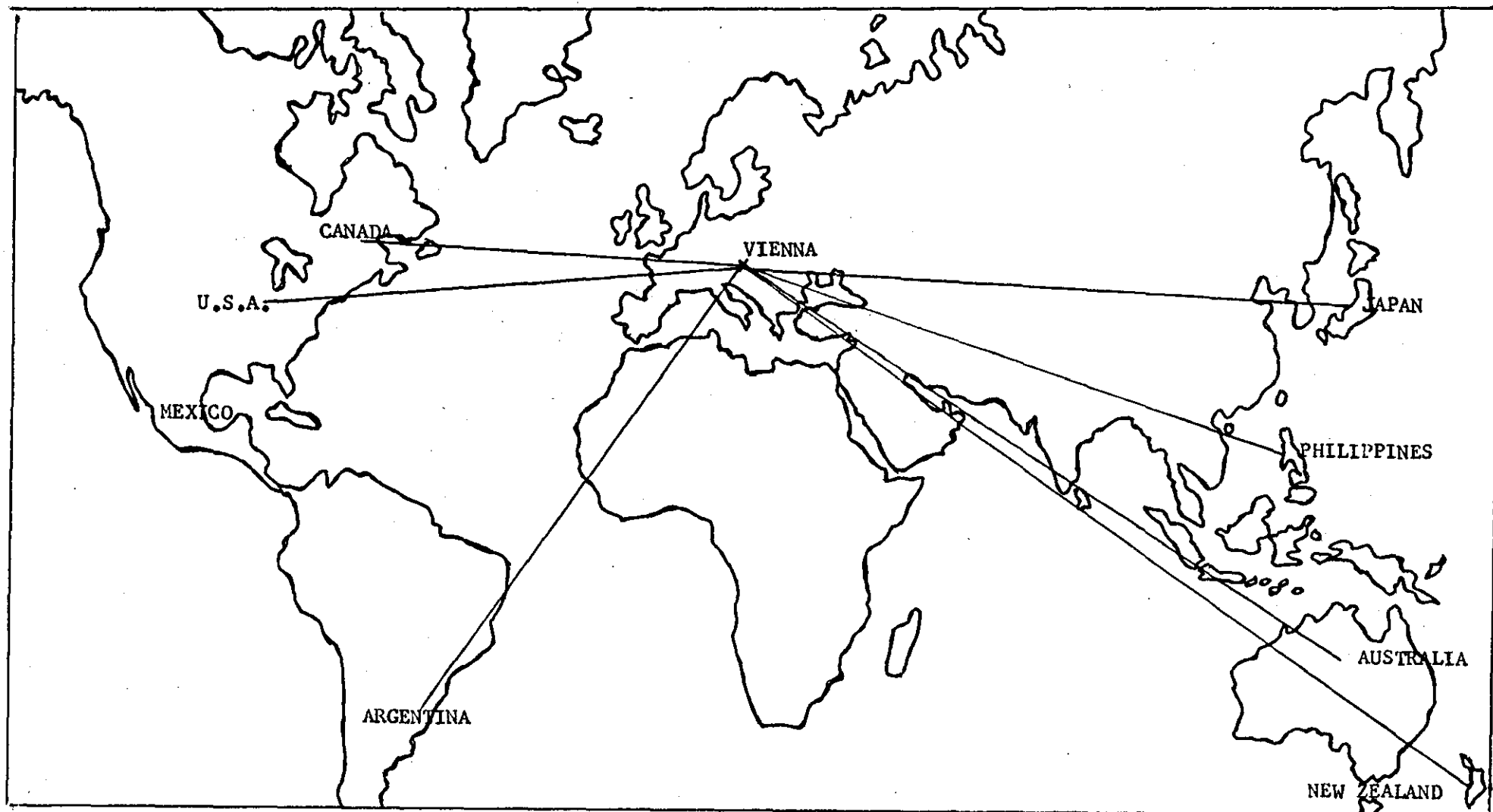
### Illustration 30

Cumulative connect times for January-November 1980 to INIS database by external users (Times 1h omitted).

Country:



TYMNET-INITIAL IMPLEMENTATION



Sources: Zheludev, I.S., Future development of INIS (unpublished report), (1980), 27.



Initial implementation of getting access to INIS database via Tymnet have been done by IAEA to several countries as shown in the map 4.

#### INIS non-conventional literature on microfiche

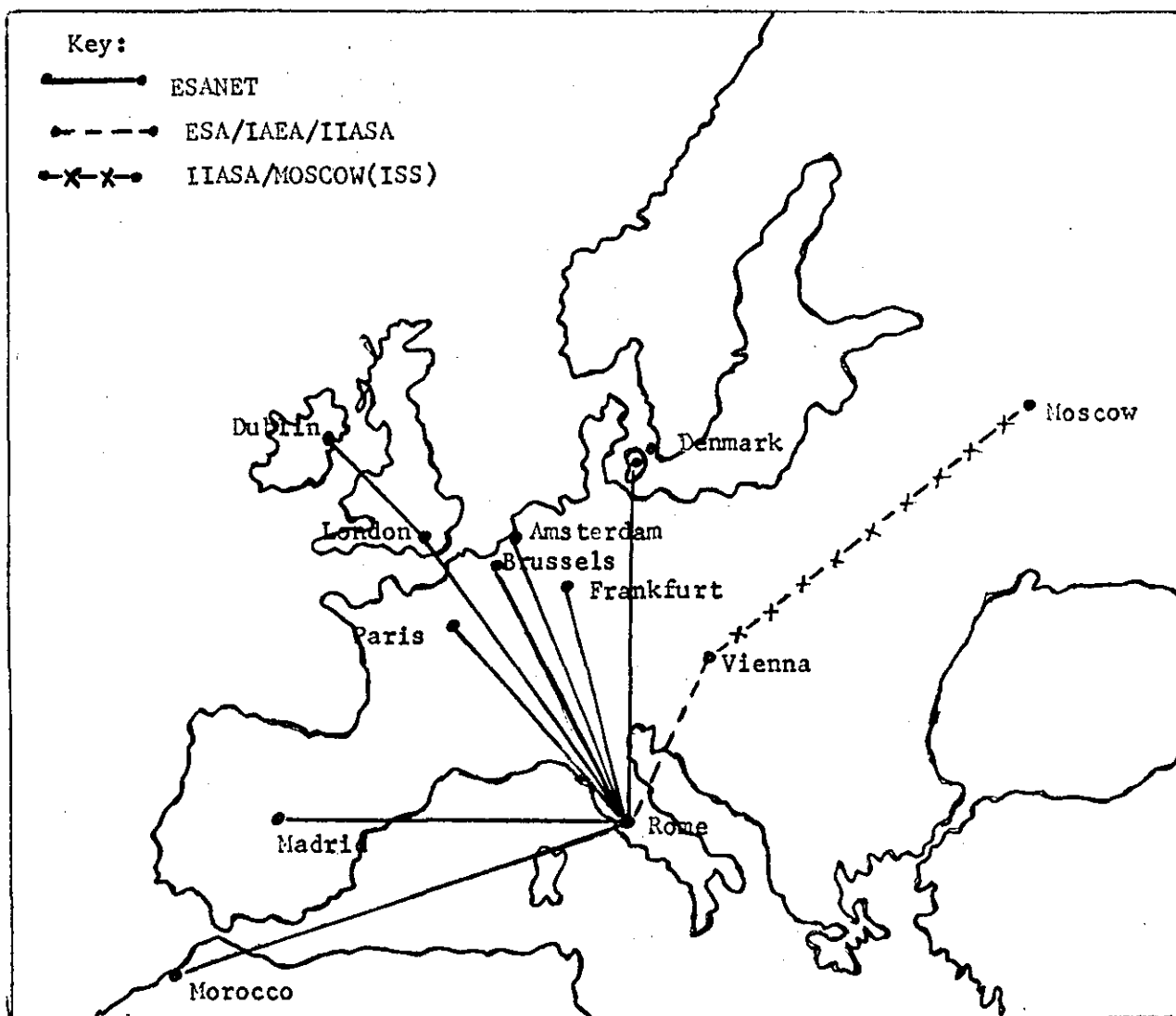
Literature reported to INIS may be subdivided into two categories, conventional and non-conventional. Conventional literature means literature which is commercially available through the normal distribution channels. Non-conventional literature comprises all other forms of literature, including scientific and technical reports, patent documents, non-commercially published theses and dissertation and standards.

The INIS clearing house, a unit within the INIS Section of the IAEA, supplied on request, microfiche copies of most of the non-conventional literature announced in the INIS magnetic tapes or in INIS Atomindex. Microfiche copies are produced on photographic film in a standard size of 105 x 148.75mm.³³

#### Document Delivery

It is also planned to add an online ordering feature to enable users to request microfiche copies of documents directly from INIS. See illustration 31. In this connection, method of document delivery through computer link request to major libraries or clearing houses are undergoing improvements and thus obtaining the actual documents desired will be merely a sub-step at the end of bibliographic search. For document delivery by offline see illustration 32.

## Map 5

1980 Network Configuration

Sources: Zheledev, I.S., Romanenko, A.G., Direct Access to INIS,  
IAEA Bulletin 23(1) (1981), 12.

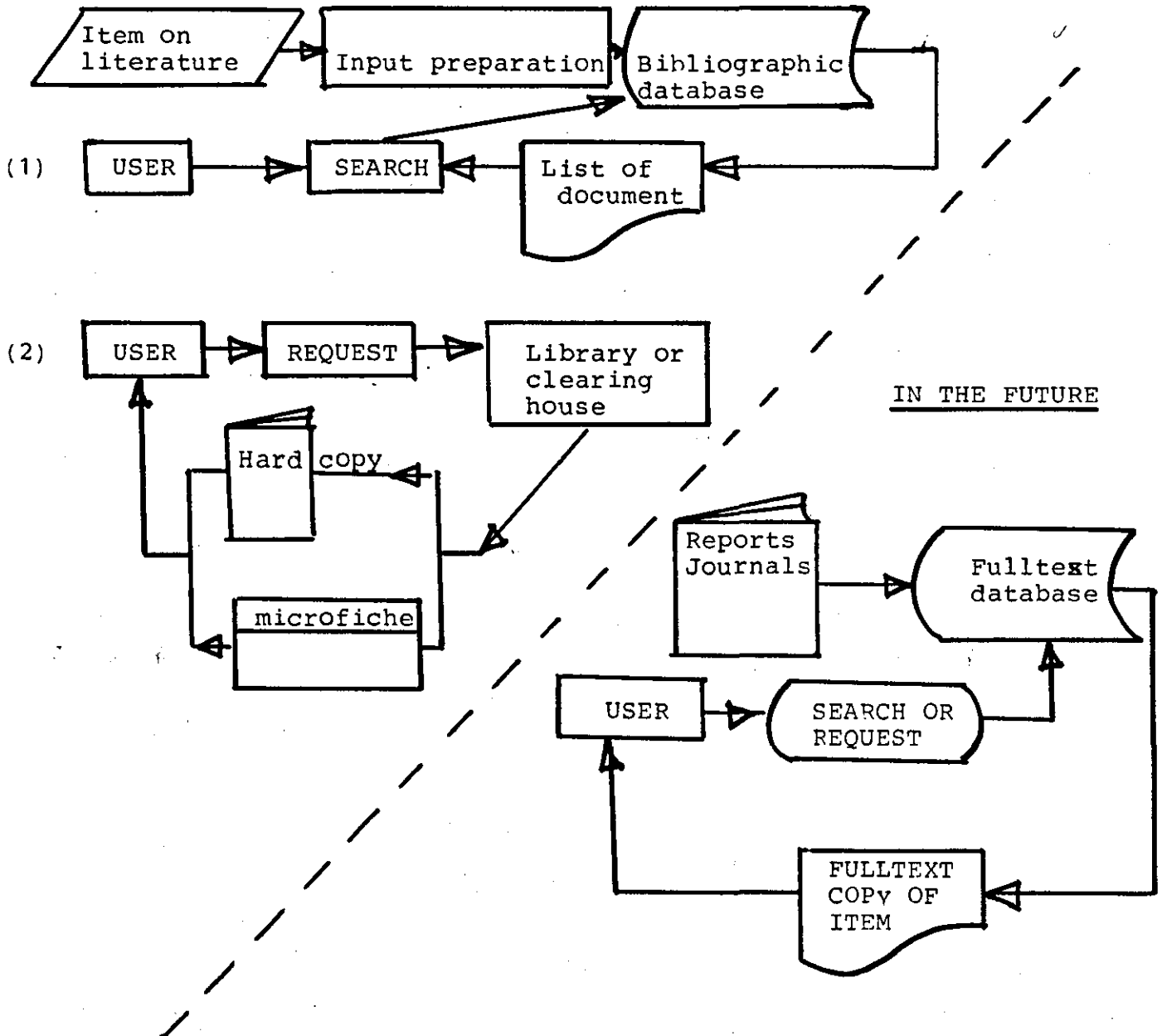
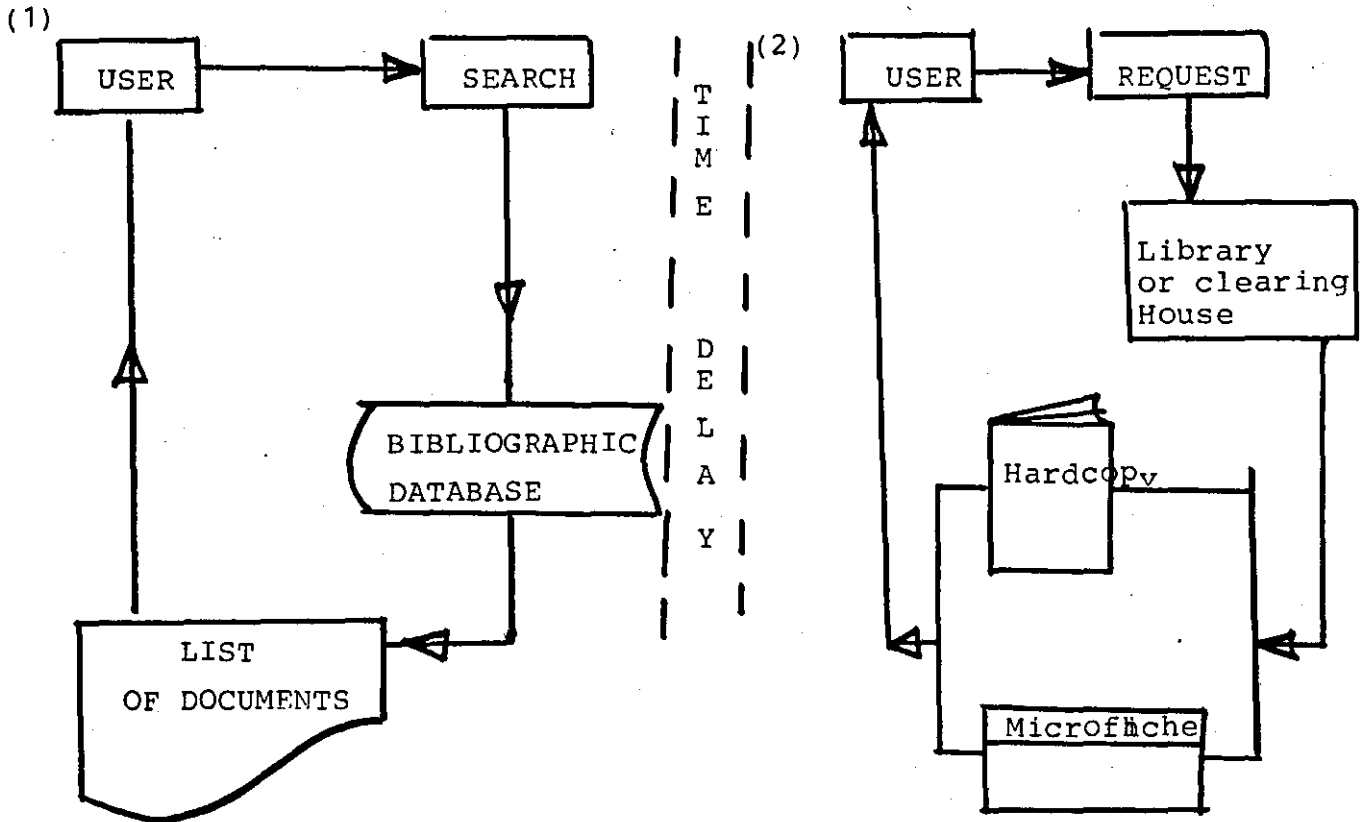
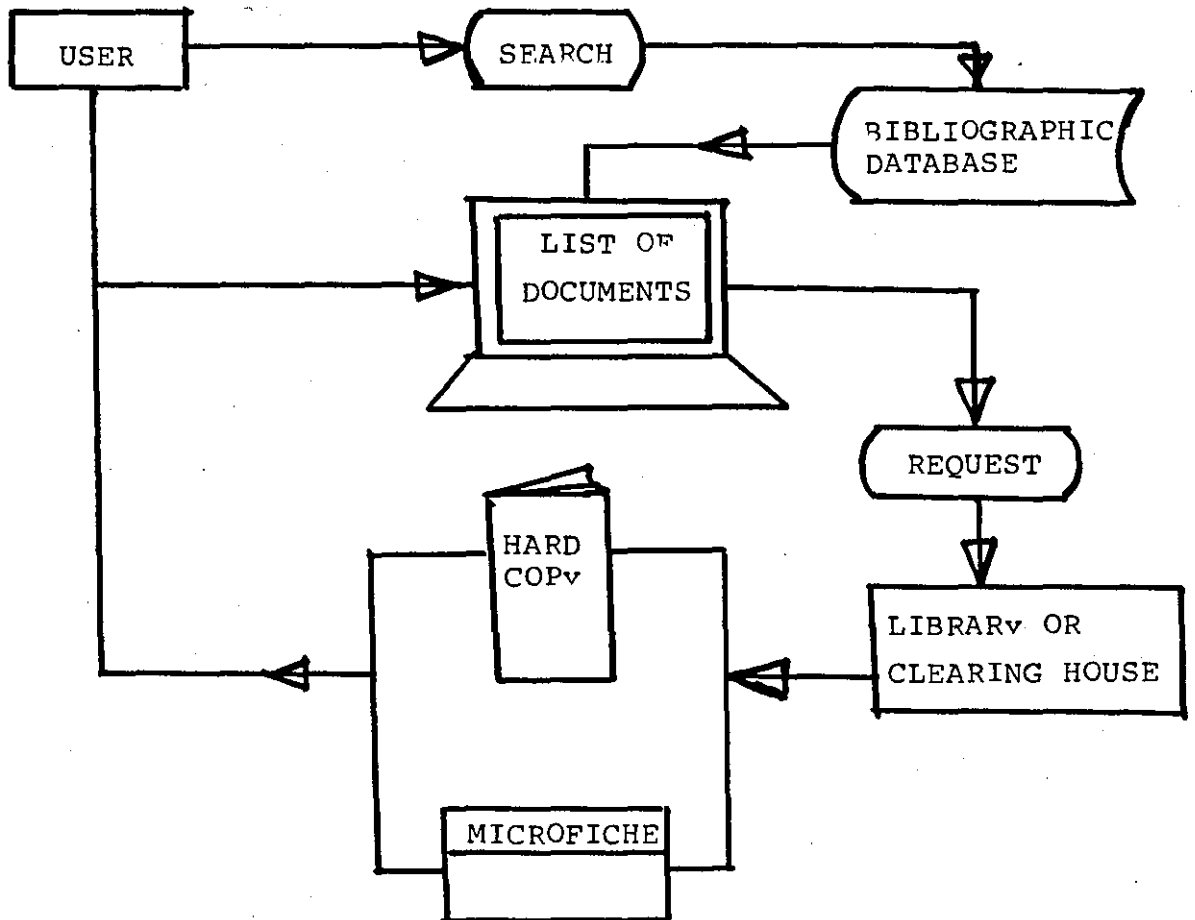
Illustration 31Document delivery onlineNOW

Illustration 32  
Document delivery off line

NOW



IN THE FUTURE



#### 4.5 DATA BASE DEVELOPMENTS

Since 1975, facilities for online interrogation of the INIS database have been available internally to the IAEA staff. In 1976, several national INIS Centres ask the INIS secretariat to provide external access. This question was discussed later by the INIS Liaison Officers at their meeting in November, 1976. The resulting recommendation to provide external access was accepted by the Agency. In 1978, 10 countries made direct access and by the end of 1978, use of the access service had reached an average of over 100 hours connect time per month.³⁴ Some INIS Member States (including some within Europe) did not have suitable direct dial connections to Vienna.

The INIS database is on Information Retrieval Service (IRS) as a distributed database, the full and latest INIS database residing on the IAEA computer in Vienna is available concurrently to users through the leased-line and software arrangements established by ESA and IAEA. These arrangements enable ESA/IRS users to search the Frascati computer databases for example Chemical Abstracts using the ESA/IRS developed software known as QUEST.³⁵ To search INIS, a user merely invokes the appropriate change data base command in QUEST and is shifted over to INIS on the IAEA's computer and placed in the hands of STAIRS software. Both QUEST and STAIRS are easy to use, English based word search languages. The distributed database availability of INIS on ESA/IRS should therefore be distinguished from versions of INIS appearing on Euronet, an information network

established by the CEC. These latter versions are derived from magnetic tapes mailed from Vienna, to INIS national centres who are also Euronet hosts.

### Network Development

One major reason for networking is to achieve decentralised control and independence of functions that are nevertheless interrelated. In 1978, INIS network project gave up to 10 Member States online access to the IAEA's computer to search INIS and AGRIS.³⁶ System and sub-systems that form part of a network may be controlled or uncontrolled, whereas the overall network at least has some points with loose control and perhaps a few junctions that occasionally require a more strict control. Although the basic idea of netting is decentralisation, one is sometimes forced to build a network from a few growth kernels yielding 'stars', 'spiders' or 'trees' and the avoidance of overlap is given as a reason.³⁷ Avoidance of overlap would justify the creation of decentralised input to network such as INIS and ERIC.³⁸

#### 4.6 FUTURE DEVELOPMENT

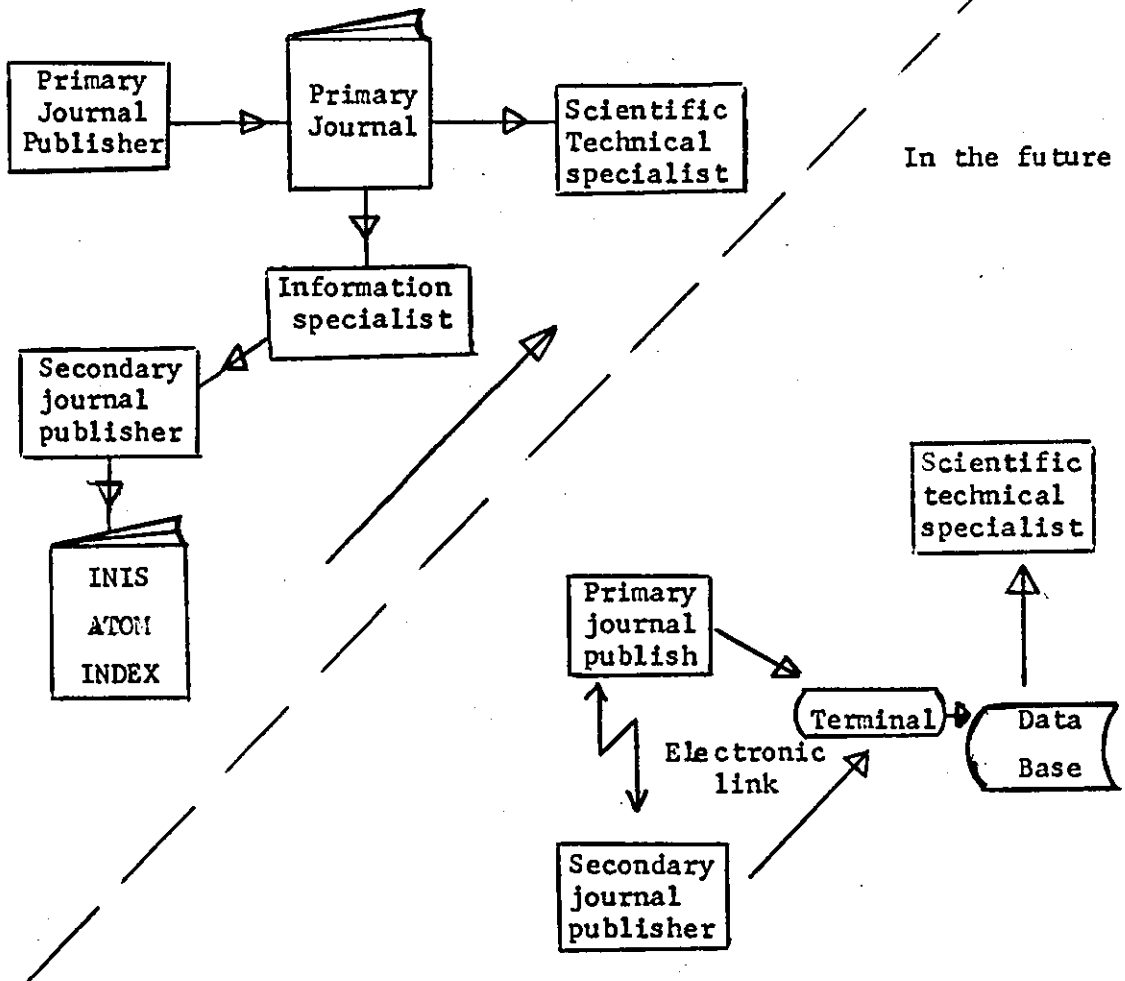
Having established various network connections, the energies of the INIS Secretariat are now being directed forward improvements in the

online interrogation process itself. Most of these are refinement in the sorting and display of search results on the screen or page and in search-sequence possibilities. Standardisation of search commands would be a valuable step in increasing the use of multiple databases and the efficiency of comprehensive search work. In the longer run, INIS anticipates possible direct links with some of the major international scientific publishers, permitting rapid-online announcement of the very latest literature.³⁹ Increased compatibility of numerical data banks with bibliographic data base is also seen as long run development, which should be of considerable value to users focusing on experimental finding and establishment of standard reference values.

A move towards a specific trend that will affect scientific and technical information systems such as INIS is that of electronic publications. This idea is taking hold now with regard to working papers exchanged electronically by small peer groups of scientists and it will be further forced by the increasing computerisation of conventional journals. Fully implemented, electronic publishing would obviously alter the nature of abstracting and indexing publications. See illustration 33. However, the need for full text delivery will continue for quite some time either in the form of hard copy or in some kind of microform and to be more efficiently met as a result of developments in facsimile transmission technology.⁴⁰

Illustration 33Electronic Publishing

## Current Situation





#### 4.7 PROBLEMS

As can be expected in any information system regardless of how well it might be functioning mechanically, there are always areas where improvement must and can be made.

The INIS Thesaurus - examination by the users and IAEA, shows some inconsistencies. These were enough to suggest that a detailed examination is required.

The subject categories and scope descriptions began to show sign of ambiguities.

The microfiche duplicates prepared by the diazo process proved to be inadequate when used for the preparation of second generation copies. To overcome this a new equipment was used by using a silver based method.

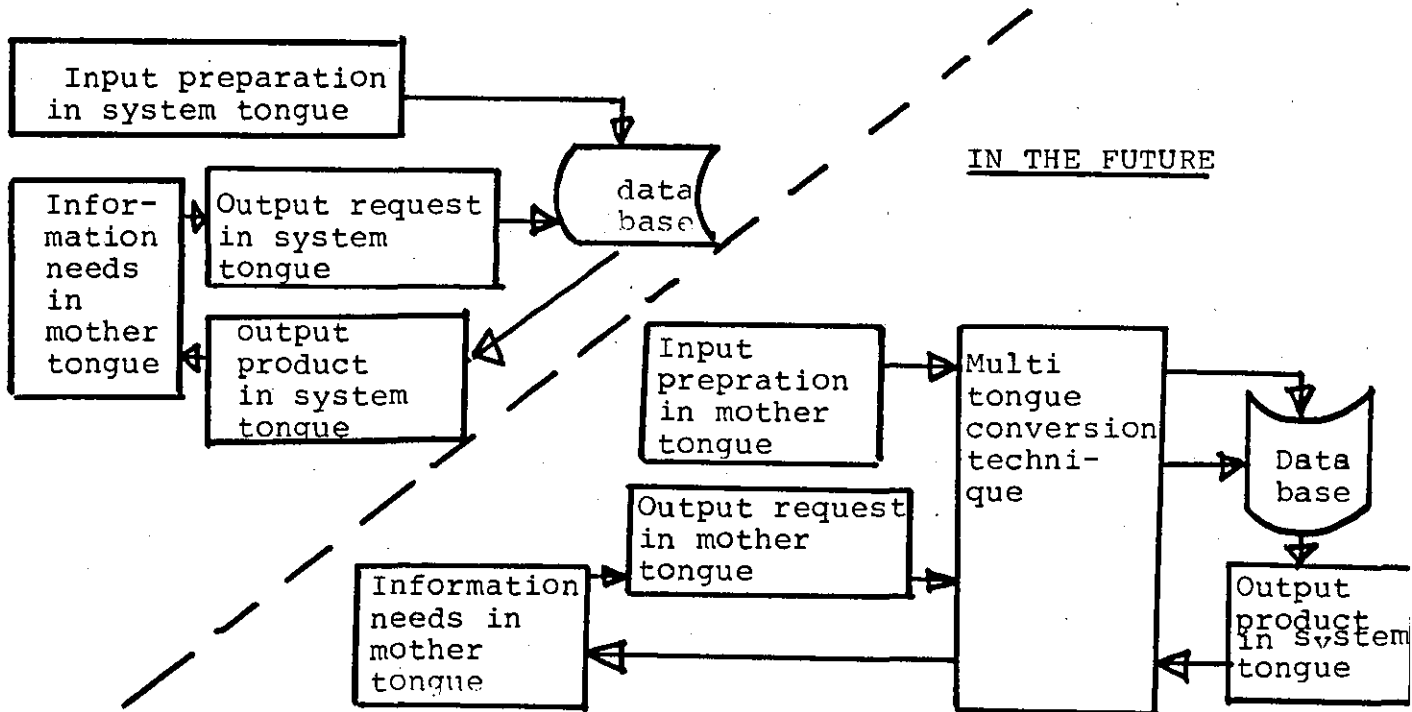
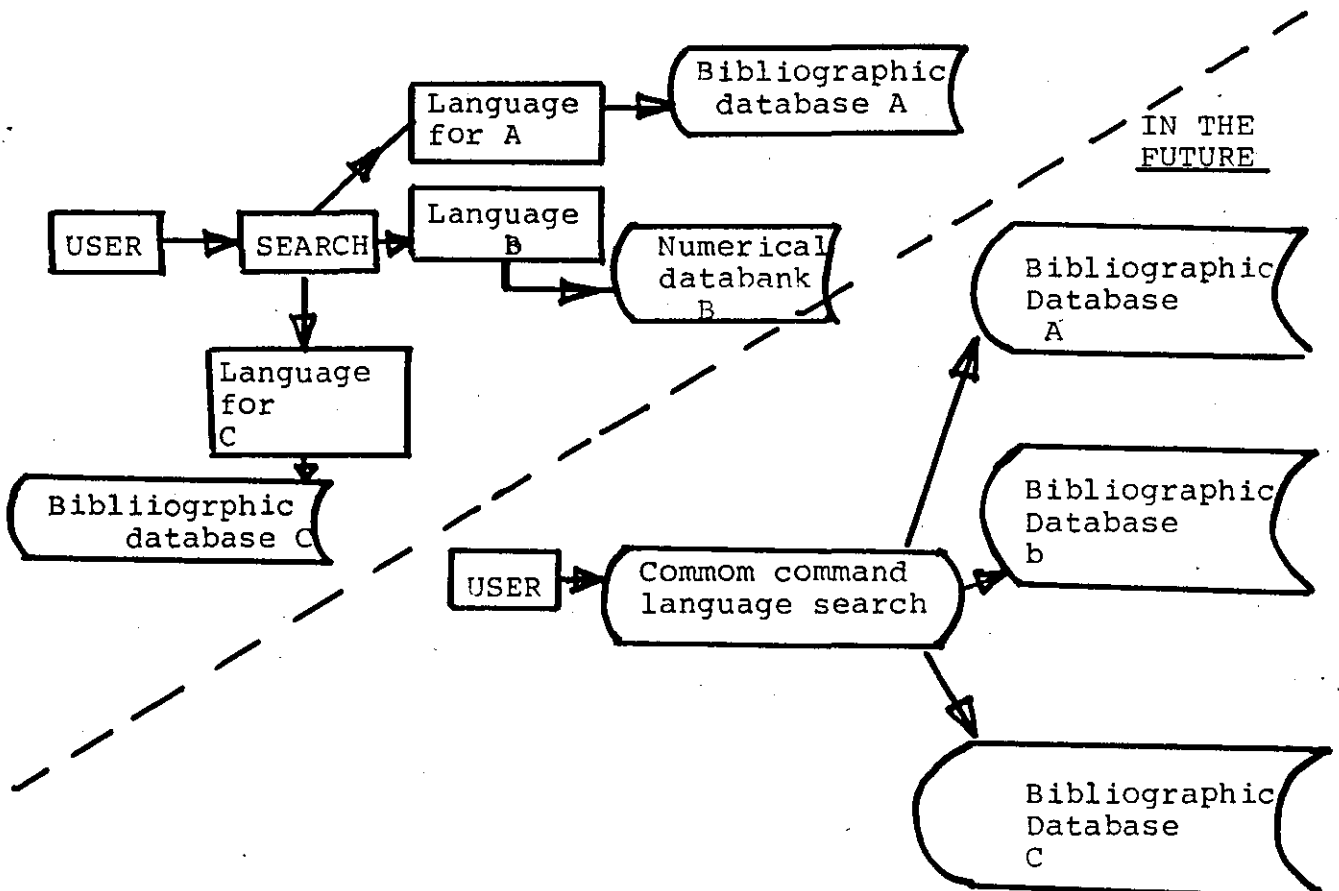
Complete coverage of the world's nuclear information presents two problems. First there is the inability of some participants to cover everything produced in their country, due to the lack of legal action, lack of promotional action by the liaison officer, lack of an organisational entity upon which to build or the inability to find qualified personnel, or the common general finding problems. Secondly the coverage of materials produced by non-member countries for example the People's Republic of China.⁴¹

Standardization - the main disadvantage of this decentralised data collecting method is the problem of achieving standardised cataloguing, abstracting and indexing from a large number of countries which only a few have English as their native language. Anticipating this problem, the IAEA has tried to minimise it by the following means: it has published the INIS Reference Series; a set of reports containing all the rules, standards, formats, codes, authority lists and so forth, to be used. Fundamental to INIS policy is that these follow UNISIST guidelines and international standards wherever these exist. One of the reports is a thesaurus from which descriptors are selected. It runs training courses every year. These cover cataloguing, indexing and retrieval; it encourages people from national INIS centres to work with the IAEA for brief periods, perhaps a few weeks or months; it organises an Indexing Consistency Test each year in which a set of 15 or so papers is sent out to all member countries for indexing. The results are considered at the yearly indexing training course and an 'ideal' set worked out.⁴²

Information systems, at present, usually have one language as the so-called carrier language or 'system tongue'. In the case of INIS, it is English, although the INIS record of non-English document carries at least the title in the original language. But for all practical purposes all communication with the system, both at input preparation and at output request, must be in the system tongue, thereby requiring conversions from and into the mother tongue of the Member States involved. Developments in multi-tongue conversion technique involving automatic translations or multilingual dictionary

files are expected to occur and when implemented they should expand user populations, usage levels and case input preparation. See illustration 34.

Existing and developing information networks are trying to include as many different databases as possible to satisfy the information requirements of their end users. Often the different databases require the use of different retrieval languages. The increasing number of data bases make it very desirable that communality or at least compatibility be achieved in these retrieval languages. Work is also underway in support of international efforts to develop a command language for the search process in general.⁴³ Machine conversion from one computer language to another is also a possibility. See illustration 35 for further explanation.

Illustration 34Language ProblemNOWIN THE FUTUREIllustration 35Language Problem(Search Software)NOWIN THE FUTURE

Malaysia joined INIS since 1978.⁴⁴ But so far no input has been made yet since there is no application of nuclear technique in Malaysia and Puspati is still at the planning stage. Secondly lacking of knowledgeable staff to conduct the collection of materials and knowing of how to make an input.

Most probably the first input from Malaysia will be made in 1984 after the nuclear research reactor in PUSPATI has been operated,⁴⁵ which means that, after radio isotope is widely used in Malaysia, some research or information will be published somewhere else.

#### 4.8 CONCLUSION

INIS began operation in 1970 and has developed considerably since then. Perhaps its most important step has been to include abstracts on the magnetic tapes from September 1975 and direct access service to INIS in February 1980. However the wider developments are more interesting. INIS was planned before the Universal System for Information in Science and Technology (UNISIST) principles were formulated but because of close liaison between the design groups it follows UNISIST principles in all important respects.⁴⁶ Because of this and because of its success it has been regarded as a possible model for the establishment of similar systems in other disciplines. The first of these is the AGRIS system.⁴⁷ It is being run by the Food and Agricultural Organisation of the Nations and it has been very closely led on INIS model. Most of the system parameters are

compatible, including worksheet format, interchange format on magnetic tape and international processing format.⁴⁸ The IAEA has assisted the Food and Agriculture Organisation (FAO) in setting up the system and in fact the two organisations have signed a formal agreement under which IAEA is responsible for processing the Agricultural Indexing system data.

There are two further systems developments with broadly similar aims and techniques. These are (SPINES) Science Policy Information Exchange System and DEVSIS - Development Science Information System.⁴⁹ These are building on the experience and insight obtained from INIS and AGRIS.

# REFERENCES

1. IAEA, Orientation manual for INIS and AGRIS (OMINAS), IAEA-INIS-8 (Rev.0), (1979), 7.
2. ROMANENKO, A.G., 4th International Online Information Meeting, London, Oxford, Learned Information (1980), 335.
3. BANFORD, A.P and MARSH, E. 'Nuclear and Atomic Physics' by Coblans. H, Butterworths, London, (1975): 218
4. CHORHERR, R., The development of nuclear energy literature in the period 1945-60 with special reference to abstracting services. Review International Document, 29(4), (1962), 117.
5. COBLANS, H., Review, handling of nuclear information. Journal of Documentation V 26 (1), (1970), 385.
6. PELZER, International Nuclear Information System. Aslib Proceeding, V 24 (1972), 38.
7. IAEA, INIS Today, Vienna (1982), 5-11.
8. WOOLTON, J.E., The design and implementation of an INIS. IAEA. SM-128/48, Vienna (1970).
9. GROENEWEGEN, H.W., INIS, AGRIS, INPADOC. Austria Today 3/4 (1978), 48.
10. EAST, A., The development of international managed information systems and their prospects. Journal of Documentation V 34 (4), (1978), 313.
11. ROMANENKO, A.G., op. cit., 355-361.
12. PELZER, op. cit., 39.
13. KEENAN, S., Development of Mechanised Documentation, Journal of Documentation, V 34 (4), (1978), 339.

14. IAEA, OMINAS, op. cit., 78
15. PELZER, op. cit., 42.
16. IAEA, INIS Today, op. cit., 10.
17. Ibid., 11.
18. ZHEIUDEV, I.S., GRONEWEGEN, H.W., INIS, the International Nuclear Information System, IAEA Bulletin, V 20(4), 1978, 9.
19. IAEA, OMINAS, op. cit., 89.
20. Personnel Communication.
21. ZHEIUDEV, I.S., GRONEWEGEN, H.W., op. cit., 13.
22. IAEA, OMINAS, op. cit., 72.
23. IAEA, INIS Thesaurus. IAEA-INIS-13 (Rev 16), (1979).
24. IAEA, INIS Today, op. cit., 322.
25. IAEA, OMINAS, Op. cit., 80.
26. Ibid., 45.
27. Ibid., 17.
28. Ibid, 39.
29. IAEA, INIS Today, op. cit., 38.
30. IAEA, OMINAS, op. cit., 51.
31. ZHEIUDEV, I.S., Future development of the INIS (unpublished report), Hofburg, (1980), 729.
32. Ibid., 7.
33. IAEA, INIS Today, op. cit., 41.
34. ZHEIUDEV, I.S. and ROMANENKO, A.G., Direct access to INIS. IAEA Bulletin, V 23(1), (1981), 11.
35. ZHEIUDEV, I.S., op. cit., 7.
36. ROMANENKO, A.G., op. cit., 358.
37. SAMUELSON, K., Implementation of International Information System, American Society of Information Science, V 9 (1972), 233.



38. Information Hotline, V 9 (7), (1977), 3.
39. ZHEIUDEV, E.S., op. cit., 12.
40. Ibid., 30.
41. PELZER, op. cit., 52.
42. ROBINSON, D.C., INIS and its use in New Zealand. New Zealand Libraries, V 40 (1977), 5.
43. ROMANENKO, A.G., op. cit., 360.
44. Personnel communication.
45. UTUSAN MELAYU 'Pembinaan PUSPATI tergendala hingga 1984. (13hb. February 1982).
46. WYSOCKI, A., International Co-operation in Information Transfer. Journal of Documentation, V 34(4), (1978), 303.
47. ROBINSON, D.C., op. cit., 5.
48. Ibid., 6.
49. COBIAN, H., A Science Policy Information System (SPINES), NETWORK International Communications in Library Automation, 2 (2), (1975), 10.

## CHAPTER 5

### PLAN TO GET NUCLEAR SCIENCE REFERENCES FOR PUSPATI

There are several ways of obtaining information related to the nuclear field. But before obtaining the information itself, a list of references would first have to be obtained and then the next step will be to search through or obtain the original documents. Searching for references pertaining to Puspati could be undertaken in several ways such as manual searching, online searching locally and internally, by batch processing method and by telex. While to receive the original documents itself, several systems or methods are available in Malaysia for example by carrier system, by courier system, by mail services and by wire transmission system such as telephone and facsimile. Searching for nuclear references is not only limited to INIS database available in Europe but some are also available in Nuclear Science Abstracts database supplied by the RECON(1) system and in the Chemical Abstracts provided by DIALOG system because Dialog is the cheaper database supplier compared to other system.²

Puspati for the time being has only a small collection of IAEA proceedings, INIS Atomindex and some books. The INIS Atomindex is provided free of charge by the IAEA since Puspati is the INIS input centre for Malaysia. There are five professional staff who are working in the Technical Information Centre for providing SDI

service, publish bulletin, answering enquiries and a little INIS activities. Telephone as a usual method of communication is available everywhere in every room in Puspati. In this chapter, I would like to explain how Puspati could obtain a list of references related to the nuclear field by using several methods such as online searching, manual searching, batch processing and telex. The method of how each process is involved is explained first, then followed by the cost related to the operation. The cost will be grouped into elementary cost needs such as equipment and site preparation, fixed cost such as rentals, maintenance of equipment, labour cost involved in doing the searching and lastly the stationery cost. All these will be put into a table and the cost comparison on different methods of doing this will be made. This cost will be estimated on taking 250 searches a year as a standard calculation for comparison. The figure 250 has been chosen since Puspati will be having 100 professional staff and assume a search will be made once a day. Secondly if we look into illustration 30 in Chapter 4, Iraq was making connection to INIS database for about 25 hours in 1980. If 15 minutes is the average time for a search, therefore in a year about 100 searches is made by Iraq. The case of Iraq is a good guide for Puspati since she is still a developing country and has recently established connection to INIS. Other than being connected to INIS database, Puspati ought to make a search via Dialog system for the CA Search, INSPEC and SCI Search which is estimated about 150 searches a year. In this way, the number of searches will be made by Puspati in order to get the

bibliographic information from INIS database and Dialog system is about 250 searches a year. Besides that a maximum number of 500 to 2,000 searches will also be included just to see how economical it will be if the number of searches increase. The database chosen will be CA Search, INIS and INSPEC.

While the method and costs of obtaining the original documents will be discussed later, the figures mentioned here is the price allocation for the supply of material needed for a 1-5 page article. Is it cheaper to use the carrier system, courier system, mailing system, telephone and facsimile in order to obtain the document? This is what will be put into table.

### 5.1 Online searching

Since the subjects needed by Puspati is related to the application of nuclear energy in agriculture, medicine and industry, INIS database is the principal choice and second to this the databases available in Dialog system. INIS database in Vienna and Dialog databases in California can be assessed from Malaysia via Singapore node for the Tymnate and Tymshare network.³

In considering the use of online bibliographic searching, one can expect to incur two broad types of costs:

### General start up and ongoing expenses

Its costs are fixed in amount and will be incurred regardless of the volume and nature of searches performed. Examples of such expenses include the cost of terminal equipment purchase or rental; site preparation; searcher training; and the acquisition of required or desirable operator's manuals, thesaurus and other search aids.

### Variable search specific costs

It includes database use charges, communication costs, offline printing charges and the cost of labour. These costs are described, estimated and discussed in the following subsections.

### The online terminal

By definition, online bibliographic searching requires that users work at remote interactive terminals. Interactive terminals can be divided into two broad groups, bases on the manner in which they present entered data, the results of computer processing to the user. They are known as teleprinter, and a display terminal consists of a cathode ray tube or other screen. Typical teleprinter prices range between \$3,400 to \$6,000 depending on speed, output quality and the availability of special features. The lease price is about \$170 a month and maintenance 10-20% from the buying price.⁴

While the price of typical cathode ray tube display terminal is between \$2,800 to \$4,000.⁵

Interactive terminals are designed to transmit or receive data in the form of digital pulse called bits, which, when taken in groups and patterns defines by standard coding schemes, represent individual characters. In order to initiate online bibliographic searching, Puspati should consequently, obtain a terminal capable of at least 300 bps (30 cps) operation or other older and less expensive device limited to communicating at 110 bps (10 cps).

#### Terminal related expenses

In addition to the purchase or lease of the terminal itself, Puspati must budget for certain terminal related expenses. Specifically, these expenses include a modem or acoustic coupler. Purchase prices are in the range of between \$1,000 to \$2,000 with the faster terminal (1200 bps) requiring the more expensive devices.⁶ Most terminal vendors will charge about 3-5% for initial equipment delivery and installation.⁷ A separately purchased acoustic coupler can usually be installed by the customer without vendor involvement.

With leased terminals, the monthly payment typically includes a charge for equipment maintenance, the nature and extent of which varies from vendor to another vendor. To protect their continued

property interest in leased equipment, most vendors provide scheduled preventive maintenance, as well as full coverage for the labour and materials required to repair defects not attributable to customer abuse. If Puspati is purchasing a terminal, however, they would also require to purchase an annual maintenance contract after a year used to acquire equivalent protection. As a rule, normally, the cost of such an annual contract is approximately 10% of the equipment purchase price.⁸ Thus if Puspati is buying a \$5,000-\$6,000 terminal they would have to budget an additional \$500 each year for a maintenance contract.

Video terminals do not require consumable supplies but keyboard teleprinter require paper and in most cases ribbons. Current prices for single part, unlined stock range from 1¢ to slightly more than 2¢ per sheet.⁹ Most portable teleprinters are usually non-impact devices which employ thermal, electrostatic, or other processes to form characters on specially treated paper and a ribbon is not required. Prices for the thermal paper used by the Texas Instruments' Silent 700 series teleprinters, for example, range from 3¢ to 5¢ for 8.5 x 11 inch page.¹⁰

#### Site preparation

The expenses incurred in preparing a work area for online bibliographic searching will vary from place to place or information

centre to information centre, depending on the nature of existing facilities. It is however possible to indicate the type and extent of site preparation which may be required.

Most terminals are designed to operate in an ordinary office environment at a wide range of temperatures between 0-30 degrees Centigrade, and relative humidity 20-80%. The typical electrical configuration for a terminal and external acoustic coupler in Malaysia is 220-240 volt 50Hz. So the room needs at least 2 plugs and socket.

A telephone, with a cord of appropriate length, must be installed in the immediate vicinity of an acoustic coupler. The installation charge is explained in the telephone section in this chapter. The maximum charge likely to be incurred where wiring is not present in that room is about \$72.¹¹

Even a minimally furnished work area will require a table or stand for placing the terminal, acoustic coupler, and telephone instrument. The work area should also include a desk or other flat surface, for note taking involved in the preparation of search strategy, shelf space for thesauri and other search aids, a filing cabinet for search related information, chairs for the searcher and client. The purchase value of furnishings in the search area can easily total about \$500 or more.



In order to function effectively, online searches will require certain printed support materials. As the least, the search area should be equipped with the operators manuals for all systems used. Since Puspati will only subscribe to Dialog and INIS, it will require the basic user's manual such as A Brief Guide to Dialog Searching (\$60), database documentation (\$15 per volume), which contains loose leaf descriptions of individual databases that are updated periodically and an INIS Thesaurus.¹²

#### General Expenses

Illustration 36 summarises the start-up costs likely to be incurred by Puspati in initiating online bibliographing searching capability by using public switch data network. Estimates presented in the table are also amortised, as appropriate, to arrive at a prorated annual cost that will later be used in the computation of individual search costs. As used here, amortisation is an accounting technique in which cash expenditures are spread out, for accounting purposes, over the estimated useful life of various system components. The estimates presented in the table are based on the following assumptions:

Illustration 36

Typical Start Up Expenses for Online Searching. All Calculation is in Malaysian Dollars.

	Cash Outlay	Useful life	Annual cost
1. Teleprinter with acoustic coupler.	\$6,000	3 years	\$2,000
2. Site preparation			
(a) electrical	\$ 90	3 years	\$30
(b) telephone	\$ 72	3 years	\$24
(c) furnishings	\$ 500	3 years	\$166
3. Search aids	\$ 75	3 years	\$25
4. Initial Searcher Training £75 (exclusive travel and subsistence)	\$ 300	3 years	\$100
TOTALS	\$7,037		\$2,346

Teleprinter with an acoustic coupler

\$5,000 is estimated for the purchase of one 30bps keyboard send-receive printing terminal with integral acoustic coupler; for example Texas Instrument silent 700 type. It is assumed that this terminal will be dedicated to online bibliographic searching only.

### Installation

The cost of terminal installation is amortised over a period equivalent to the terminals estimated useful life.

### Site preparation

Electrical work and telephone installation are estimated and amortised over the useful life of the terminal they are intended to support. The estimate for furnishings assumes a work area with a terminal stand, desks or tables, chairs for searcher and client, shelf space for thesauri and other search aids.

### Search aids

The estimate for search aids assumes an initial medium expenditure of \$300 for manuals videotape, thesauri, packet guide and related printed materials which will be replaced by new editions at approximately three year intervals.

### Initial searcher training

The \$3,000 estimate assumes the initial training of two persons to travel to a two day seminar offered by one search service only.

Initial basic training is about \$1,000. Indirect cost, practice time during initial basic training is about \$500 per head. Continuing training cost per year per individual staff member is about \$400.

Illustration 37 summarises the fixed, on-going annual expenses likely to be incurred in online bibliographic searching. The recurring costs involve the fee for paying the registration user name at the Singapore Telecom Department, annual subscription for using Telepac service from Singapore Telecom Department, telephone rental and maintenance charges.

### Illustration 37

#### Recurring costs:

Activities	Cost/year	cost/250 searches
1. Telecom Department of Singapore for using IPSS		
Register for user name ¹³	\$20.00	\$0.09¢
2. System subscription to PTT Singapore \$50/month	\$600.00	\$2.40
3. Telephone rental to Malaysian PTT ¹⁴	\$ 72.00	\$0.28
4. Maintenance charges (10% from the cost of equipment).	\$500.00	\$2.00
TOTAL COST A	\$1,192.00	\$4.77

#### COMMUNICATION CHARGES

The cost discussed in the remainder of this section on search specific communication charges are an example of a cost which varies directly with search duration. See Appendix G Illustration 8 for cost involved between PUSPATI to Singapore TYMNET node. The

communication charge from PUSPATI to Singapore via the ordinary Public Switch Telephone Network is about 80¢ minute.¹⁵ If using the leased line from PUSPATI to Singapore, the communication charge is not counted. The call can be made regardless of the duration of the call.

#### Telecommunication Charges

By using Telepac service provided by Singapore Telecoms, the charge will be as follows:¹⁶

Traffic charge	International
Duration charge	50¢ per block or per one minute.
Volume charge	24¢ per block of 10 segment or 2.4¢ per segment

Telecommunication charges by using Telepac service will be \$0.86 per minute. See Appendix G, illustration 1 for detail.

#### DATA BASE CHARGES

In Dialog, connect time charges are assessed for the entire period from when a searcher is online to a given database, prorated fractionally to the nearest thousandth of an hour. Connect time rate, on the subject scopes which will be used by PUSPATI is listed in Appendix F. For searching activity in excess of five connect

hours per month, DIALOG users received database usage discount based on the schedule given in Appendix G, illustration 3.

In the given month, for example since PUSPATI will make an annual search of about 250 search a year or one in a day or 20 in a month, the total number of hours used will be  $20 \times 15$  minutes equal to 5 hours. Since PUSPATI accumulates slightly more than 5 hours of connect time in a month using various DIALOG databases its monthly bill automatically is reduced by a total of US \$5.00.

The standard DIALOG discount plan described above does not require an advance subscription payment or minimum monthly searching commitment. If PUSPATI is willing to sign a contract for a minimum dollar amount of monthly connect time, she will receive the greater discounts as indicated in Appendix G, illustration 3. To qualify for this discount plan, PUSPATI must guarantee Dialog a minimum monthly connect hour payment from \$200-\$3,200. Usually this system is better improved over the standard discount plan.

Dialog also offers a guaranteed payment group discount to multi users systems requiring multiple DIALOG passwords. Under this scheme, the total group usage counts towards the discount which is computed on the basis of total hours billed and the discount according to schedule given in Appendix G, illustration 3.

The basic group consists of five passwords and requires a guaranteed minimum payment of US \$500 per month.

### Offline Printing

Except where very few citations are involved, online searching is merely used to confirm the correctness of a search strategy and obtain an indication of the number of retrieval citations.

Further detail of citations can be sent to the user by asking the offline printing. See Appendix F for charges made by DIALOG.

### Labour Costs

Library literature and current online searching practice generally support the need for an intermediary - which needs a professional librarian or information specialist capable of translating the expressed information needs of scientists, researchers or other clients into the logical strategy and commands appropriate to a particular search service. The cost of professional intermediary labour are of two types: (a) the cost of initial and ongoing training, as discussed in a preceding subsection and (b) the cost of the time spent in specific search related tasks. These tasks include the client interview, the selection of search terms, formulation of strategy, related preparation and discussion of the client's further information requirements.¹⁸

While reports of actual online connect time indicate variation with the search topic and searcher skill, a typical search session consists of fifteen to twenty minutes of terminal involvement.¹⁹

Reported connect times longer than twenty minutes are rare.²⁰

Available studies suggest that the required connect time per search varies inversely with searcher experience and that effective searches can be completed in less than ten minutes of actual online time.²¹

Available studies likewise project that two minutes of preparation and follow up time will be required for each minute spent online.²²

Thus, an information need culminating in a twenty-minute search session, will require a total of one hour professional labour.

An average salary of information officer in Malaysia is about \$12,000 a year.²³ Using these figures, the approximate cost of one hour of professional labour is about \$6.25, with a beginner searcher and \$7.00 with an experienced one.

#### Computing the cost per search

Given the combination of general and search-specific costs discussed throughout this section, the cost of any individual search can be expressed by the formula:

$$C = \frac{(A + E)}{N} + S$$

C = the undiscounted cost of an individual search.

A = the annual amortized start up expenses listed in table 1.

E = the ongoing annual expenses listed in table 2.

N = the number of searches performed annually.

S = the total of search specific costs discussed in the intermediately preceding subsections - communication charges, data base usage charges and professional labour.



Appendix G, illustration 6 to 8 demonstrate the interplay of these cost components and determinants in searches of various DIALOG and INIS databases at four volume levels. 250 searches per year or an average of one searcher per work day and 1,000 searches per year or an average of four per day. It assumes that each search, performed by a \$6.25 per hour intermediary, results in the printing of 50 citations.

Because all components are considered, the costs presented in the tables are higher than most vendor-advertised search costs but reasonably close to those reported in study which take account of most major components.²⁴

#### 5.1.1 ONLINE SEARCHING IN MALAYSIA

There are two methods of doing an online literature search in Malaysia:

- (a) Online from Puspati to U.K.M. or Kuala Lumpur either via leased line or dial up network.
- (b) Using the computer centre in Kuala Lumpur or U.K.M.

The magnetic tape receive from the INIS can be processed in the computer centre, University Kebangsaan Malaysia, Bangi or Kuala Lumpur without charge. This magnetic tape will be sent fortnightly by the INIS section in Vienna through the diplomatic bag free of charge, please refer to chapter 4 for detail. So retrieval of INIS

database can be by either using method (a) and method (b).

#### Method (a)

By using this procedure Puspatti needed a terminal, rental line, modem and a printing machine or terminal with a printer. The advantage is that information officer does not have to go to Kuala Lumpur which will involve transport cost and it can be done at any time required. The cost structure on method (a) is listed in Appendix G illustration 4. Total cost per search to Kuala Lumpur by leased line is \$23.98 or \$7.98 if using the PSTN. See Appendix G illustration 5. The cost per search from Puspatti to U.K.M. by leased line is \$9.84 or \$6.58 if by PSTN. See Appendix G illustration 5-1.

#### Method (b)

What Puspatti is needed to do is to store all the back issues of INIS Atomindex from the magnetic tape sent by the INIS into the disc form. From the disc, the search can be done faster and no problem of big storage. The extra cost involved will be the transport cost and the labour costs since a staff needed to go to U.K.M. or Kuala Lumpur to do his own search.

Cost structure on method (b): Using the computer centre in Kuala Lumpur.

Since the information officer has to travel to Kuala Lumpur to

undertake the search, the cost involved will be labour and transport, because there is no line rentals and equipments cost involved. Time taken for an information officer to travel from Puspati to Kuala Lumpur and return will consume about 2 hours. Searching time for about 15 minutes. A return journey 44 miles for the information officer will cost about  $\$44.00 \times 44 = \$19.36$  since the allowance for petrol is 44¢ per mile.²⁵ Other charges are free since Puspati is the government agency.

Total overall cost on method (b):

Charges.	Cost per search
Labour costs for 2½ hours	
An hour = \$6.25	\$14.06
Transport charges	\$19.36
 Total cost per search	 \$33.42

5.1.2 Online searching to overseas

Online searching to overseas is only applicable via Singapore for the time being.²⁶ This is because Singapore now becoming a node for Tymnate and Tymshare network. Since the subject scope needed by Puspati and its uses are related to the application of nuclear techniques in agriculture, medicine and industry. INIS database will be the first choice for the nuclear information searching. Then followed by AGRIS database. Subject scopes which is outside

the nuclear field will be retrieved via the DIALOG system such as INSPEC, SCI and CA Search. DIALOG was chosen here because it is cheaper compared to ORBIT and secondly because Dialog is the only system having its office for user registration to use Dialog in Malaysia and Singapore area.

The cost affected by using Dialog and INIS databases is explained in Appendix G illustration 6-9. This data is an estimation figures by taking Singapore as a node via the dialing network. The detail calculation about the cost incurred on every search on different data bases is explained in Appendix G illustration 6-9 by taking Singapore as a node and using PSTN as a transmission line. Costs affected by using leased line to Singapore from Puspati is about \$285 per search for retrieving INIS data base. If Kuala Lumpur could become a node in the future, the cost incurred from both methods of online is illustrated in Appendix G. The cost per search for INIS data base is about \$79 by PSTN and \$102 if by leased line.

## 5.2 MANUAL SEARCHING

Literature searching by manual search means to search manually on the secondary publications. The main abstracts needed are INIS Atomindex, Chemical Abstracts and abstracts from INSPECT. The supporting materials are Agrindex, Biological abstracts, Index Medicus, Engineering Index and International Pharmaceutical Abstracts. From the survey made by Risley Atomic Energy Research Establishment,

the total secondary publications used were Nuclear Science Abstracts - 45% or we can replace it with what is today known as INIS Atomindex. Engineering Index 25%, British Technology Index 9%, Chemical Abstract 6%, Applied Science and Technology Index 6%, Physics Abstracts 4%, Electrical Engineering Abstracts 3%, Fuel Abstracts 1% and Metallurgical Abstracts 1%.²⁷ We can see here the subject scope covered by Risley is more concerned towards engineering aspects but for Puspatti, it is related more towards agriculture, medicine and isotope production. Therefore some of the publications used by Risley if applied to Puspatti should be replaced by Index Medicus, Agrindex and Neutron Activation Analysis.

In order to do manual searching, there are several alternatives to run it. Firstly, all the secondary publications should be available in PUSPATI. Secondly by searching manually at the National University of Malaysia which is about 3 miles away from PUSPATI. Thirdly by searching manually at the University of Malaya, University of Technology, University of Agriculture and National library which is located around Kuala Lumpur and about 22 miles from PUSPATI. It is therefore worth having a look into the cost involved in each particular circumstances.

In order to calculate the cost of the whole publications needed to run the manual search, we assume that we only need to buy the back issues of the main materials in Appendix G, illustration 10. The year 1970 has been taken as a boundary to buy these back issues

because we assume the information needed by the nuclear scientist is about the last 12 years and secondly the first INIS ATOMINDEX was published in 1970.

#### Manual Searching in National University of Malaysia

The secondary publications available in this particular library are chemical abstracts, Physics Abstracts, Biological Abstracts and Agrindex. The cost involved in doing this manual searching are transport, labour cost and photocopy.

Transport cost: - the return distance is about 6 miles. The information officer is eligible to claim 44¢ a mile of petrol consumption. Therefore the transport cost will be \$2.64. Labour cost: we assume that the information officer needed three days to do manual search because of the time consumed to look for several abstracts available. Journey time will be around 1 hour for each three days. Photocopy: stationery here means costs of photocopying the notations and abstracts. This photocopy will be given to the users for selection and reading. The photocopy cost per page is about 10¢. If there are 30 titles available from manual search, the photocopy cost will be \$3.00. Total cost per search by this method is \$49.39. See Appendix G, illustration 10, table 4 for details.

### 5.3 BATCH PROCESSING

Since INIS Section in Vienna will send their magnetic tape of INIS ATOMINDEX to Malaysia every fortnight, it is possible to do batch processing method in order to retrieve information from INIS Atomindex.²⁹ The user either gets back a comprehensive answer some days later (retrospective searching) or gets the newest information periodically over a long time or known as selective dissemination of information. Corresponding to these information services there are two file organisations used for batch processing procedures. The first is called 'inverted file' organisation, which is based on an arrangement of the information file in order by keywords. The particular document itself found by direct access or random access storage. It can be easily seen that such a file organisation is advantageous where much random access storage is available.

The second file organisation known as 'direct file' organisation. Direct file organisation allows the retrieval of the information items through a variety of different keys, for example, author's name, date of publication, bibliographic level, subject category, descriptors, etc. and has the advantage of needing random access storage only for temporary storage files. The permanent file of documents is stored in order of sequence on tape. On the other hand, the response time for a direct file search is necessarily slow, since a complete file scan is needed before any information can be retrieved. This fact does not matter since the computer used by

PUSPATI available in the Prime Minister's Department is a fast and big computer.

Since the magnetic tape provided every fortnight, the batch processing has to be done biweekly too. An officer has to go there and transmit the data from the magnetic tape into disc. So in the future, online search could be done straight forward through terminal. While key puncher needs to punch the data of the users subject interests. The punch cards will be left there and the print out will be collected the next day. An officer or intermediaries could do some retrospective search requested by the PUSPATI users. In this situation, cost involved will be using cards, paper, transport for both staff from Bangi.



#### 5.4 TELEX

##### Current Situation in Malaysia

Telex service is available to the general public within Malaysia and overseas on subscription and is provided by the telecommunications department in various parts of the country. For instance, at Subang Airport (Kuala Lumpur) and at Jalan Weld (Kuala Lumpur). If the user chooses not to subscribe he can use the service via the Public Telex Booths.³⁰

By telex service, subscribers can communicate with each other by messages produced in printed form on teleprinters at both sending and receiving ends. However, the telex terminal uses character printing and through the view of information technology today, it is considered to be the slowest; in fact the auto-transmitter speed for telex terminal available in Malaysia is 50 bits per second or equivalent to about 7 characters per second or approximately 80 words per minute.³¹ Moreover, the character-set on the telex service is limited, consisting of only 26 alphabets, 10 digits from 0 to 9, the space and the symbol signs: ? : % \$ £ ( ) . , ' / = +.

Anyway, telex service although available has not been used widely among most of the institutions, research establishments, libraries and information centres besides having to apply to the Telecommunication Department, the governments or semi-government bodies have also to get approval from the Ministry of Foreign Affairs Office.³²

That is the reason why only five libraries in Malaysia are having telex machine nowadays. See Illustration 3 in Chapter 1 for further detail. Most of the communication overseas is done via telegram. What actually happens in Puspati is that, when a message is to be sent via telex, the officer in charge would ring the officer in Ministry of Foreign Affairs and the message will be telexed by them to the destination. In the case of using telex to get access to the database available in the computer overseas, the searcher has to be at the terminal in order to select the right commands.

The purpose of using telex here is to get the nuclear information from Malaysia and at the International Region from computer and not between telex to telex connection. See illustration 5. This is because graphic, pictures and certain scientific and technical symbols cannot transmit via telex machine. It is appropriate for bibliographic searching since citation of literatures will only use alphanumeric letters. Telex services to certain database available overseas could be accessed nowadays from Malaysia, for example to United States and Vienna.

#### Malaysian Telex Services

The Malaysian Inland Telex Service is fully automatic and service is provided on a 24-hour basis. It uses the keyboard selection system.³³ Messages may also be received after office hours (8.00-16.15) even though the teleprinter is unattended, provided the power supply to the machine is left switched on, and there is an

adequate supply of teleprinter paper on the machine. This means that if nuclear information is stored in a computer somewhere else outside Puspatti (but in Malaysia), it is possible for the computer to list the references even though the information department is closed.

#### International Telex Services

Telex subscribers in Malaysia can, by keying the appropriate code and the required telex number, make calls automatically to most countries in the world. INIS database in Vienna could be accessed by telex in which agreements were made by the IAEA with Radio Austria, which is responsible for overseas telex connections to and from Vienna.³⁴ Even though the speed of this connection is a bit slow, limited to normal speed (5 to 10 characters per second), but it is still satisfactory for basic retrieval, training and demonstration for Malaysia.

#### Method of Using Telex

In order to obtain nuclear information internally and overseas in the form of bibliographic or references, there are several ways of doing this as follows: buying or renting a telex machine for PUSPATI: using any telex machine available or sharing nearby such as at the National University of Malaysia which is located about 3 miles from PUSPATI; using the public telex booth available at the Kuala Lumpur Central Telegraph Offices - but it will involve transport.

### COST STRUCTURE FOR TELEX SERVICE

To subscribe to the telex service in Malaysia, no fee is charged for telex unit while the relevant recurrent expenses may consist of the maintenance of operator and the following components: (i) rentals, (ii) insurance on equipment, (iii) stationery and (iv) call charges. Rentals are variable. The following information on these cost components is extracted from the telecommunications guide 1979 published by Telecommunications Department.³⁵

Rentals charge can be broken down into Line Rentals and Equipment Rentals. Line Rentals are charged on local lines between the subscriber's teleprinter and telex exchange according to the following rates:

Within 2 miles radial distance of the	N\$ per annum
telex exchange	\$ 180
Each additional $\frac{1}{2}$ route mile or part	
thereof	\$24

Where the line passes via one or more telephone exchanges to the teleprinter, additional exchange line rental of \$70.00 per annum would be charged for each radial mile distance between the terminal exchanges.

Equipment Rentals

- (a) Teleprinter send and received complete with  
Reperforator and Automatic Transmitter attachment: \$2,090 per annum.
- (b) Keyboard Perforator with monitoring point \$ 900 per annum.

Deposits: an initial deposit of \$1,000 is payable before a new telex installation is provided.

Insurance

Subscriber is liable for loss or damage to apparatus and is therefore recommended to ensure each item or equipment. Insurance values for standard equipment are as follows:

- (a) Teleprinter send and receive complete with Reperforator  
and Automatic Transmitter attachment. \$8,000
- (b) Teleprinter Receiver with Reperforator (tape punch) \$6,000
- (c) Teleprinter Receiver without Reperforator (tape  
punch) \$5,500

Stationery

Paper, paper tape and typewriter ribbons used in any teleprinter shall be of quality, kind and size approved by the Telecommunications Department and have to be provided by the subscriber.

Inland Call Charges

There are two types of telex calls, automatic calls and operator assisted calls; different types have different rates of call charges. There are six different charging rates for automatic calls, varying according to the distance between nominated centres in charging areas throughout Malaysia. The following shows the period of time for every 10 cents in making direct automatic calls, x denotes the distance in radial miles.

Radial Miles	Time for each unit of basic charge (10 cents) Seconds
x less than or equal 85	60
x less than or equal 185 but more than 85	30
x less than or equal 285 but more than 185	15
x less than or equal 385 but more than 285	12
x less than or equal 700 but more than 385	3
x more than 700	2

The following is a schedule of the amount of time in seconds which can be bought for every 10¢ unit of inland automatic telex calls between PUSPATI and its user.

Name of Exchange	K. Lumpur	Ipoh	Penang
Bangi and Serdang	60	30	15
Kuala Lumpur	60	30	30
Ipoh		60	60
Penang			60

Since accessing the database from computer does not need an operator's assistance because the intermediate have to key themselves, therefore charges for operator assisted calls is neglected.

#### Overseas call charges

If one does not subscribe to telex service, one can also use telex machine via the Public Telex Booth with the following charges:

- (i) Call office fee                      \$2 per telex call

Call charges to several databases available overseas from Puspati in Malaysian dollars per minute.

From	to Vienna (INIS & AGRIS)	USA (DIALOG)
Puspati or Kuala Lumpur	\$12.30	\$12.30

#### Labour cost

Labour involved in making self key calls have to be a professional type of labour or information officer level, in order to communicate and answering or choosing commands smoothly. A monthly salary for an information officer in Malaysia is about \$1,000³⁷ a month working hours is about 150 hours and therefore a one hour labour will cost \$6.25. Since the search time will normally take 30 minutes for each search the labour cost will be \$3.12. If for instance the search has to be done at the Public Telex Booth in

Kuala Lumpur, the time taken to reach Kuala Lumpur is about one hour. To and pro will all take 2½ hours and this will cost the labour used for \$16.30 per search.

Transport cost from Puspati to Kuala Lumpur which is about 22 miles for a single journey will make the information officer eligible to claim 44¢ a mile and the overall cost would be \$19.36.

Overall cost involved in obtaining the references

Cost related to using telex from Malaysia can be categorised as the initial expenses for installing telex machine, fixed costs, stationery, transport, labour and call charges and is shown in Table 1, 2,

Table 1

Typical start up expenses	Cash Outlay	Useful Life	Annual Cost
Deposit (not included in the cost)	\$1,000	-	-
Furniture (chair and table)	\$ 50	5	10
Total annual cost			\$10



Table 2

Fixed costs involved in setting up telex operation:

1.	Equipment rental	Annual cost
(a)	Teleprinter with reperforator and automatic transmitter	₹2,090
(b)	Keyboard perforator with monitoring print.	900
2.	Line rental	
	Bangi to Kuala Lumpur 22 miles	₹1,680
	Total cost if using 1(a)	₹3,770
	Total cost if using 1(b)	₹2,580

The cost per search by using telex from Puspatri to Kuala Lumpur is about 916.68 or ₹453.68 if from Puspatri to Vienna. See Appendix G12. The cost per search will decrease if the number of searches increase. See Appendix G13. For example the cost per search from Puspatri to Kuala Lumpur for 1,000 searches per annum is about ₹8.90 which is half the cost for 250 searches in a year.

##### 5.5 COST COMPARISON ON OBTAINING THE LITERATURE REFERENCES

##### Searching for INIS database

From Graph 6 and Illustration 38 we can see that batch processing

and online by PSTN system to U.K.M. is the cheapest way of acquiring the INIS database. Followed by the batch processing method in Kuala Lumpur. Manual searching is not the cheaper way of acquiring the INIS database. In fact it is cheaper to have an online to University Kebangsaan Malaysia if the number of searches done are more than 600 searches. This will only occur if U.K.M. will have its own computer at the end of 1982.³⁸ Online searching by leased line from Puspatti to U.K.M. will be cheaper than the batch processing method in Kuala Lumpur on condition that the number of searches are more than 1,000 in a year. Using telex system as a method of obtaining the references from Malaysia and Vienna, it is the most expensive way of acquiring the literature search. See graph 6 and 7 for further detail.

#### Searching for Chemical Abstract

From graph 8 and illustration 38 we could see the range from the cheapest to the most expensive method. If Kuala Lumpur can become a node, online via Public Switch Telephone Network can become the second cheaper way for Chemical Abstract. Manual method in U.K.M. become the cheapest in doing literature search. We can see from graph 8, manual method in PUSPATI itself is the most expensive search for Chemical Abstract.

#### Searching for Inspec.

There is not much difference between Inspec and CA searches because

Illustration 38

Cost comparison between online, manual, batch, mailing and telex system in obtaining the references from different places:

All figures in Malaysian Dollars and cost per search for the 250 search per annum.

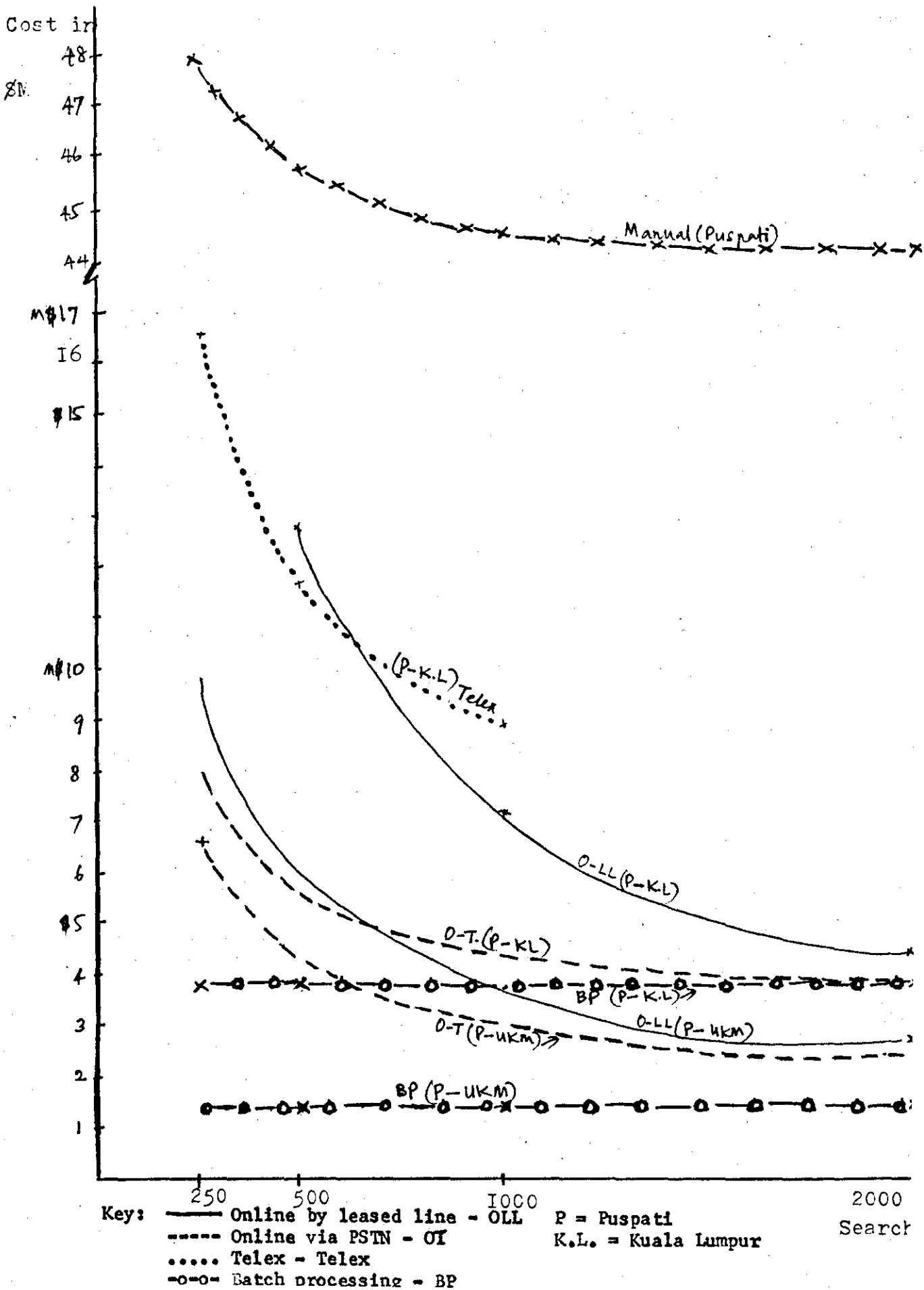
Method	Puspati	U.K.M.	K.L.	Vienna (INIS)	U.S.A. CA/In- spec	SCI
1. Online Singapore as a node for USA & Vienna	N.A.	6.58	7.98	89.55	96.55	133.50
PSTN leased line	N.A.	9.84	23.98	285.31	280.31	329.31
K.L. as a node U.S.A./Vienna						
P.S.T.N.	N.A.	6.58	7.98	79.05	85.83	123.05
Leased line	N.A.	9.84	23.98	102.75	97.75	146.75
2. MANUAL						
CA search	425.25	49.39	-	-	-	-
Inspec	233.8	49.39	-	-	-	-
INIS	47.89	N.R.	-	-	-	-
SCI	763.75	N.R.	66.11	-	-	-
3. BATCH PROCESSING						
INIS	N.R.	1.83	3.88	-	-	-
4. TELEX		11.66	16.68	453.68	477.06	-

Key: N.A. - not available

P.S.T.N. - Public Switch Telephone Network

Graph 6

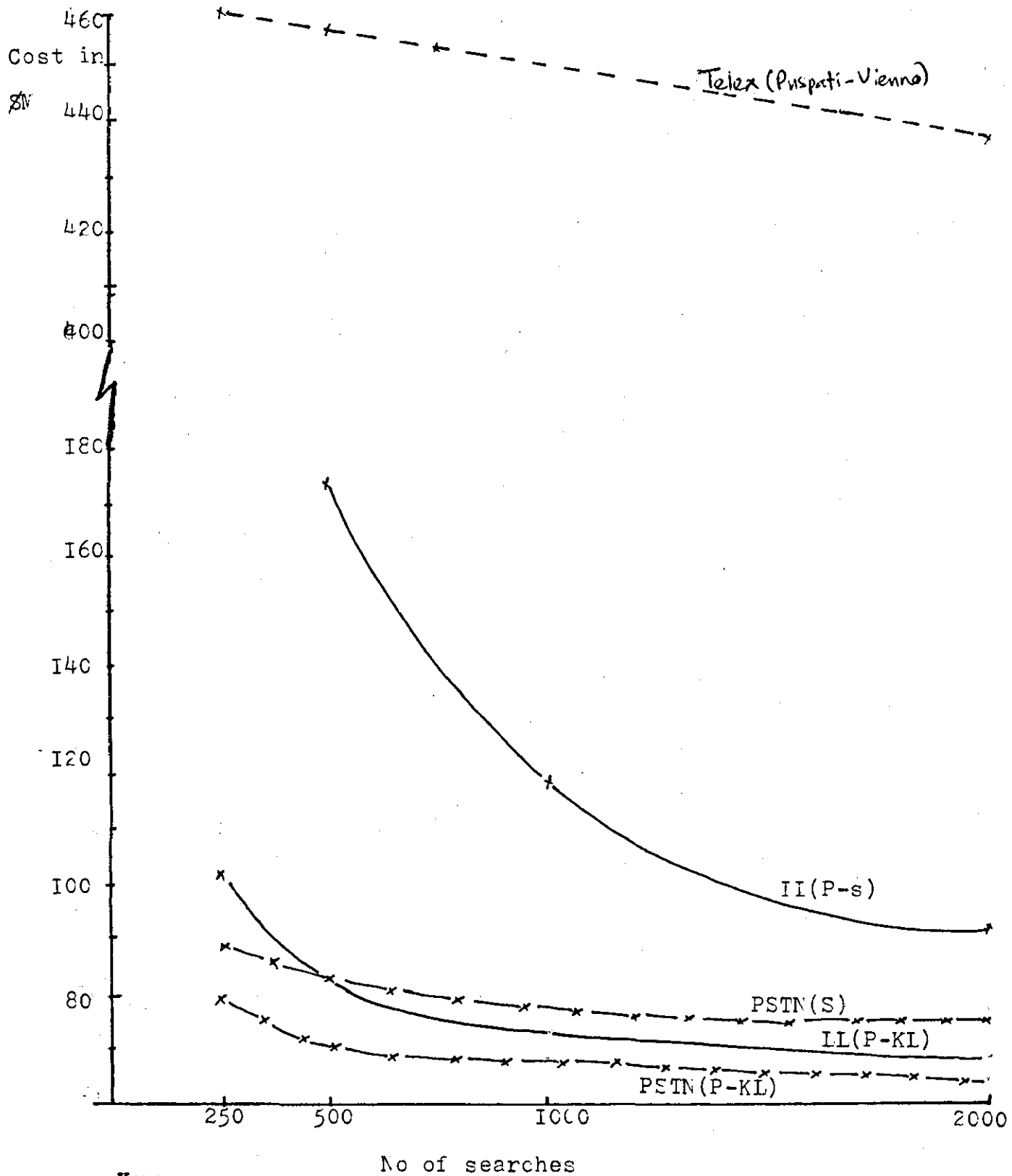
Cost comparison per search by doing several types of methods on searching the INIS database available in Malaysia.



Graph 7

Cost per search for searching INIS database from overseas (Vienna)

Costs are all in Malaysian dollars.



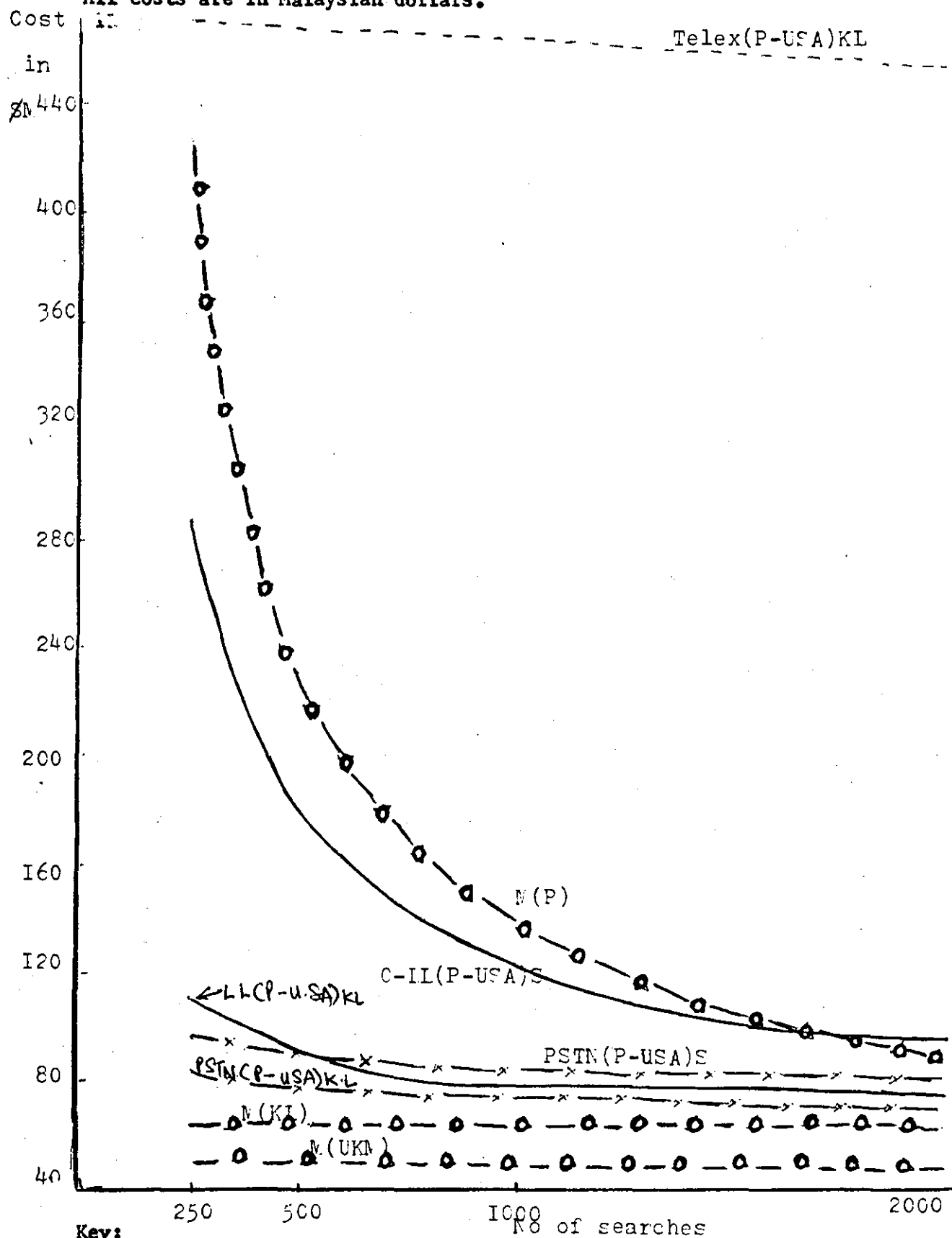
Key:

— Online leased line LL  
 X—X PSTN  
 - - - - - Telex

P - Puspati  
 S - via Singapore  
 K.L. - Via Kuala Lumpur

Graph 8

Cost per search for searching Chemical Abstract.  
All costs are in Malaysian dollars.

**Key:**

----- Telex  
———— Leased line  
-x-x- PSTN  
-o-o- Manual

P - Puspatti  
U.K.M.-Universiti Kebangsaan  
K.L. - Kuala Lumpur  
S - Singapore  
U.S.A. - United States of America

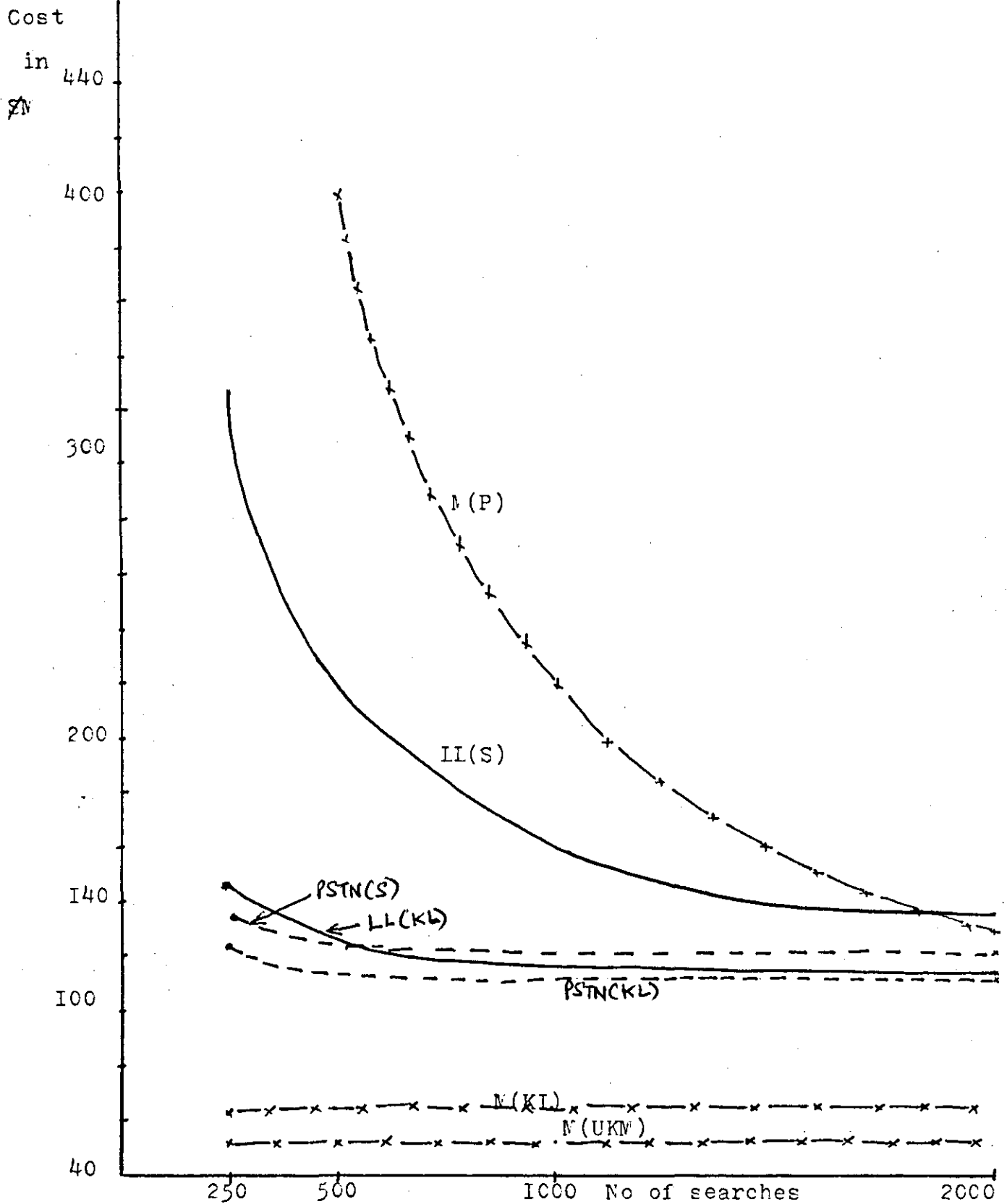
the database charges is the same. Thus we can see from illustration 38 and graph 8. Online searching by PSTN to Kuala Lumpur will be the most cheap way of doing literature searcher for Inspec if Kuala Lumpur become a node. Manual in U.K.M. and PUSPATI become the fourth and fifth priority.

#### Searching for Science Citations Index (SCI)

From graph 9 and illustration 38 we can see that it is cheaper if the manual search is done in the University of Technology, Kuala Lumpur. Then followed by the online method either by PSTN or leased line via Kuala Lumpur or Singapore. Manual method in PUSPATI is the most expensive one.

Graph 9

Cost per search for searching SCI by different method.  
Costs are all in Malaysian dollars.



Key:

-x-  
——  
-----

Manual  
Leased line  
PSTN

K.L. - Kuala Lumpur  
S - Singapore  
P - Pusapati



From the above illustration, we can see that batch processing and the online PSTN to the Universiti Kebangsaan is the cheaper way of obtaining the INIS references. Even though batch processing is the cheaper way of doing literature search for INIS, unfortunately it appears that the figures we have here do not include the cost for preparing the programme on doing this batch processing. This programme surely needs a professional body to work on it and this will consume more money than expected. Secondly the disadvantage of it is that no search strategy could be handled by it. If the keywords given by the users cannot be read by the computer, the computer will automatically print zero documents. But by using an online search, the search strategy could be changed at the same time in order to make sure that the computer could search the word that we need.

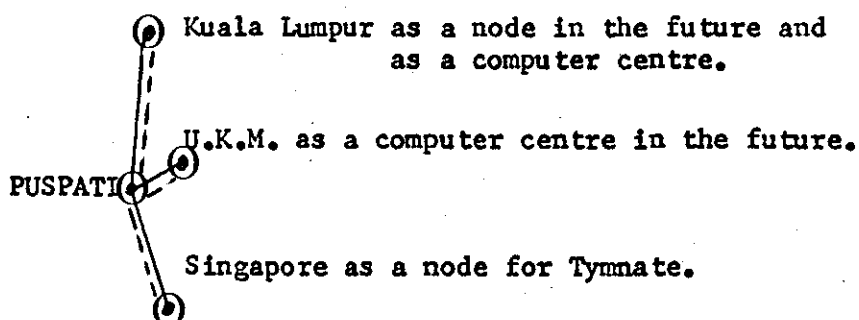
Although we can see from illustration the cost of search for CA, Inspec and SCI is in the first rank of the cheaper order it is difficult to measure the exact cost of manual searching. The cost of this manual will be higher than the online method itself, if the searching was done for more than 2 days. The cost here is calculated based on a 7 hour manual searching, standard taken from the survey made by Smith, J.R.³⁹ in United Kingdom Atomic Energy Authority, Risley. Where he found that out of 86% of the job done in his Library and Information Department completed within a day or 7 hours of working hours in Malaysia, only 4% of the work was completed for more than 3 days. The cost for the online searching will be much cheaper if the number of searches increased to more than 250 searches and because of the DIALOG group discount plant.

See graph 6 to 9 and Appendix G illustration 6 to 9 for detail.

Online searching can be done by several methods. See illustration 39 below:

### Illustration 39

Method of doing online for the literature search.



Key: — Leased line  
 --- PSTN

Manual search could be done at the nearest U.K.M. library in order to search for Chemical Abstract or Inspec publications.

# Illustration 40

The rank on the cost per search in doing literature search for INIS, CA Search, Inspec and Science Citation Index.

Key Parameter: (1) Location : Puspatti

(2) No of searches-250 searches a year

Panking: 1= very cheap; 2=cheap; 3=moderate; 4=expensive; 5=very expensive; 6=the most expensive

Rank Name of Database	1	2	3	4	5	6
1. INIS database	BP(UKM)	BP(K.L.)	OT(UKM)	OT(K.L.)	O.LL(U.K.M.)	O.LL(K.L.)
cost per search	1.83	3.88	6.58	7.98	9.84	23.98
2. Chemical Abstract	Manual U.K.M.	O-T(KL) to USA	O-T(S) to USA	O-LL (K.L.) to USA	O-LL(S) to USA	Manual (P)
cost per search	49.39	85.83	96.55	97.75	280.31	425.25
3. Inspec	Manual U.K.M.	O-T(K.L.) to USA	O-T(S) to USA	O-LL(K.L.) to USA	Manual (P)	O-LL(S) to USA
cost per search	49.39	85.83	96.55	97.75	233.80	280.31
4. SCI	Manual (K.L.)	O-T(K.L.) to USA	O-T(S) to USA	O-LL(K.L.) to USA	O-LL(S) to USA	Manual (P)
cost per search	66.11	123.05	133.50	146.75	329.31	763.75

Key:  
 BP = batch processing  
 O-T= Online on PTSN  
 O-ll = Online by leased  
 line.

U.K.M. = University Kebangsaan  
 K.L. = Kuala Lumpur  
 S = Singapore  
 P = Puspatti

From this illustration 40, graph 7&8, telex method is still the most expensive way of doing literature search. It is because the communication charges for telex is quite high, about \$12.30 per minute compared to the online search via the PSTN only 80¢ per minute for the communication charges between Puspati to Singapore and charges for telecommunication through IPSS only 86¢ per minute. See Apperdix G-8 for further detail.

## 5.6 REFERENCES

1. SMITH, J.R., Service and system: a study of an information service based on conventional systems. IAEA-8M-128/25. (1970), 155.
2. DIALOG, Database catalog, California (1981): 10.
3. DIALOG Information Service, DIALOG access from outside the U.S. and Canada (1981). Brochure and IAEA, 'INIS Today'. Vienna, 1972: 43.
4. AXNER, David H., Teleprinter Terminal Survey. Datamation, (1978), 232-255 and BECKER, J. Printer Terminal for Libraries. Library Technology Report 16 (1980), 269.
5. HOBBS, L.C., Terminals, Proceedings of the IEE, 60 (II), 1 (72).
6. BORN, J.H., 'Terminal Equipment for online interactive information retrieval using telecommunications', Special Libraries 67 (1978), 30-39.
7. LEE SAU LAN, The economics of inter-library communication in Peninsular Malaysia.
8. S. KEENAN, How to go online. BIRD Report No.5533. London (1980), Appendix 3.
9. Texas Instruments LTD Terminal and Peripheral price list. Catalog (1982).
10. Ibid.
11. Jabatan Telekom. Panduan Telecom. Kuala Lumpur (1979), 228.
12. DIALOG Information service. Price list. Brochure (1981).
13. Personal communication, Singapore Telecoms, (30th December, 1981), BTS/S5/60/82/B/NQ in Appendix 1.

14. See ref. II.
15. See Ref. II.
16. See Appendix I.
17. MAIER, M.J., 'The scientists vs. machine search services: we are the missing link', Special Libraries 65 (1974), 180-88.
18. HULEATT, R.S. 'Finishing the Online Search', Online 3 (1979), 24-31.
19. JAHODA, G. 'Online Searches: Characteristic of users and users in one Academic and One Industrial Organisation', Proceedings of ASIS 15 (1978), 165-7.
20. COOPER, M.D., 'The cost of Online Bibliographic Searching', Journal of Library Automation 9 (1976), 165-7.
21. BROWN, C.P., 'Online Bibliographic Retrieval Systems Use', Special Libraries, 68 (1977), 155-60.
22. KNOK, D.R., 'Effective Search Strategies', Online Review 3 (1979), 148-52.
23. Personal communication. Dr. Ahmad Tajuddin Ali, PUSPATI 030 (6 January 1982).
24. SAFFADY, W., 'The Economics of online Bibliographic Searching: Costs and Cost Justification', Library Technology Report 15 (1), 598.
25. Jabatan Perkhidmatan Awam, 'Elauan-elauan dan bayaran-bayaran kepada pegawai-pegawai Persekutuan kerana bertugas,' Perkeliling Perbandaharaan Bil 7 (1977), 6.
26. See Appendix I.
27. See ref. 1 page 155.
28. See ref. 25.

29. IAEA, Vienna, INIS Today (1982), page 38.
30. See ref. 11.
31. Lee Sau LAN, op. cit., p.56.
32. Personal Communication.
33. See ref. 11.
34. IAEA, Vienna, INIS Today, op. cit., p.43.
35. Jabatan Telekom, Telex directory, Kuala Lumpur (1980), 34.
36. Jabatan Telekom, 'Telecommunications Guide', Kuala Lumpur (1979), 203.
37. See ref. 23.
38. Personal communication, Dr. Abd Rahman Abdullah, U.K.M.
39. See reference 1, page 160.

## CHAPTER 6

### DOCUMENT DELIVERY AND INFORMATION TRANSFER

#### 6.0 INTRODUCTION

After considering the several methods of getting the references in chapter 5, we now move on to examine the methods of how to acquire the original document itself. Only with this original document could the information needed by the Puspati users be fulfilled. The information itself may be published in the form of books, journals, reports, pamphlets, graphs, tables, magnetic tapes and charts.

Transmission costs are not the only costs incurred in the process of information gathering or information transfer. It will involve costs of telecommunication, stamps, stationery, papers, hiring and equipment itself. Since the information needed by PUSPATI is limited to the application of nuclear techniques in industry, agriculture and medicines, transferring the original information by means of printed forms or verbally will be discussed under the topic of carrier system, courier system, mailing system, telephone, and facsimile. First of all the method of each obtained will be discussed and the cost involved on each method is explained in Appendix H.

#### 6.1 COURIER SYSTEMS

By the courier systems, the information needed by PUSPATI is trans-



mitted from the sources library to PUSPATI via a courier or messenger. The courier may be provided by either the source library or by PUSPATI itself. This job is known as despatch clerk and it has existed in PUSPATI. The clerk will despatch and collect, mostly letters from other institutions by using motorcycles. The article transmitted or collected via courier may include letters, documents, books, journals, reports, punch cards, reels of magnetic tapes and paper tapes, disketts and other materials that can be easily handled by a single person. This service is provided as need arises, and it is thus not regular. This system of communication is useful when the source is not too far from the destination, or when the materials must be speedily transmitted, or when communication services are not frequently needed. The cost of this system is explained in Appendix H - Illustration 1.

## 6.2 CARRIER SYSTEM

The carrier system works in the same way as the courier system except that it is provided on hire basis by organisations other than the user libraries concern, and that it may serve one or more clients at the same time. The system may either be private or common. A private carrier serves one client at a time, often by lorry or van. A common carrier, on the other hand, may serve more than one client at the same time by, for instance, lorries, vans and buses. Materials sent by common carrier require adequate packing.

### Cost structure of carrier system

#### i. Service charge.

The carrier service charge varies from agency to agency, depending on the type of goods to be carried, size or volume, weight or quantity and distance. Transportation charge for a parcel of a few books is around M\$25 an hour within Selangor and around M\$15 from Kuala Lumpur to Penang, taking about three days.¹ The mode of transport being van, lorry or bus.

#### ii. Labour costs.

In order to wrap a book, reports, journals or standards with a paper or putting straight into a big envelope, we do need an office boy to do the job. Then the parcel needs an address either by typing a piece of paper or envelope or writing the address by hand. The process of wrapping a book, magnetic tape or a journal and writing or typing the address would take about 10 minutes. Monthly salary of an office boy is around M\$220.²

#### iii. Stationery cost.

The cost involved will be that of wrapping papers, big envelopes, robes and glue. The cost of brown paper wrapping measuring 3 feet x 4 feet is about 1¢ and the same cost apply to the yellow envelope size 4" x 9".³

The overall cost is explained in Appendix H - Illustration 3.

### 6.3 MAIL

#### Mail Service in Malaysia

The mail service in Peninsular Malaysia is mainly provided by rail along the West coast and part of the East coast of Peninsular Malaysia. Mail service by air is also available between large towns, notably between Kuala Lumpur (Subang Airport) and Penang (Bayan Lepas Airport). For short distances, mail services may be provided by General Post Office (GPO) vans followed by postmen using motorcycles.

Airmail and GPO van services are commonly used for sending materials or packages which are relatively light and less bulky while railmail services are preferably used for sending materials or parcels which are relatively heavy and more voluminous.

Time taken for each letter to reach their destination is described in Appendix H, illustration 4. The delivery time is only once a day usually around 10.00 in the morning and the collection time is only twice a day, once in the morning and the next in the afternoon.

Postage for sending a letter which contains three to four pages of a photocopy papers will cost 15¢ for the first oz. and 10¢ for every additional oz. Mail charges are dependent on the mode of transport, weight of article and distance travel. Appendix H, illustration 4 shows the current postal charges for sending original documents by mail and the current postage charges for sending articles by airmail

within Peninsular Malaysia.⁴ For the overall cost, please see Appendix H, illustration 6.

#### Mail Service Overseas

All the mail overseas has to go either via airmail for faster receipt or surface mail for longer receipt. The time taken for a letter to reach United Kingdom will normally take 5 to 7 days and it is the same time taken for a letter to reach Malaysia from the United Kingdom. The number of delivery and collection of mail is done four times a week while from Malaysia to United States of America the letter usually will take 7 to 10 days and from America to Malaysia normally will take 7-8 days. The letter mentioned here is not the aerogram type since in order to obtain the original copy from British library lending division or NTIS in U.S.A., an ordinary airmail letter has got to be used for attaching interlibrary loan forms and BIID coupons or UNESCO coupons.

Postal charges from Malaysia to United Kingdom is about 85¢ and from Malaysia to United States if \$1.05.

#### 6.4 TELEPHONE

In Peninsular Malaysia, the selected libraries or information centres can communicate with one another by telephone. Telephone service is provided by the Telecommunications Department in various parts of Malaysia. Most exchanges in Malaysia are equipped with

direct dialling trunk call facilities. Subscriber Trunk Dialling (STD) is being extended to cover more exchanges so that eventually every subscriber can make their own trunk calls from any part of Malaysia with ease, speed and economy.⁵ The service uses the voice grade transmission lines at 1,200 bits per second.⁶

By using telephone, the type of information required cannot be provided in printed form but it is possible to be taped. The case for using telephone happens when the need arises to obtain the information in a small data form or to enquire the other library about the availability of the document needed, before filling the ILL form or before going to a particular library.

#### The Cost Structure of Using Telephone

The cost of subscribing to the telephone service consists of two parts; installation fees and recurrent expenses. Recurrent expenses are composed of rentals and call charges, in addition to the maintenance of an operator. Rentals are fixed while call charges are variable depending on the distance and the duration of the call. The data is obtained from 'PANDUAN TELEKOM' August 1979 published by Telecommunication Department. For the overall cost please see Appendix H, illustration 7.

#### 6.5 USE OF FACSIMILE TRANSMISSION IN GETTING NUCLEAR INFORMATION IN MALAYSIA

##### Introduction

In order to obtain nuclear information from the primary journals which is not available in PUSPATI, it is possible to do facsimile transmission from any libraries in Malaysia via the telephone leased line.⁷ The cost of transmission illustrated here will involve the retrieval of copy from the libraries situated in the area of Serdang, Kuala Lumpur, Ipoh and Penang. Facsimile service mentioned here enables transmission and reception of written, typed or graphic data from one facsimile terminal equipment to another of a compatible type.

#### Facsimile Equipment available in Malaysia

There are only a few types of facsimile equipment available in Malaysia since this method is not very well known in Malaysia yet except to the private industry.⁸ In 1980, there were about 23 facsimile circuits in Malaysia.⁹ All facsimile equipments are subject to 'type approval' by the Telecommunications Department before they are allowed to be connected on telecommunication leased circuits.¹⁰

#### Rank Xerox¹¹

Rank Xerox Telecopier type 400 is the most common used in Malaysia since it has the lowest rental cost of any equipment currently available on the market. The Telecopier 400 gives four to six minutes maximum transmission of an A4 sized paper out of the original size and uses an electrothermal burn off process for recording. The scanning rate is 180 LPM (Line Per Minute). It

has a single page drum type transceiver and unattended reception is not possible. Specification and further information is available in Table I.

Table I

Type	Purchase Price	Output
Telecopier 400	M\$ 4,800	
Telecopier 400-1	M\$ 5,400	8½" x 11"
Telecopier 410	M\$ 9,000	

3M¹²

Only a few institutions use 3M facsimile machines supplied by 3M Company, Sections 16, Petaline Jaya, Selangor. There are several types of 3M machines as illustrated in illustration 4I.

Illustration 4I  
-----

Model	Scanner Type	Input		Output	Speed	Recording Method	Communication facility	Purchase Price
		Max.	Min.					
600	Rotating	8½ x 14"	3½ x 5"	9.5 x 14	3 mins.	electrofax	voice	\$13,000
600	cylinder with	8½ x 14"	4" x 4"	9.5 x 14	"	"	grade	
6033	flat bed	8½ x 11½	3" x 5"	8.5 x 11	6.4 & 3 mins.	"	telephone	
3M express		8½ x 14	2½ x 6	8.5	35 sec.	liquid toner	line	\$30,000



6.6 COST COMPARISON BETWEEN USING CARRIER, COURIER, MAILING, TELEPHONE AND FACSIMILE SYSTEM IN OBTAINING THE ORIGINAL ARTICLE OR INFORMATION

Illustration. 42

Key Parameters: Location from Puspatti

Total cost for 5 pages of an article

All figures are in Malaysian dollars

METHOD	U.K.M.	KUALA LUMPUR	SERDANG	PENANG	BIID U.K.
1. Carrier	25.74	25.74	25.74	15.74	-
2. Courier system	14.73	14.73	14.73	-	-
3. Mailing (letter)	1.00	1.00	1.00	1.00	8.96
4. Telephone	1.30	2.20	1.30	9.20	-
5. Facsimile	12.57	18.77			-

From the above table, for acquiring the original article, mailing system is still the cheaper way of doing it. The disadvantage of it is that the process is a bit slow. Please look into the table in this chapter for the time received. From PUSPATI to U.K.M. itself will take about two days and from PUSPATI to Penang will take three days. Even though carrier system is the most expensive method, it can handle a large collection of parcels, which cannot be done by facsimile and telephone; for example to send a magnetic tape, disc or large copies of books. See Graph 3 for further detail. This carrier becomes cheaper than the mailing system for inter-library

loan if the delivery occurs in more than 40 pages a day. Telephone is the second cheaper method of obtaining information. It is limited to the voice only but can be obtained in a short time compared to the letter. The problem is that by telephone, graphic could not be sent. For writing material, the provider could just read the paper if it is not that long.

### Illustration 43

-----

Cost comparison on sending or obtaining the original papers by different methods from PUSPATI to Kuala Lumpur or U.K.M. to Penang in bracket.

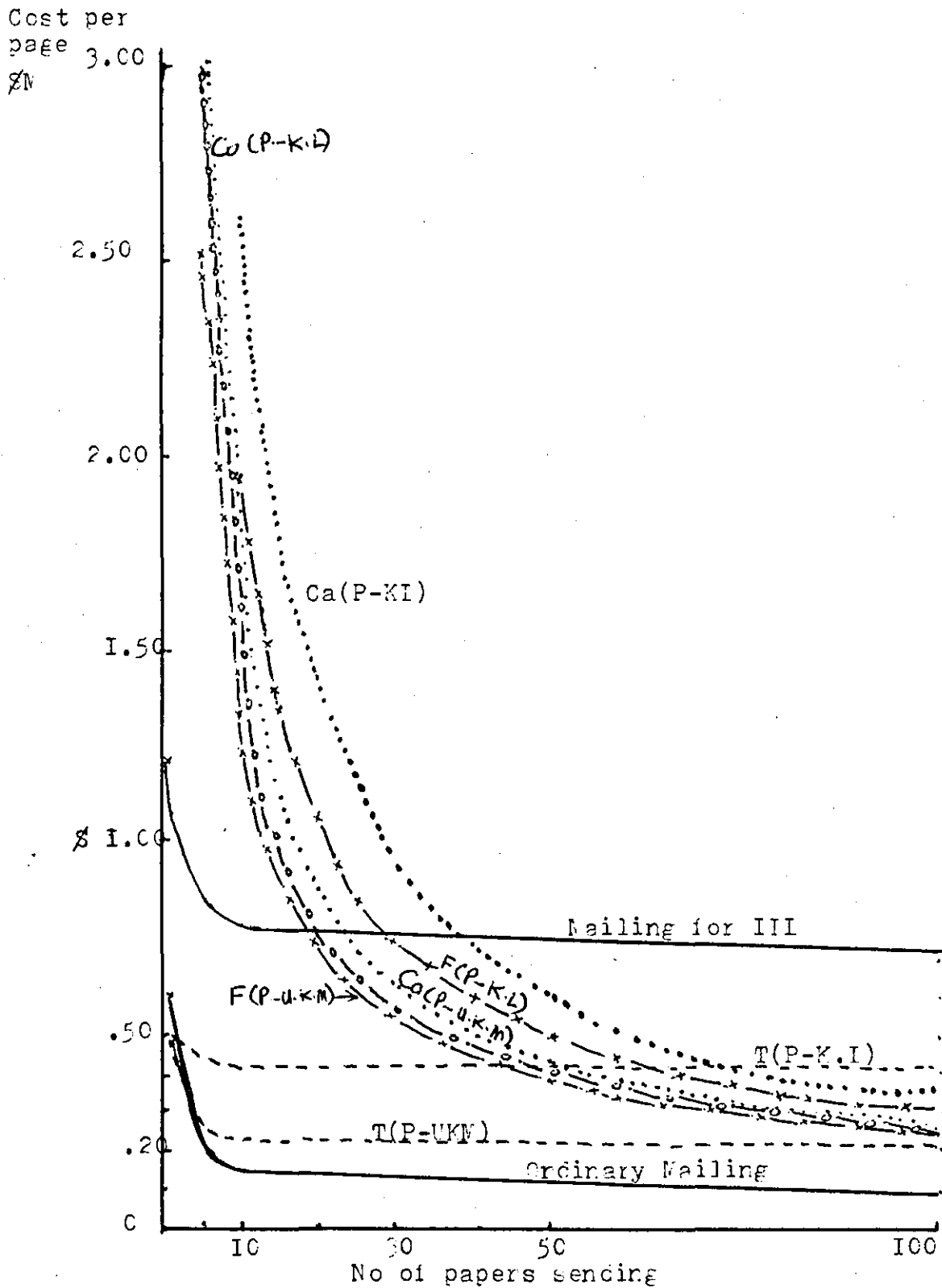
Method	Cost of each paper			
	No. of paper			
	1	5	10	100
1. Carrier to Kuala Lumpur & U.K.M. to Penang	25.32 (15.32)	5.15 (3.15)	2.62 (1.62)	.35¢ (.25¢)
2. Courier to K.L. & U.K.M.	14.31	2.94	1.52	.24¢
3. Mailing to K.L., U.K.M. & Penang	.58¢	.20¢	.15¢	.10¢
4. Telephone to Kuala Lumpur and U.K.M.	.50	.44 (.26)	.42 (.23)	.41 (.21)
5. Facsimile to Kuala Lumpur and U.K.M.	18.27 (12.07)	3.75 (2.51)	1.94 (1.32)	.31 (.24)

The above table shows the different cost on each paper sent by different methods. It is connected with the graph IQ. In this case,

mailing for example, the cost of delivery becomes less if the number of papers sent increases. All the methods show that when the number of papers delivered increases, the cost of each paper decreases.

Graph IC

Cost comparison on sending or obtaining for each of the original paper by different methods from Puspatti to K. Jumsur, UKW and Penang.



Key: ----- Telephone T  
 ----- Mailing  
 -x-x- Facsimile F  
 ..... Carrier Ca  
 -o-o- Courier Co

P= Puspatti  
 UKW= Universiti Kebangsaan  
 KI= Kuala Lumpur

## 6.7 REFERENCES

1. LEE SAU LAN, 'The economics of inter-library communication in Peninsular Malaysia', 56.
2. Personal communication. Dr. Ahmad Tajuddin Ali. Puspati 030 (6 January 1982).
3. Ibid.
4. LEE, op. cit., p.65.
5. MAHMUD, 'Data communication in Malaysia', Kawat (1980), 10.
6. See ref. 1.
7. Jabatan Telekom, 'Telecommunication Guide', Kuala Lumpur, (1979), 247.
8. Personal communication.
9. Mahmud, op. cit., p.9.
10. Jabatan Telekom, op. cit., 248.
11. Xerox Telecopier 485. Rank Xerox, England (1982), pamphlet.
12. See ref. 2.

## CHAPTER 7

SUMMARY, RECOMMENDATION AND CONCLUSION7.1 Introduction

From the previous chapter 1 to chapter 6, some recommendations can be made, in order to identify the problems of acquiring information in the nuclear field. This will be discussed under the topic of the availability of information sources in Malaysia, telecommunication condition, computerised information network for Malaysia, the awareness of Malaysian people towards the existing of online database services and the cost comparison of doing the literature search and acquiring the original document.

7.2 Puspati

Puspati was selected by the Malaysian Government as a centre for INIS in Malaysia. So it is the duty of Puspati to collect all the information falling under INIS subject which is published in Malaysia, and to prepare for the input to INIS section in Vienna. Puspati is also supposed to disseminate any information related to the nuclear field to the Puspati users. Both input and output from Puspati could only be done if Puspati have a co-operative scheme with its users. The duty of Puspati is to let their users know what INIS could provide for their research and development projects.

Without the co-operation of the local institutions, input to Vienna is impossible and there will be difficulty in disseminating the information required by the Puspati users.

In order to make Puspati fulfil its objectives of disseminating and retrieving information on nuclear field successfully, there should be an adequate qualified personnel to handle this case. Puspati needs at least 3 to 4 professional personnel with the qualification of Information Science or Computer Science in order to achieve this aim. Two professionals are needed to do work fully on INIS input preparation. Another two staff doing on line searching and search strategy. This will surely involve a need for training the professional staff. They have to be trained not only in the field of input preparation for INIS but also on how to use the services provided by the INIS to its Member States. For example with the supply of magnetic tape from INIS to Puspati, Puspati staff should be able to process this magnetic tape through the STAIRS software which is already available in the Prime Minister's Department.

Even though training of this staff will consume time and money at the beginning but for the long run project, it will be a cost benefit since this staff will not only be used by Puspati alone but will also be used by other research and universities in order to do online searching. It is sincerely hoped that Puspati should take action as soon as possible to recruit staff in information and computer science field in order to fulfil this objective. This staff is also required to make a propaganda or publicity on INIS services to the

organisations in Malaysia. This could be done by allowing them to visit each and every individual organisation and explain to them what INIS can do to them. The other way is by disseminating or presenting a paper in a conference or seminar held in Malaysia.

INIS is the centre where Puspati can get most of the nuclear information published in this world. INIS services is either by INIS Atomindex, magnetic tape, unconventional literature or online is very valuable to Puspati and its user. Puspati can get a lot of benefits by joining INIS since it provides nuclear information, training facilities and document delivery. It is the duty of Puspati to co-operate and work closely with INIS in order to gain better services to than omit to the users in Malaysia.

Telecommunications is an important part of the new technology which holds great promises for improving the retrieval and dissemination of information within PUSPATI as well as Malaysia.

Telecommunications costs are a function of distance, amount of usage and channel capacity. In addition, the form of transmitted information and the inherent characteristic of the transmission media affect telecommunication cost.¹ The shorter the distance, the less connecting time and the use of dial up network (PSTN) by Puspati will give much advantage on the telecommunication costs. Advances in data compression techniques will affect the cost of transmitting analog and digital signals. These techniques are expected to be particularly effective in reducing the cost of transmitting such analog information as facsimile.² If Puspati is



using the leased line, full time utilization is the key to achieving maximum economies in information transfer.

The success in obtaining the information needed by PUSPATI will depend on the availability of sources in Malaysia and also on the co-operation from the other libraries to provide the documents via the inter-library loan procedure. The shortest distance from PUSPATI to the available sources is the best or cheapest way of acquiring the original document. There is no point for PUSPATI to have a list of references but could not get the original documents to provide to the user.

It has been found that in Malaysia (with common colonial heritage and history), the librarians have found it extremely difficult to carry out co-operative projects in the library field.³ This is because, as a library service, inter-library loan is costly and time consuming, especially when sending a heavy book or multiple copies of photocopies. The estimated cost of this survey is only \$1.28 for 5 papers of photocopy. It has been estimated in U.S.A. that a single inter-library loan may incur as much as U.S. \$8.00 for the lending institution alone.⁴ This data can be applied if PUSPATI is asking an inter-library loan from overseas. The disadvantage of inter-library loan in Malaysia is the time consumed which sometimes takes a week or three when an inter-library loan is being applied. It is hoped that this problem no longer exists. Since PUSPATI is very close to the Library of University Kebangsaan

Malaysia which is the largest library in the South East Asia, the co-operation between these two libraries must be very close. If not, otherwise, there is going to be a great problem in terms of time and cost for PUSPATI to acquire the original documents related to PUSPATI subject interests.

Since Puspati to U.K.M. is about 3 miles only, it is possible to have a local network for sharing by using computers, installation of facsimile machine and employing the same type of courier. From graph 10, we can see when the number of papers delivered increases, the cost by using facsimile and courier is decreased sharply, almost equal to the mailing system cost. Even though the mailing system is cheaper for transferring or obtaining the document from either Puspati or U.K.M. (distance 3 miles), the time involved is a lot, about 2 days. See Appendix H, illustration 4. This is because there is no post office in Bangi yet. Instead the mail has to be brought to Kajang first which is about 8 miles east of U.K.M., awaiting to be sorted.

From the data on the cost comparison, Puspati should not buy any Chemical Abstracts, Inspec abstract publications and Science Citation Index since it is not a cost benefit. With the implementation of dial up network, Puspati can get access to this data bases much cheaper via the online compared to the manual searching method done in Puspati. While for the INIS database, batch processing method and online to U.K.M. or Kuala Lumpur will be the alternative ways. In taking the manual search time as 7 hours only, the cost

of search is already high. If by taking the average manual search times done by Rogers about 16 hours;⁵ Bivans about 20 hours;⁶ and Elman about 22 hours, it shows that by doing manual searching method in Puspati and in Kuala Lumpur the cost will be much more than the cost of online searching. Elman⁷ finds that a manual search can cost five times more than an online search. But from the table, the manual search here costs from 2 to 4 times higher than the online search depending on the subject of data bases chosen.

Mailing system is still the most cheap way of sending or obtaining the original documents. The disadvantage of the mailing system, is that it cannot reach the destination in a short time or directly as in the telephone or facsimile system. In fact mailing will consume time for typing the address, filling the form and stamping before despatch. The cost of sending material via facsimile transmission will be cheaper if we use the dial up network. The cost of facsimile transmission per page is about US \$1.00 from Puspati to U.K.M. compared to the report made by Jackson⁸ about US \$6.91 at Penn. State University in 1968. This is probably because of the high cost of communication charges during that time.

Some of the methods of obtaining the documents for Puspati have to be done by a combination of methods proposed in Chapter 5. Mailing and facsimile for example have to be done first by telephone to the other side in order to enquire the documents required, to make sure the document is available in their stock.

### 7.3 MALAYSIAN GOVERNMENT

Malaysian Government should if possible make a legal enforcement or an act requiring any organisations in Malaysia which published any materials related to nuclear field to deposit their publications to Puspatti. By this way it will also help Puspatti to do the input worksheet to INIS easily and also to prepare for the nuclear bibliography which is available in Malaysia. This abstracting and indexing publications could most probably be written in the Malay language itself.

Malaysian Government should also give more opportunities for the students to take up courses in data processing, system analysis, computer networking, information science and computer science courses in order to smooth the process of information retrieval in Malaysia. The good facilities available in Malaysia like computer and telecommunication network is a good starting point for doing automation in information storage and retrieval. But we still lack professional staff who can organise and carry forward the project.

Malaysian Government should also give opportunities to staff to learn more about INIS by allowing them to attend conferences, training seminars and workshops which are usually organised by the INIS section in Vienna every year.

Automation of literature bibliographies, indexes and abstracts enable the scientist and computer to intercommunicate information and expedite the transfer of knowledge in the library world. The possibility of switching from one data bank to the other is possible nowadays.⁹ For Malaysia this can happen if the computer centre or any institutions having big computer could have interconnection among themselves. Computer network for Malaysia should be implemented. The sharing of computer mainframe will save time, money and space for information retrieval.

The major obstacle to better utilization and improved results of computers is the lack of computer personnel. This could be overcome if Malaysian Government can recruit more staff to gain a degree in computer or information science, system analysis and data processing. The local universities should modify their educational programmes to be more practical oriented and suit the local needs of the data processing industry. The government of Malaysia should establish a National Computer Institute for a proper education plan and computer training to meet the demands of the country.

Computer utilization in Malaysia is in the lowest rank compared to the Republic of China, Hong Kong, Philippines and Thailand.¹⁰ Malaysia consumes only 182.7 hours in a month compared to more than 240 hours of other countries. This is because the majority of computer applications are still of the bread and butter type for administrative and accounting purposes. The computers used are still in the payroll and accounting areas; while in the field of

data base and data bank for information storage and retrieval they are still lacking. This is because only a few data processing staff know or prefer to buy packages rather than making them. So the computer staff must change their attitude and actively engage in the transfer of application programs. Some bought an expensive software which they do not know how to use it. STAIRS software is very popular in the Western countries and being used by for example IAEA for the INIS operation, but still it is not being used by Malaysia since they bought it in the last 3 years. One of the major factors that hinder the transportation of application packages is the 'not invented here' (NIH) syndrome. The NIH syndrome is still prevalent and the EDP installations still prefer to develop their own application programs than locate and modify existing packages.

So it is a proposal that Malaysian Government should implement the establishment of the planned Public Data Network (PSDN) as soon as possible in order to allow for the utilization of online and computer communication which will become more cost beneficial. With the implementation of Public Switch Data Network (PSDN), the cost on using online, telex and facsimile will be much cheaper. For example by using dial up network from Puspati to Kuala Lumpur computer centre it will cost about \$7.98 compared to \$23.98 or \$16 difference by using the leased line from the same point. See Table for reference. The same thing will happen in the case of connection from Puspati to Singapore which will cost \$96.55 compared to \$280.31 or \$183.76 difference by using leased line.

From this data and from the report made by Nordling, we can conclude that dial up service is more economical than leased line.¹¹

Malaysian government should implement the establishment of Kuala Lumpur as a node for international network such as Tymnate and Tymshare. This is what has been done by Singapore Government. It will save a lot of money by establishing Kuala Lumpur as a node. For example to search for SCI via Singapore node through leased line will cost \$329.31 per search compared to \$146.75 per search or \$182.56 difference to SCI via Kuala Lumpur node through the leased line. If 200 searches are carried out annually by Puspati, \$36,512 could be saved.

Malaysian government should also go ahead for the establishment of special service common carriers which will offer private line communication facilities for both analog and digital transmission in competition with the telephone carriers. This common carries such as WATS (Wide Area Telephone Service) in USA is essentially a system for buying telephone service in bulk quantity. By paying a fixed cost per month, the customer can make unlimited number of calls from any telephone within a designated area.

From Appendix G, Illustration 2, the direct search related costs for doing online from Malaysia is not much different from the cost made by Keenan¹² for United Kingdom. The one minute cost per search for Dialog system is about £1.03 and for INIS data base is about £0.80.

From these figures, since the developed countries were using this online searching for their effectiveness of doing research and development, the Malaysian research institutes should also follow what they have done. Manual searching is out of date nowadays and will only delay the research project.

It is heartening to note that the National Scientific Research and Development Council (NSRDC) in Malaysia plans to set up a National Scientific Documentation and Information Centre (NSDIC).¹³ The proposed NSDIC will serve as the nucleus for information gathering and dissemination for the country's various research institutions. The centre would be linked by satellites to other international database suppliers like DIALOG and DIANES in Europe for prompt acquiring of information.

Malaysian government should implement the establishment of this proposal as soon as possible in order to strengthen the network of research institutions and to help in the transfer of technology. NSDIC or known in the other countries as Scientific and Technical Information Centre like Japan (J STIC) and Korea was established in the developed countries between 10 to 15 years ago.

In the field of Scientific and technical information relevant to Malaysia, there must be a national union catalogue of scientific and technical periodicals. To devise and supervise a programme for the co-operative acquisition of scientific and technical



periodicals in the country and outside the country, with the aim of widening coverage and eliminating duplication: to compile an up to date register of current Malaysian research; to publish a regular list (preferably with abstracts) of current articles, papers, reports of scientific and technical work in Malaysia; to compile and publish a directory of sources of scientific and technological information within the country. This recommendation was made by J.D. Grogan in his report 'Scientific and Technical Library and Information Services in Malaysia'.¹⁴

The enforcement for establishing union catalogue should be done first. This will also help Puspatti to organise and search for the literature published in the country which is related to the INIS subject scope and doing the input for INIS easily. All the research institutes, universities or private organisations should send their papers to the National Library of Malaysia which is the depository body for Malaysia. Then they will easily publish the Union catalogue which will cover the whole new publications available in Malaysia. Besides that Puspatti and National Library can build their own databases in Malay language itself from this Union Catalogue.

Malaysian Government should also make the pool type system for doing online searching. For example, Puspatti, U.K.M., U.P.M., MARDI, IIN can share the same terminal and data communication available for doing searching. Since they are located about 5 miles distance from each other, the maximum full use of the terminal

or sharing the terminal will be more cost beneficial. This will save the cost on search aid, renting, training and elementary expenditure cost.

Malaysian Government should discourage every research institutions and universities to acquire their own secondary publications like Chemical Abstract, Science Citation Index and other scientific abstracting and indexing publication which is very costly. These institutions should co-ordinate and co-operate with each other in order to do online searching on what their users needed. This will surely save the Malaysian Government in a large amount of money. For example, from Appendix G, illustration 6 to 9, in the area of Bangi and Serdang which is about 4 to 5 miles away from Puspatti and comprise 2 universities and 2 research institutions, if 250 manual searching are supposed to be done on SCI, CA and Inspec, the cost will be about  $4 \times \$355,711$  or M\$1,422,844 to be spent. But if using the online searching through the PSTN on all those three data bases, the cost will only be \$75,000 for each individual institution or M\$300,000 for those four institutions. This means that M\$1,422,844 - M\$300,000 or more than M\$1 million dollars could be saved by doing the online searching.

7.4 REFERENCES

1. DITTBERNER, D.L., 'Telecommunication Costs', Conference Inter-library Communications and Information Networks. American Library Association (1970), 160.
2. Ibid., 162.
3. LIM HUCK TEE, 'The Library situation in Malaysia: problems and prospects of solution through international and regional library co-operation. Conference International Co-operation in orientalist librarianship. Canberra, National Library of Australia (1972), 186-194.
4. DAVID KASER, 'Whither Inter-Library Loan?', College and Research Libraries, 33 (5) (1972), 399.
5. ROGERS, F.B., 'Costs of operating an information retrieval service'. Drexel Library Quarterly, 4(4), (1968), 271-278.
6. BIVANS, M.M., 'A comparison of manual and machine literature searches', Special Libraries, 65 (5/6), (1974), 216-222.
7. ELMAN, S.A., 'Cost comparison of manual and online computerised literature searching'. Special Libraries, 66 (1), (1975), 12-18.
8. JACKSON, W.C., 'Telefacsimile at Penn State University', Library Resources and Technical Services, 15 (2), (1971), 224.
9. CARLSON, W.M., 'Communicating via computers', Jnl. of Chemical Documentation, 10 (4), (1970), 265-267.

10. N.G.F.L., 'Software technology and South East Asian Countries', SEARCC, North Holland, (1976), 115-119.
11. NORDLING, K.I., 'Analysis of common carrier tariff rates', Datamation, (1971), 29-33.
12. KEENAN, S., 'How to go online'. BLRD Report 5533, London, British Library (1980), 52.
13. 'Information Centre for research work', Malaysian Digest, (31 May, 1982), 7.
14. GROGAN, D.J., Scientific and technical library and information services in Malaysia: an appraisal with recommendations. Aberystwyth (1971).

APPENDIX AINIS Member States and Organizations

(July 1978)

The following States are Members of the International Atomic Energy Agency:

AFGHANISTAN	HOLY SEE	* PERU
ALBANIA	* HUNGARY	* PHILIPPINES
* ALGERIA	ICELAND	* POLAND
* ARGENTINA	* INDIA	* PORTUGAL
* AUSTRALIA	* INDONESIA	* QATAR
* AUSTRIA	* IRAN	* ROMANIA
* BANGLADESH	* IRAQ	SAUDI ARABIA
* BELGIUM	* IRELAND	SENEGAL
BOLIVIA	* ISRAEL	SIERRA LEONE
* BRAZIL	* ITALY	SINGAPORE
* BULGARIA	IVORY COAST	* SOUTH AFRICA
BURMA	JAMAICA	* SPAIN
* BYELORUSSIAN SOVIET	* JAPAN	* SRI LANKA
SOCIALIST REPUBLIC	JORDAN	SUDAN
* CANADA	KENYA	* SWEDEN
* CHILE	* KOREA, REPUBLIC OF	* SWITZERLAND
COLOMBIA	* KUWAIT	SYRIAN ARAB REPUBLIC
COSTA RICA	LEBANON	* THAILAND
CUBA	LIBERIA	TUNISIA
CYPRUS	LIBYAN ARAB JAMAHIRIYA	* TURKEY
* CZECHOSLOVAKIA	LIECHTENSTEIN	UGANDA
DEMOCRATIC KAMPUCHEA	LUXEMBOURG	* UKRAINIAN SOVIET
DEMOCRATIC PEOPLE'S	* MADAGASCAR	SOCIALIST REPUBLIC
REPUBLIC OF KOREA	* MALAYSIA	* UNION OF SOVIET
* DENMARK	* MALI	SOCIALIST REPUBLICS
DOMINICAN REPUBLIC	MAURITIUS	UNITED ARAB EMIRATES
* ECUADOR	* MEXICO	* UNITED KINGDOM OF
* EGYPT	MONACO	GREAT BRITAIN AND
EL SALVADOR	MONGOLIA	NORTHERN IRELAND
ETHIOPIA	MOROCCO	* UNITED REPUBLIC OF CAMEROON
* FINLAND	* NETHERLANDS	UNITED REPUBLIC OF TANZANIA
* FRANCE	* NEW ZEALAND	* UNITED STATES OF AMERICA
GABON	NICARAGUA	URUGUAY
* GERMAN DEMOCRATIC REPUBLIC	NIGER	* VENEZUELA
* GERMANY, FEDERAL REPUBLIC OF	NIGERIA	* VIET NAM
* GHANA	* NORWAY	* YUGOSLAVIA
GREECE	* PAKISTAN	* ZAIRE
GUATEMALA	PANAMA	* ZAMBIA
HAITI	PARAGUAY	

* Countries marked by an asterisk are those that by the day of edition of this document had formally indicated their willingness to participate in the International Nuclear Information System (INIS).

In addition the following international and regional organizations have formally accepted an invitation to participate in INIS:

Commission of the European Communities (CEC)  
 Council for Mutual Economic Assistance (CMEA)  
 European Organization for Nuclear Research (CERN)  
 Food and Agriculture Organization of the United Nations (FAO)  
 International Atomic Energy Agency (IAEA)  
 International Commission on Radiological Protection (ICRP)  
 International Organization for Standardization (ISO)  
 Joint Institute for Nuclear Research (JINR)  
 Nuclear Energy Agency (NEA)  
 Organization of African Unity (OAU)  
 United Nations (UN)  
 World Energy Conference (WEC)  
 World Health Organization (WHO)

Sources:

**Further INIS Information may be obtained by contacting the  
"INIS Liaison Officer"  
at one of the following addresses:**

**IAEA MEMBER STATES**

**ALGERIA**

Mr. Benhamadi Moussa  
INIS Liaison Officer  
Centre des Sciences et Technologie  
Nucleaire (CSTN)  
Tagarin (El Biar) Alger  
Algeria

**ARGENTINA**

Mr. Tito Suter  
INIS Liaison Officer  
Comision Nacional de Energia Atomica  
Avenida Libertador 8250  
RA-1429 Buenos Aires  
Argentina  
Telephone: 70-7711  
Telex: 0121388 PREAT-AR

**AUSTRALIA**

Mr. W.H. Neale  
Head Librarian  
Australian Atomic Energy Commission  
Lucas Heights Research Laboratories  
Private Mail Bag  
Sutherland  
New South Wales 2232  
Australia  
Telephone: (02) 543.0111  
Telex: 24562

**AUSTRIA**

Mrs. M. Tisljar  
INIS Liaison Officer  
Oesterr. Forschungszentrum Seibersdorf  
Ges.m.b.H.  
Lenaugasse 10  
A-1082 Wien  
Austria  
Telephone: (02254) 80 23 13  
Telex: 014/353

**BANGLADESH**

Mr. M. Farooque  
Director  
Scientific Information Division  
Bangladesh Atomic Energy Commission  
P.O. Box 158, Ramna  
Dacca-2  
Bangladesh  
Telephone: 28 01 12, 28 01 13 ext. 9.  
28 31 51 ext. 132  
Cable: Banglatom

**BELGIUM**

Mr. R. Billiau  
Chief  
Administration of Research  
S.C.K./C.E.N.  
B-2400 Mol  
Belgium  
Telephone: (014)31.68.71, 31.18.01  
Telex: Atomol 31922

**BRAZIL**

Mr. A.C. de Souza  
INIS Liaison Officer  
Comissao Nacional de Energia Nuclear  
Centro de Informacoes Nucleares  
Rua General Severiano 90-Terreo  
Botafogo-ZC-82  
22294 Rio de Janeiro  
Brazil  
Telex: 21 21 280 CNEN

**BULGARIA**

Mrs. Iglia Miteva  
INIS Liaison Officer  
Central Institute for Scientific  
and Technical Information  
Bul. Nasser 52 a  
N.K. 71  
Sofia 1000  
Bulgaria  
Telephone: 7-12-91, 71-71-31  
Telex: 022404

**CAMEROON**

INIS Liaison Officer  
Recherches Energetiques de l'IRTISS  
Office National de la Recherche  
Scientific et Technique  
B.P. 4110  
Yaounde  
United Republic of Cameroon

**CANADA**

Mr. G.P.L. Williams  
Head  
Technical Information Branch  
Atomic Energy of Canada Ltd.  
Chalk River, Ontario K0J 1J0  
Canada  
Telephone: (613) 584-3311  
Telex: 053-34555

**CHILE**

Miss L. Trujillo C.  
Head Librarian  
Comision Chilena de Energia Nuclear  
Los Jesuitas 645  
Casilla 188-D  
Santiago de Chile  
Chile  
Telephone: 26 35 11  
Cable: NUCLEARCHILE

**COLOMBIA**

Mrs. C. Briceno  
Librarian  
Instituto de Asuntos Nucleares  
Adscrito al Ministerio de Minas y Energia  
Apartado Aereo 8595  
Bogota, D.E.  
Colombia

**CUBA**

Mr. F. Fernandez Nodarse  
INIS Liaison Officer  
Comision de Energia Atomica  
Apartado 2169  
La Habana  
Cuba  
Telephone: 22-1298  
Telex: 1837

**CZECHOSLOVAKIA**

Mr. O. Patek  
Director  
Nuclear Information Centre  
Czechoslovak Atomic Energy Commission  
CS-255 45 Praha 5 - Zbraslav  
Czechoslovakia  
Telephone: 59 15 83  
Telex: 121427 fnt c

**DEMOCRATIC PEOPLES REPUBLIC OF KOREA**

Mr. Pak Hong Chol  
INIS Liaison Officer  
State Committee for Atomic Energy  
Pyong-Yang  
Democratic People's Republic of Korea

**DENMARK**

Mrs. E. Pedersen  
Chief Librarian  
Riso National Laboratory  
DK-4000 Roskilde  
Denmark  
Telephone: 02 371212  
Telex: 43116 RISATOM

**ECUADOR**

Mrs. F. Lopez Moral  
Librarian  
Comision Ecuatoriana de Energia Atomica  
Oficial de Enlace del INIS  
Calle Cordero 779 y 6 de Diciembre  
Casilla 2517  
Quito  
Ecuador  
Telephone: 233-691, 234-656  
Cable: Comatom-Ecuador

**EGYPT**

Mr. A.R. El Hadidy  
Head  
Scientific Information Division  
Atomic Energy Establishment  
101, Kasr El-Eini Street  
Cairo  
Egypt  
Telephone: 86 95 10  
Cable: Atomcom Cairo

**FINLAND**

Miss L. Katajapuro  
INIS Liaison Officer  
Helsinki University of Technology  
Library  
SF-02150 Espoo 15  
Finland  
Telephone: 90-4512-826  
Telex: 12-1591 tkk sf

**FRANCE**

Mr. R. Larue  
Chef  
Service de Documentation  
CEN. SACLAY  
F-91191 GIF SUR YVETTE Cedex  
France  
Telephone: (6) 908 22 08  
Telex: 690641 F-ENERGAT-SACLAY

**GERMAN DEMOCRATIC REPUBLIC**

Mr. H. Scheel  
Head  
Abteilung Information  
Staatliches Amt fuer Atomsicherheit  
und Strahlenschutz der DDR  
1157 Berlin-Karlshorst  
Waldowallee 117  
German Democratic Republic  
Telephone: 5022146  
Telex: 11 26 32 Saas dd

**GERMANY, FEDERAL REPUBLIC OF**

Mr. W. Rittberger  
Director  
Fachinformationszentrum Energie, Physik,  
Mathematik GmbH  
INIS Sektion  
D-7514 Eggenstein-Leopoldshafen 2  
Federal Republic of Germany  
Telephone: (0 72 47) 82 46 00/01  
Telex: 7 826 487 fize d

**GHANA**

Mr. G. Tay  
Senior Scientific Officer  
Ghana Atomic Energy Commission  
P.O. Box 80  
Legon, Accra  
Ghana  
Telephone: 21323  
Cable: GHANATOM-ACCRA

**GREECE**

Miss N. Christoforidou  
Head Librarian  
Nuclear Research Centre  
'Democritus'  
Greek Atomic Energy Commission  
Aghia Paraskevi Attikis  
Athens  
Greece  
Telephone: 65.19.544  
Telex: 216199

**HUNGARY**

Mr. D. Panto  
Director  
National Technical Information  
Centre and Library  
Reviczky U.6  
P.O. Box 12  
H-1428 Budapest  
Hungary  
Telephone: 137-822  
Telex: OMIKK H 22-4944

**INDIA**

Mr. V.A. Kamath  
Head  
Library and Information Services  
Bhabha Atomic Research Centre  
Trombay  
Bombay 400 085  
India  
Telephone: 52 33 31 ext. 280  
Telex: 2817AB code BARC

**INDONESIA**

Mrs. R.U. Widodo  
INIS Liaison Officer  
Centre for Special Materials and  
Instrumentations  
National Atomic Energy Agency  
P.O. Box 8  
Jogjakarta  
Indonesia  
Telephone: 3661

**IRAN**

Mr. H. Djavidi  
INIS Liaison Officer  
Nuclear Information Centre  
Atomic Energy Organization  
P.O. Box 314-1673  
Tehran  
Iran  
Telephone: 89 84 52/53, 89 18 84  
Telex: 212165

**IRAQ**

Mr. D.M. Hashim  
INIS Liaison Officer  
Computer Centre  
Nuclear Research Institute  
P.O. Box 765  
Tuwaitha-Baghdad  
Iraq  
Telex: 2312 IK

**IRELAND**

INIS Liaison Officer  
Nuclear Energy Board  
20-22 Lower Hatch Street  
Dublin 2  
Ireland  
Telephone: 76 43 75  
Telex: 30610 neb ei

**ISRAEL**

Mr. Y. Goldstein  
INIS Liaison Officer  
Information Services  
Nuclear Research Centre - Negev  
P.O.B. 90001  
Beer-Sheva 84 190  
Israel  
Telephone: 057-5211

**ITALY**

Mr. M. Ballarin  
INIS Liaison Officer  
COGEP - GSI  
C.N.E.N.  
Viale Regina Margherita 125  
I-00178 Rome  
Italy  
Telephone: 4698  
Telex: 61167

**JAPAN**

Mr. H. Nakamoto  
Head  
Japan Atomic Energy Research Institute  
Fukoku Seimei Bldg.  
2-2, Uchisaiwai-cho 2-chome  
Chiyoda-ku  
Tokyo 100  
Japan  
Telephone: (03) 503-6111  
Telex: JAERI J24596

**KOREA, REPUBLIC OF**

Mr. Kwak Chongsun  
INIS Liaison Officer  
Korea Atomic Energy  
Research Institute (KAERI)  
P.O. Box 7  
Cheong Ryang  
Seoul 131  
Korea  
Telephone: (02) 433-2081-9  
Telex: KAERI K23241  
Cable: KAERI

**KUWAIT**

Mr. A.M. Al-Minayes  
INIS Liaison Officer  
Power and Water Project Section  
Ministry of Electricity and Water  
P.O. Box 12  
Kuwait  
Kuwait

**LIBYA**

INIS Liaison Officer  
Library  
Nuclear Research Centre  
Tajura  
Socialist People's Libyan Arab Jamahiriya

**MADAGASCAR**

Mr. J. Mazaubeana  
Director  
Laboratoire de Radio-Isotopes  
Route d'Andraisono  
B.P. 3383  
Antananarivo  
Madagascar  
Telephone: 404-88

**MALAYSIA**

Mr. M. ISA bin Samad

Tun Ismail Atomic Research Centre  
No. 4, Jalan 1/4  
Bandar Baru Bangi  
Kajang Selangor  
West Malaysia

**MALI**

INIS Liaison Officer  
Ministere du Developpement Industriel  
et du Tourisme  
Direction de l'Hydraulique et de l'Energie  
B.P. 66  
Bamako  
Mali  
Telephone: 225-88  
Telex: 406 HYDRAULIQUE BAMAKO

**MEXICO**

Mr. P. Zamora  
Librarian  
Centro de Informacion y Documentacion  
Nuclear  
Instituto Nacional de Investigaciones  
Nucleares (ININ)  
Apdo. Postal No. 27-190  
Mexico, 18, D.F.  
Mexico  
Telephone: 563-71-00  
Cable: NACNUCLEAR, Mexico

**NETHERLANDS**

Mr. J.H.M. Heijnen  
Head  
Office of the Netherlands Bibliographical  
and Documentary Committee (COBIDOC)  
2e etage PTT bijkantoor  
St. Antoniesbreestraat 16  
Amsterdam-C  
Netherlands  
Telephone: 020 - 223 955  
Telex: 18766

**NEW ZEALAND**

Mr. D.C. Robinson  
INIS Liaison Officer  
Department of Scientific  
and Industrial Research  
Science Information Division  
P.O. Box 9741  
Wellington  
New Zealand  
Telephone: 858 939  
Cable: SIDSIR

**NORWAY**

Mr. R. Feyling  
INIS Liaison Officer  
Institutt for Energiteknikk  
P.O. Box 40  
N-2007 Kjeller  
Norway  
Telephone: 2 712560/713560  
Telex: 16361 energ n

**PAKISTAN**

Mr. J. Aslam  
INIS Liaison Officer  
Pakistan Institute of Nuclear Science  
and Technology  
P.O. Nilore, Rawalpindi  
Pakistan  
Telephone: 68111, 42812, 40151-8 ext. 227  
Telex: 1BA-725

**PARAGUAY**

Mr. C. Caceras Aguilera  
Departamento de Enseñanza e  
Intercambio Científico  
Comisión Nacional de Energía Atómica  
Casilla de Correo 1055  
Asunción  
Paraguay  
Telephone: 43-345, 25-153, 203-238

**PERU**

Mr. M. Riva-Malaga  
INIS Liaison Officer  
Instituto Peruano de Energía Nuclear  
Av. Luis Aldana 120  
Apartado 1687  
Urb. Santa Catalina, La Victoria  
Lima  
Peru  
Telex: 25746P

**PHILIPPINES**

Mrs. R.T. Donato  
Supervising Librarian and O.I.C.  
Scientific Library and  
Documentation Center  
Philippine Atomic Energy Commission  
Don Mariano Marcos Avenue, Diliman  
Quezon City  
Philippines  
Telephone: 97 60 11  
Cable: PhilATOMIC

**POLAND**

Mr. J. Kielbasinski  
Director  
Energetics and Atomic Energy  
Information Centre (EAEIC)  
Palace of Culture and Science  
PL-00-901 Warsaw  
Poland  
Telephone: 26 96 73

**PORTUGAL**

Miss A. Costa  
INIS Liaison Officer  
Lab. de Física e Engenharia Nucleares  
Estrada Nacional No. 10  
Sacavem  
Portugal  
Telephone: 2510021/6  
Telex: 12727 Nuclab P

**QATAR**

Mr. Maher Jawdat Abu Ali  
INIS Liaison Officer  
Industrial Development Technical Centre  
P.O. Box 2599  
Doha  
Qatar  
Telephone: 32 12 11, 32 04 57  
Telex: 4323 DH

**ROMANIA**

Mr. I.A. Dorobantu  
Head  
Centre for Nuclear Documentation  
and Publication  
Central Institute for Physics  
P.O. Box 5206  
Bucharest  
Romania  
Telephone: 80 70 40/2079  
Telex: 11397 fiam r

**SOUTH AFRICA**

Mr. S.P. Korkie  
INIS Liaison Officer  
Library Services  
Atomic Energy Board  
Private Bag X256  
Pretoria 0001  
South Africa  
Telephone: (012) 21-3311  
Telex: 30253

**SPAIN**

Miss I. Sanz  
INIS Liaison Officer  
Servicio de Biblioteca y Documentación  
Junta de Energía Nuclear  
Avenida Complutense, 22  
Madrid-3  
Spain  
Telephone: 429 44 00 ext. 1316  
Telex: 23555 JUVIG E

**SRI LANKA**

Mrs. R.C. Suranimala  
Scientific Officer  
Office of the Atomic Energy Authority  
120/10 Wijerana Mawatha  
Colombo 7  
Sri Lanka  
Telephone: 94038, 93152  
Cable: LANKATOM

**SWEDEN**

Mr. L. Edvardson  
INIS Liaison Officer  
Swedish INIS Centre  
Studsvik Energiteknik AB  
Library  
S-611 82 Nyköping  
Sweden  
Telephone: (155) 80000  
Telex: 64070 stubib s

**SWITZERLAND**

Mr. R. Schmid  
INIS Liaison Officer  
Institut Federal de Recherches  
en Matière de Réacteurs  
CH-5303 Wuerenlingen  
Switzerland  
Telephone: (056) 30741  
Telex: 53714 eir ch

**SYRIA**

Mrs. T. Attie  
INIS Liaison Officer  
Atomic Energy Commission  
P.O. Box 6091  
Damascus  
Syria

**THAILAND**

INIS Liaison Officer  
Office of Atomic Energy for Peace  
Vibhavadee Rangsit road  
Bangkhon  
Bangkok 9  
Thailand  
Telephone: 579 05 47, 579 01 38/9  
Cable: ATOMTHAI BANGKOK

**TURKEY**

Mrs. F. Cermen  
INIS Liaison Officer  
Ankara Nuclear Research  
and Training Center  
Fen Fakültesi  
Besevler, Ankara  
Turkey  
Telephone: 23 32 08/09  
Telex: 42581 ATOM TR

**USSR**

Mr. I.A. Arkhangelskij  
INIS Liaison Officer  
Atominform  
Abonementnyi Yashchik 971  
Moscow 127434  
USSR

**UNITED KINGDOM**

Mr. P. Jones  
INIS Liaison Officer  
Library Building 465  
AERE Harwell  
Oxfordshire OX11 0RB  
United Kingdom  
Telephone: (0235) 24141  
Telex: 83135

**USA**

Mr. J.G. Coyne  
Manager  
Technical Information Center  
Department of Energy  
P.O. Box 62  
Oak Ridge, Tennessee 37830  
USA  
Telephone: (615) 576-1188  
Telex: 810-572-1076

**VENEZUELA**

Mr. L.G. Clemente  
INIS Liaison Officer  
Consejo Nacional Nuclear (CONAN)  
Apartado Postal 68233  
Caracas 106  
Venezuela

**VIET NAM**

Mr. DINH NGOC LAN  
INIS Liaison Officer  
National Institute for Nuclear  
Research of Viet Nam  
67 Nguyen Du  
Hanoi  
Viet Nam  
Telephone: 52103  
Cable: NINREV - HANOI

**YUGOSLAVIA**

Mr. M. Petrovic  
INIS Liaison Officer  
Institut za Nuklearne Nauke  
"Boris Kidric" (VINCA)  
Postni Predal 522  
YU-11001 Belgrade  
Yugoslavia  
Telephone: (011) 44961/202  
Telex: YU11563

**ZAIRE**

Mr. Ngindu-Dikolela  
Librarian  
Commissariat General a l'Energie  
Atomique (C.G.E.A.)  
Centre Regional d'Etudes Nucleaires  
de Kinshasa (C.R.E.N.-K.)  
B.P. 868  
Kinshasa/XI  
Zaire  
Telephone: 77502, 77503  
Telex: 242

**ZAMBIA**

Mr. L. Mushipi  
INIS Liaison Officer  
National Council for Scientific Research  
P.O. Box Ch. 158  
Chelston  
Lusaka  
Zambia  
Telephone: 75321/2/3/4/5/6  
Cable: NACSIR CHELSTON, LUSAKA



**INTERNATIONAL AND  
INTERGOVERNMENTAL  
ORGANIZATIONS**

**COMMISSION OF THE EUROPEAN  
COMMUNITIES (EURATOM)**

Mr. C.O. Vernimb  
INIS Liaison Officer  
Commission of the European Communities  
DG XIII-B  
Batiment Jean Monnet  
Plateau du Kirchberg  
Luxembourg  
Luxembourg  
Telephone: 43.01.28.82  
Telex: 2752 eurdoc lu

**COUNCIL FOR MUTUAL ECONOMIC  
ASSISTANCE (CMEA)**

Mr. A.I. Chepkasov  
INIS Liaison Officer  
International Center for Scientific  
and Technical Information  
Ul. Kuusinen, 21-B  
SU-125 252 Moscow  
USSR  
Telephone: 198-70-21  
Telex: 411925 MCNTI SU

**EUROPEAN ORGANIZATION FOR  
NUCLEAR RESEARCH (CERN)**

Mr. A. Guenther  
INIS Liaison Officer  
Scientific Information Service  
CERN  
CH-1211 Geneva 23  
Switzerland  
Telephone: (022) 83 24 54  
Telex: Geneva 23698

**FOOD AND AGRICULTURE  
ORGANIZATION (FAO)**

Mr. G. Stergiou  
INIS Liaison Officer  
David Lubin Memorial Library  
Via delle Terme di Caracalla  
00100 Rome  
Italy  
Telephone: 57971  
Telex: 610181 FAO I

**INTERNATIONAL COMMISSION ON  
RADIOLOGICAL PROTECTION (ICRP)**

Mr. F.D. Sowby  
Scientific Secretary  
International Commission of  
Radiological Protection  
Clifton Avenue  
Sutton  
Surrey SM2 5PU  
United Kingdom  
Telephone: 01-642-4680  
Telex: 8951244 icrp g

**INTERNATIONAL INSTITUTE FOR  
APPLIED SYSTEMS ANALYSIS (IIASA)**

INIS Liaison Officer  
IIASA  
Schloss Laxenburg  
A-2361 Laxenburg  
Austria  
Telephone: (022 36) 71 52 10  
Telex: 079137 iiasa a

**INTERNATIONAL ORGANIZATION FOR  
STANDARDIZATION (ISO)**

Mr. E.J. French  
INIS Liaison Officer  
ISO Central Secretariat  
1, Rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Telephone: (022) 34 12 40  
Telex: 23887 ISO CH

**JOINT INSTITUTE FOR NUCLEAR  
RESEARCH (JINR)**

Mr. V. Sandukovsky  
INIS Liaison Officer  
Joint Institute for Nuclear Research  
Head Post Office Box 79  
Dubna  
Moscow  
USSR  
Telephone: 226-22-68  
Telex: MSK Dubna 412621

**NUCLEAR ENERGY AGENCY (NEA)**

Mr. I.A.G. Rosen  
INIS Liaison Officer  
NEA Scientific Division  
38, Boulevard Suchet  
F-75016 Paris  
France  
Telephone: (01) 524 96 98  
Telex: 630668 AEN/NEA

**ORGANIZATION OF AFRICAN UNITY  
(OAU)**

Mr. K.A. Quagraine  
Head  
Scientific Department  
Organization of African Unity  
P.O.Box 3243  
Addis Ababa  
Ethiopia  
Telephone: 47480  
Cable: OAU, ADDIS ABABA

**UNITED NATIONS ORGANIZATION  
(UN)**

Mr. V. Lyscov  
INIS Liaison Officer  
UNSCEAR  
Scientific Committee on the Effects of  
Atomic Radiation  
Vienna International Centre  
P.O. Box 500  
A-1400 Vienna  
Austria  
Telephone: 2631 ext. 4331  
Telex: 135612

**WORLD ENERGY CONFERENCE (WEC)**

Mr. F. Putz  
INIS Liaison Officer  
World Energy Conference  
Oesterr. Forschungszentrum Ges.m.b.H.  
Lenaugasse 10  
A-1082 Vienna  
Austria  
Telephone: 42 75 11  
Telex: 07/5400 SGAE

**WORLD HEALTH ORGANIZATION  
(WHO)**

Mrs B. Ruff  
INIS Liaison Officer  
World Health Organization  
Avenue Appia  
CH-1211 Geneva 27  
Switzerland  
Telephone: (022) 34 60 61 ext. 2070  
Telex: 27821 OMSCH

Sources: IAEA INIS ATOMINDEX V 13(8) (1982), 18, xi-xiv.

## BIBLIOGRAPHIC AND INDEXING DATA

EDNA	JOHN	WANDA	IRVING	STANLEY	BERNARD	JOHN HEPT	AUSTIN	CHARLES	LEONARD
K	L	N	U	W	Z	Y	E	X	O

LIBRARY - CULATON

1 009  Level

2 009 **S**  
Leve

Date Completed:

01

COUNTRY	YEAR	SERIAL NUMBER

002

--	--	--

TWO

NO

YES

4

009

X

(Use a separate Worksheet for each language version of the abstract)

	Tag	Data
Language	850	(enter by typewriter only)
Abstract	860	

Abstracter:

Puncher:

Proofreader:

Date Completed:

APPENDIX EA. Logging on

1. Switch on terminal and modem  
getting should be : half duplex  
30 cps  
even parity.
2. Dial INISNET number in Vienna through International  
Exchange Operator : 42-222-531501.  
Computer will respond: IAEA TWX
3. In upper case repeat: TWX  
Computer response: DFH1025 READY
4. TYPE:  
AQUA (password) (user identification)  
Computer will respond: DFH3504 SIGN ON IS COMPLETED  
R0102 ENTER DATA BASE NAME
5.
 

IN75	Vol.6
IN76	Vol.7
IN77	Vol.8
IN78	Vol.9 to date
INIQ	1st quarter
IN2Q	2nd quarter of current year
INLI	latest issue
INIS	Vol.6 to date

or for getting AGRIS database use:

AG75	Vol.1
AG76	Vol.2
AG77	Vol.3
AG78	Vol.4 to date

AG1Q	1st quarter
AG2Q	2nd quarter of current year
AGLI	latest issue
AGRI	Volume 1 to date

Once in on INIS or AGRIS data base

...HELP BASES - will list all user-authorised bases.

To change data base use...CHANGE

In case of problems call...Vienna 43-222-531184

#### STAIRS COMMANDS:

SEARCH	SELECT	SAVE	HELP
BROWSE	SORT	EXEC	OFF
PRINT	DISPLAY	CHANGE	
MAIL PUR	PURGE	SET	

SEARCH mode.

Operators (in order of descending printing)

ADJ, SYN, WITH, SAME, NOT, AND, OXR, OR

AND/NOT - equal priority

XOR/OR - equal priority

Execution according to priority

Example: A AND B	Both in same document
A SAME B	Both in same paragraph
A WITH B	Both in same sentence
A ADJ B	ADJACENT

**Qualifiers****OPERAND. QUALIFIER****OPERAND....QUALIFIER (Negative).**

For paragraph qualifiers, use name or code as listed:

PARAGRAPHS

NUMBER	NAME	CODE	CONTENTS
1	CTRY		COUNTRY
3	TYPL	015	TYPE OF RECORD
4	LITI	025	LITERARY INDICATOR
5	LANG	026	LANGUAGE
6	SUBC	035	SUBJECT CATEGORY
7	AUTH	050	PERSONAL AUTHOR
8	CORP		CORPORATE AUTHOR
9	TITL		TITLE
10	EDIT		EDITORS
11	MTTI		MONOGRAPH TITLE
12	JRNL		JOURNAL TITLE
13	CTTL		COLLECTION TITLE
14	SERI		SERIES TITLE
		400	CONFERENCE TITLE
16	CONF	401	CONFERENCE PLACE
		402	CONFERENCE DATE
17	IMPR		PUBLISHER
19	ISBN	602	ISBN NUMBER
20	ISSN	603	ISSN NUMBER
22	CLLT		COLLATION
23	CODE	750	OBJECT AND GEOGRAPHIC CODES (AGRS only)
24	ABST	802	ABSTRACT (INIS only)
25	DESC		DESCRIPTORS (INIS only)

## Additional qualifier:

L/C	-	lower case only
U/C	-	upper case only
F/C	-	first letter in upper case
M/C	-	mixed upper and lower case

SELECT mode

NUMBER	NAME	CONTENTS
1	CAT	primary subject category
2	RN	record number
3	VVSS	volume, issue
4	YEAR	publication year

EQ 9or =)	equal to
GT (or )	greater than
LT (or )	less than
WL	within limits
NE	not equal to
NG	not greater than
NL	not less than
OL	outside limits

BROWSE mode

## Options for browsing (printing of decomments):

A	All paragraphs
B	All formotted fields
ALL	All paragraphs and fields



For modifications during browse use NEWSPEC, and indicate new specifications.

PRINT subcommand

Layout as set for BROWSE

Example:   PRINT 7 (document 7 only)  
          PRINT 7, 13 (document 7-13 only)  
          PRINT ALL (all browsable documents).

MAIL command

Example:   MAIL 7 title, auth, F=year.

APPENDIX F

Data Base Usage charges per connect hour on DIALOG System which will be used by PUSPATI

DATA BASE	ONLINE CONNECT TIME US \$	OFFLING PRINT PER FULL RECORD
1. AGRICCIA	30	10¢
2. Aquatic sciences and fisheries abstracts	62	20
3. Biosis previews	49	15
4. CA Search	70	18
5. CAB Abstracts	35	25
6. Economics abstracts international	65	20
7. Energy line	90	20
8. Energynet	90	50
9. Food science and technology abstracts	65	15
10. Georef	65	20
11. Human chemical exposure	45	15
12. Inspec	70	20
13. International Pharmaceutical Abstracts	50	15
14. LISA	50	10
15. Medline	35	15
16. NTIS	40	10
17. Pharmaceutical News Index	90	20
18. SC Search 1974-1977	130	20
19. SC Search 1978 - to present	120	25
20. SPIN	35	10
21. Weldasearch	65	15

Sources: DIALOG Information services. Price list October 1981.

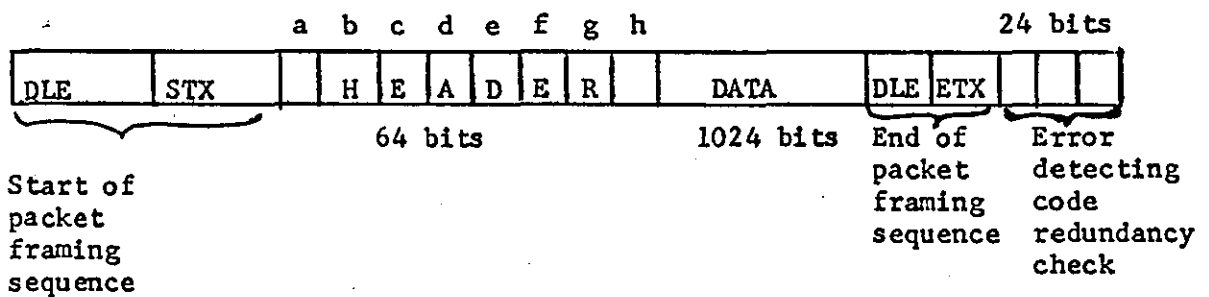
Appendix G.Cost Related to Several Methods of Obtaining Nuclear ReferencesIllustration G-1

By using switch telephone network through public switching exchange the number of segments in a minute can be calculated as follows:

Max. size of data transmitted by packet switching - 128 bytes.

For ordinary PSTN the transmission is 1,200b.p.s.

Format for packet switching.



A = control bits for priority indication.

B = message number and last packet indicator.

C-D = destination address.

E-F = sources address.

G = link number .

H = packet number.

In packet switching one segment is transmitted at 1,200 b.p.s.

If using public dial up or Texas Instrument Silent 700. Transmission speed is 300 b.p.s.

$$1,200 \text{ bps} = 1 \text{ segment}$$

$$300 \text{ bps} = 300 \text{ segment per sec.}$$

$$1,200$$

$$\text{in one minute} = 300 \times 60 \text{ segment transmitted}$$

$$1,200$$

$$= 15 \text{ segments}$$

$$\text{since 1 segment cost} = 2.4¢$$

$$15 \text{ segments} = 15 \times 2.4¢$$

$$= 36¢ \text{ per minute.}$$

Telecommunication charge by using Telepac service will be

$$50 + 36¢ = 86¢ \text{ per minute.}$$

Illustration G-2DIRECT SEARCH RELATED COSTS

1f = 29.95 to 30 AS

	COST DIALOG SYSTEM	INIS DATABASE
1. Communication charge (inland) to Singapore	80¢/min.	80¢ per min.
2. Telecommunication charge (IPSS) via TYMNET	50¢/min. ⁺ 2.4¢ segment	86¢ per min.
3. Royalty charge to database \$110/hour (U.S.A.) \$62/hour (Vienna)	\$1.84/min.	\$1.03/min.
4. Offline print costs 36¢/record (U.S.A) 30¢/page (INIS)	36¢	30¢
Total	\$3.86	\$2.99
£1 = 3.74 \$ S	£1.03	£0.799
Cases where if Kuala Lumpur become node		= £0.080
5. Communication charge (inland) Bangi to Kuala Lumpur	30¢/min.	30¢/min.
Total	M\$3.56=£0.87	\$2.49=£0.61

Based on:

1. Jabatan Telekom. Panduan Telekom 1979. 4th ed. Kuala Lumpur (1979), 279.
2. Personal communication BTS/85/60/82/B/NQ. Business Telecommunications Sales, Singapore, Telepac service p.3.
3. Price List, October, 1981, Database Dialog Information Retrieval service, U.S.A. (1981).

Illustration G-3Discount on Using Dialog

## DIALOG Group Discount Plan

Hours billed	Discount per hour billed + Guaranteed Monthly Minimum				
	US\$500	\$1,000	\$2,000	\$4,000	\$8,000
0-49	+5	9	12	14	15
50-99	9	9	12	14	15
100-199	12	12	12	14	15
200-399	14	14	14	14	15
400 +	15	15	15	15	15

+ This basic group discount for 5 passwords applied to database usage charges only.

DIALOG Discounts - Minimum Guaranteed Usage Plan  
Discount per Hour Billed

Hours billed	Guaranteed Monthly Minimum				
	US\$200	\$400	\$800	\$1,600	\$3,200
0.-4.99	\$5	\$9	\$12	\$14	\$15
5-9.99	5	9	12	14	15
10-19.99	9	9	12	14	15
20-39.99	12	12	12	14	15
40-79.99	14	14	14	14	15
80 +	15	15	15	15	15

## DIALOG STANDARD DISCOUNT

Hours billed per month	Discount per hour (excluding from communication charges and offline printing)	
	US\$	187
0 - 4.99	00.00	00.00
5 - 9.99	5.00	11.50
10 - 19.99	9.00	20.70
20 - 39.99	12.00	27.60
40 - 79.99	14.00	32.20
80 +	15.00	34.50

Illustration G-4

Cost structure on method (a) (Online from Puspatti to Kuala Lumpur via leased line).

## 1. Rentals (3)

The rentals for data transmission circuits are assessed at 1.25 times the existing speech rate. Speech rate rental from

Kuala Lumpur to Kajang = \$1,750 x 2                      \$2,187.50

The line rental for data transmission circuits        \$2,187.50

---

Total rentals per annum	\$4,375
-------------------------	---------

---

## 2. Equipment costs:

	Useful Life	Cash Outlay	Annual Cost
Keyboard and printer with			
acoustic coupler	5	\$6,000	\$1,200
Total annual cost			\$1,200

---

## 3. Labour cost:

An hour working time for information officer will cost \$6.25.

Since search time usually will take 15 minutes search cost involved will be                      \$1.56

## 4. Stationery

Printout papers 1,500 pages = \$60

so 3 pages                      = 12¢                      12¢



Illustration G-5

Overall cost by doing online from PUSPATI to U.K.M. by leased line.

Volume of search(s)	250	500	1,000	2,000
Annual rentals and line (420 x 2) rentals per search 3.36		1.68	.84	.42
Equipment per search (1,200/S)	4.8	2.4	1.2	.60
Labour	1.56	1.56	1.56	1.56
Stationery	.12	.12	.12	.12
Cost per search	9.84	5.76	3.72	2.70

Illustration 5.1

Overall cost by doing online from PUSPATI to U.K.M. by PSTN

Volume of search(s)	250	500	1,000	2,000
Communication charges (10¢ per call)	.10	.10	.10	.10
Equipment (1,200/S)	4.8	2.4	1.2	.60
Labour	1.56	1.56	1.56	1.56
Stationery	.12	.12	.12	.12
Cost per search	6.58	4.18	2.98	2.38

Illustration 5.2

Overall cost by doing online from PUSPATI to Kuala Lumpur by PSTN.

Volume of search(s)	250	500	1,000	2,000
Communication charges 10¢ min. 15 minutes search	1.50	1.50	1.50	1.50
Equipment	4.8	2.4	1.2	.60
Labour	1.56	1.56	1.56	1.56
Stationery	.12	.12	.12	.12
Cost per search	7.98	5.58	4.38	3.78

Illustration 5.3

Total overall cost on method (a)

Overall cost by doing online from Puspatti to Kuala Lumpur by leased line.

Volume of search	250	500	1,000
Rentals per search	\$17.50	\$8.74	\$4.37
Equipment per search	4.8	2.4	1.2
Labour cost	1.56	1.56	1.56
Stationery	.12	.12	.12
Total cost per search	\$23.98	\$12.82	\$7.25

Illustration G-6

Cost of online searching from Puspati to Vienna or USA by dial up network.

Key parameter: 1. Kuala Lumpur as a node.

2. PSTN

3. INIS, CA/INSPEC in bracket, followed by SCI figures.

4. All figures are in Malaysian dollars 1 US\$ = 2.53M

No. of searches(S)	250	500	1,000	2,000
1. Amortised start up expenses. Chapter 5 prorated. \$2346/S	9.38	4.69	2.34	1.17
2. Recurring costs. Chapter 5 prorated \$1192/S	4.77	2.38	1.19	.59
3. Telephone charges inland 10¢ per min. 15 mins. connect time	1.50	1.50	1.50	1.50
4. Telecommunication charges (IPSS) via TYMNET 15 minutes connect time.	12.90	12.90	12.90	12.90
5. Data base charges INIS -AS800=M\$124/hr CA =M\$140/hr	31(35)65	31(35)65	31(35)65	31(35)65
6. Offline printing cost full record rates. 50 citations .36 for CA search .30 for INIS .50 for SCI	15(18)25	15(18)25	15(18)25	15(18)25
7. Professional labour about 45 mins. including search strategy planning \$6.25/hr.	4.50	4.50	4.50	4.50
TOTAL COST PER SEARCH	79(85)123	71(78)115	68(75)112	66(73)110

Illustration G-7

Cost of online searching from Puspatti to Vienna or USA by leased line.

- Key Parameter: 1. Kuala Lumpur as a node.  
 2. Leased line.  
 3. INIS, CA/INSPECT in bracket, followed by SCI figures.  
 4. All figures are in Malaysian dollars.

No. of searches(S)	250	500	1,000	2,000
1. Amortised start up expenses. Chapter 5 prorated. \$2346/S	9.38	4.69	2.34	1.17
2. Recurring costs. Chapter 5 prorated \$1192/S	4.77	2.38	1.19	.59
3. Leased line rental. \$6300/S	25.2	12.6	6.3	3.15
4. Telecommunication-charges (IPSS) via TYMNET 15 minutes connect time.	12.90	12.90	12.90	12.90
5. Data base charges	31(35)65	31(35)65	31(35)65	31(35)65
6. Offline printing cost full record rates. 50 citations .36 for Ca search .30 for INIS .50 for SCI	15(18)25	15(18)25	15(18)25	15(18)25
7. Professional labour about 45 mins. including search strategy planning. \$6.25/hr.	4.50	4.50	4.50	4.50
<b>TOTAL COST PER SEARCH</b>	<b>102(109)146</b>	<b>83(90)127</b>	<b>73(80)117</b>	<b>68(75)112</b>

Illustration G-8

Cost of online searching from Puspatti to Vienna or USA by PSTN

Key parameter: 1. Singapore as a node.

2. PSTN.

3. INIS, CA/INSPEC in bracket, followed by SCI figures.

No. of searches(S)	250	500	1,000	2,000
1. Amortised start up expenses. Chapter 5 prorated. \$2346/S	9.38	4.69	2.34	1.17
2. Recurrent costs. Chapter 5 prorated \$1192/S	4.77	2.38	1.19	.59
3. Communication charges inland. 80¢/Min. 15 mins. connect time.	12.00	12.00	12.00	12.00
4. Telecommunication charges (IPSS) via TYMNET 15 minutes connect time.	12.90	12.90	12.90	12.90
5. Data base charges.	31(35)65	31(35)65	31(35)65	31(35)65
6. Offline printing cost full record rates. 50 citations .36 for Ca search .30 for INIS .50 for SCI	15(18)25	15(18)25	15(18)25	15(18)25
7. Professional labour about 45 mins. including search strategy planning. \$6.25/hr.	4.50	4.50	4.50	4.50
<b>TOTAL COST PER SEARCH</b>	<b>89(96)133</b>	<b>82(89)126</b>	<b>78(85)122</b>	<b>77(84)121</b>

Illustration G-9

Cost of online searching from Puspatti to Vienna or USA by leased line.

Key parameter: 1. Singapore as a node.

2. Leased line.

3. INIS, CA/INSPEC in bracket, followed by SCI figures.

4. All figures are in Malaysian dollars.

No. of searches(S)	250	500	1,000	2,000
1. amortised start up expenses. Chapter 5 prorated \$2,346/S	9.38	4.69	2.34	1.17
2. Recurring costs. Chapter 5 prorated \$1,192/S	4.77	2.38	1.19	.59
3. Leased line rental, \$51,940/S	207.76	103.88	51.94	25.97
4. Telecommunication charges (IPSS) via TYMNET 15 minutes connect time	12.90	12.90	12.90	12.90
5. Data base charges	31(35)65	31(35)65	31(35)65	31(35)65
6. Offline printing cost full record rates. 50 citations .36 for Ca search .30 for INIS .50 for SCI	15(18)25	15(18)25	15(18)25	15(18)25
7. Professional labour about 45 mins. including search strategy planning. \$6.25/hr.	4.50	4.50	4.50	4.50
<b>TOTAL COST PER SEARCH</b>	<b>285(292)329</b>	<b>174(181)218</b>	<b>118(125)162</b>	<b>91(98)135</b>

Illustration G-10

Illustration of cost involved in doing manual search in Puspatti,  
National University of Malaysia and Kuala Lumpur.

Cost on back issues of secondary publications (1970-82) inclusive  
cumulative indexes on the subject available in INIS database and  
DIALOG.

Table 1

Main materials	US\$ or £	M\$
1. INIS ATOMINDEX	\$413	1033
2. Electrical and Electronic Abstract, Computer and control abstracts; physic abstract	£10,561	47,524.5
3. Chemical Abstracts	£19,075	95,375
4. Science Citation Index	\$72,000	180,000
Total cost on back issues		M\$323,932.5

The cost structure of doing manual searching in Puspatti. In order  
to get information in the INIS Atomindex and the files available  
from the Dialog system we have to find the (i) price of secondary  
publications; (ii) and labour costs involved in doing searching.  
Price of secondary publications needed to do manual searching is  
available from above.

We assume that the time taken for doing complete manual search will be about 7 hours per person job; which is the time needed for reading the abstracts and writing the number of abstracts. This figure is only estimation since it is difficult to say how the actual time search will take since some of the manual search can be done in an hour or some more than 3 days. Then the user himself will come and read the abstract on his own. The references is expected about 15 to 30 titles. An hour labour cost of information officer in Malaysia is about M\$6.25.

The overall cost of doing manual searching in Puspatri by getting the information from INIS Atomindex

Table 2

Parameters: INIS Atomindex back issues from 1970.

No. of searches	250	500	1,000	2,000
Cost of material	M\$1,033	1,033	1,033	1,033
Labour cost (6.25 x 250)	10,937	21,875	43,750	87,500
Total cost	11,970	22,908	44,784	88,533
Total cost per search	47.89	45.81	44.78	44.26

The overall cost of doing manual searching on the subjects available from DIALOG System.



Table 3

- Parameter i. Database available in DIALOG
- ii. No. of searches: 250 per annum.
- iii. Location: PUSPATI

Cost in M\$

	SCI	CA	INSPEC
1. Cost of secondary publications	¥180,000	¥95,375.00	¥47,524.50
2. Labour costs (6.25 x 7 x 250)	10,937.50	10,937.50	10,937.50
Total cost	190,937.50	106,312	58,462
Cost per search: 250	763.75	425.25	233.848

The overall cost of doing manual search in National University of Malaysia

Table 4

Parameter: Location: National University

No. of searches: 250 per annum.

Labour costs (6.25 x 7)	M\$43.75
Transport cost (2.64)	2.64
Photocopy cost	3.00
Total cost per search	49.39

Manual searching in the University of Technology, or University of Malaysia

The secondary publications available has described in Chapter 1. We assume that only one or three abstracts is needed to be searched. In Malaysia, University of Technology is the only library having Science Citation Index. The distance from Puspati is about 24 miles for single journey.

The overall cost of doing manual search in Kuala Lumpur

Table 5

Labour cost (6.25 x 7 x 1 day)	RM43.75
Transport cost (.44 x 44 miles)	19.36
Photocopy cost (10¢ each)	3.00
<hr/>	
Total cost per search	RM66.11
<hr/>	

Illustration G-11

Overall cost for batch processing (by using computer in Kuala Lumpur and University Kebangsaan Malaysia).

- Parameters: 1. Using individual transport.  
2. Computers in Kuala Lumpur and UKM.

No. of searches: 20 per two weeks  $\text{\$}$  in Malaysia.

	K.L.	U.K.M.
1. Stationary charges	$\text{\$}0.50$	$\text{\$}0.50$
Punch cards $1\text{\$/card}$ - let say 50 cards	0.50	0.50
Paper printout $4\text{\$/page}$ - let assume 10 pages	0.40	0.40
2. Labour cost.		
Officer (4 hours) $\text{\$}6.25/\text{hour}$	25.00	18.75
Key puncher (2 hours) $\text{\$}1.875/\text{hour}$	3.75	1.97
3. Transport		
Officer (double return journey)	38.72	5.28
Key puncher (return journey)	8.80	1.20
Total	77.17	28.00
Total per search = $\text{\$}77.17$ divided by 20		
	= $\text{\$}3.85$	1.40

The cost per search will be much cheaper if the number of search increase.

Illustration G-12

Overall cost involved from several places per annum by using telex.

Parameters: 1. Using keyboard perforator.

2. Annual volume: 250 searches.

	Bangi/Serdang to K. Lumpur	Bangi to Vienna and U.S.A.	KL to Vienna & U.S.A.
1. Elementary costs (from Chapter 5)	\$10.00	\$10.00	-
2. Fixed cost from Chapter 5	2,580	2,580	-
3. Call charges (30 min. for each search=\$3.00) Bangi-Vienna/USA \$12.30 per min. 30 min. = \$369.	750	92,250	\$92,250
4. Stationery charges	\$50	\$50	-
5. Call office fee (\$2 per telex call)	-	-	\$500
6. Labour charges (half an hour if in Bangi, 2½ hrs. if in KL). \$6.25 per hr.	\$780	\$780	\$4,075
7. Transport charges (44 miles)	-	-	\$4,840
Total cost per annum per using teleprinter	\$4170	\$95,670	\$101,665
8. Database charges CA (\$140/hr) 30 min=\$70 INIS \$62/30 min.	-	\$17,500 (15,500)	\$17,500 (15,500)
9. Offline printing charges. .30 per INIS for 50 records	-	4,500 (3,750)	4,500 (3,750)
Total overall cost	4,170	117,670 (114,920)	123,665 (120,915)
Total cost per search	16.68	470.68 (459.68)	494.66 (483.66)

Illustration G-13

Overall cost involved from Bangi to Kuala Lumpur with different volume of search by using keyboard perforator.

	500 searches	750	1,000
1. Elementary cost	₹10.00	₹10.00	₹10.00
2. Fixed cost	2,580	2,580	2,580
3. Call charges ₹3.00 per 30 min.	1,500	2,250	3,000
4. Stationery charges	100	150	200
5. Labour charges (half hour per ₹3.12 per search)	1,560	2,340	3,120
<hr/>			
Total cost per annum for using teleprinter	5,750	7,330	8,970
<hr/>			
Total cost per search	11.50	9.89	8.97
<hr/>			

## APPENDIX H

### Cost related to acquiring the original documents

#### Illustration 1

#### Cost structure for courier system

##### 1. Typical start-up expenses.

	Cash Outlay	Useful Life	Annual Cost
(a) buying a motorcycle	\$1,500	5	\$300

##### 2. Fixed cost

(a) Insurance			\$80
Furniture (chair and table)	\$50.00	5	\$10

##### 3. Labour cost

One despatch clerk is required and the salary is about \$250 a month. Despite of delivering letters, despatch clerk can also be used as an office boy to wrap a parcel, putting the papers into the envelope and writing the address. All this process will take about 3-5 minutes for each article, book or magnetic tape to be completed for despatch. The maximum time taken for despatching or collecting between the most far libraries around Selangor is about 4 hours which is about 40 miles distance.

4. Operating cost.

The annual mileage would be around 6,000 miles.

Annual cost.

Petrol - \$4.50 per gallon. If the motorcycle consumes about 100 m.p.g.	\$1,170
Oil - \$3.00 a tin for every 3,000 miles	26
Tyre - \$26.00 per each tyre. Change twice a year	104
Maintenance (service and change) service every month - \$7.00 part change month - \$10.00	204
TOTAL	\$1,504

Overall cost for courier systemTable 1

Parameters: 1. Despatch around Kuala Lumpur and Petaling Jaya only.

Annual volume of delivery	260	500
1. Start up expenses	\$300	\$300
2. Fixed cost	90	90
3. Labour cost	3,000	3,000
4. Operating cost	1,504	1,504
TOTAL OVERALL COST	5,154	5,154
Cost for each delivery	\$20.61	\$10.30

Illustration 2

Cost of delivering different number of papers by courier system in a day.

No. of sending = x	1 page	5 pages	10 pages	100 pages
1. Start up expenses \$300 ÷ 365	.82	.82	.82	.82
2. Fixed cost \$100 ÷ 365	.25	.25	.25	.25
3. Labour cost \$9.00 a day	9.00	9.00	9.00	9.00
4. Operating cost (petrol, insurance) 1,504 ÷ 365	4.12	4.12	4.12	4.12
5. Photocopy cost	.10	.50	1.00	10.00
6. Stationery (envelopes).02		.04	.04	.08
Cost per sending	14.31	14.73	15.23	24.27
Cost per page	14.31	2.94	1.52	0.24



Illustration 3

Cost comparison on different number of pages sent per day by carrier method.

Location: Puspatti to U.K.M., Serdang and Kuala Lumpur

In bracket for Penang

No. of page per sending	1 page	5 pages	10 pages	100 pages
1. Carrier service charge: Puspatti - Kuala Lumpur or Serdang \$25/hour \$15/3 days reach	\$25(15) 20¢	25(15) 20¢	25(15) 20¢	25(15) 20¢
2. Labour charges 10min. for parcel 20¢ for 10min.				
3. Stationery cost	.02	.04	.04	.04
4. Photocopy	10¢	.50	1.00	10.00
Cost per sending	25.32 (15.32)	25.74 (15.74)	26.24 (16.24)	35.24 (25.24)
Cost per page	25.32 (15.32)	5.15 (3.15)	2.62 (1.62)	.35 (.25)

Illustration 4

Time taken for letters to reach its destination in days:

Place	Bangi	Serdang	K. Lumpur	Ipoh	Penang
Bangi	2	2	2-3	3	3-4

Current postal charges by surface mail

Type of mail	Charge
Letter	15¢ for first oz. 10¢ for every additional oz.
printed papers	6¢ first two oz.
parcels	4¢ every additional oz. \$1.20 for not exceeding 2lbs. \$1.50 for not exceeding 3lbs. \$2.10 for not exceeding 7lbs.

Current postal charges by airmail

Type of mail	Charges.
letter (2nd class)	15¢ for first oz.
printed papers	6¢ for every 2oz. additional

### Illustration 5

#### Cost of mailing information in Malaysia

There are two types of information transfer in Malaysia by mailing system. Firstly by sending photocopy which contain the information to the institution required and secondly by asking the other library to supply the information to Puspati. Let us assume for mailing a photocopy paper we employ an office boy with a salary of about \$1,000 a year, working 260 days a year and 8 hours a day. The overall cost of sending information by post by Puspati is given in table 4(a) and the cost involved in asking the information is shown in table 4(b).

#### Sending information from Puspati

No. of papers and book sending	Cost in Malaysian dollars	
	1 or 2	Parcel or books less than 7lbs.
1. Photocopy (10¢)	.20¢	-
2. Typing cost (address and envelope)	.01	.01
3. Postal charges (2 pages per envelope)	.15	2.10
4. Labour cost (photocopy, wrapping, stamping)	.40	.20
5. Envelope	.02	.01
Total Cost	78¢	\$2.32

Illustration 6

Cost of delivering different number of papers in a day by using mailing system.

Key parameter:

1. Letter from Puspatti to Kuala Lumpur, Serdang and Penang.
2. 1-10 pages of photocopy weight 1½oz. postage 6¢
3. 100 pages of photocopy weight 1lb., postage 48¢

No. of sending	1	5	10	100 pages
1. Photocopy cost 10¢ each	.10	.50	1.00	10.00
2. Postal charges	.06	.06	.06	.48
3. Labour cost (photocopy, wrapping, stamping and typing). 10min. for each sending.	.40	.40	.40	.40
4. Stationery (envelopes).02		.04	.04	.08
Cost per sending	.58	1.00	1.50	10.96
Cost per page	.58	.20	.15	.10
Cost of acquiring document by ILL method. cost per page+63¢.	1.21	.83	.78	.73

## Asking information from other library

1. ILL forms (20¢ per form)	.20
2. Envelope and typing	.01
3. Labour cost	.01
4. Photocopy charges	.10
5. Postal charges	.15
<hr/>	
Total cost	.47¢
<hr/>	

Mail cost for getting information and asking information from overseas

In order to ask for inter library loan overseas, a library assistant is required by Puspatti to be as an incharge for filling the ILL forms, stamping the BLLD or UNESCO coupons and putting the forms into the envelope. Normally the library assistant's wages are about \$3,600 a year and they take 5-10 minutes to fill and check the ILL forms and then to put the forms into the envelope. Since their salary is about \$300 a month and working 160 hours a week, thus 10 minutes per each application will cost 20¢.

The overall cost for asking the information from overseas.

Cost is in Malaysian dollars US \$1 = \$2.5 and £1 = \$M4.00

BLLD coupon

Typing cost for envelope	3¢
Labour costs	20¢
Postal charges	85¢
BLLD coupons £39.40 per 20 for a coupon	\$7.88
<hr/>	
Total cost for each application	\$8.96
<hr/>	

Illustration 7Overall cost of using telephone.

Since PUSPATI has already telephone lines, so the lines needed are only extension lines.

1.	Installation fees	Cash outlay	Useful life	RM per annum
	Extension lines			
	Internal per instrument	\$10	10	\$1
2.	Rentals			
	Extension lines			
	Internal - within same building			\$72
3.	Call charges			
	Subscribers Trunk Dialled call (STD)			
	PUSPATI to KUALA LUMPUR			.30¢
4.	Labour costs			

An hour cost of information scientist is about \$6.25. Let say, enquiries of documents or data will take 10 minutes. One minute of working hours will cost 10¢.

Parameters: Distance - Bangi to Kuala Lumpur.

Time 7a.m. to 6p.m.

No. of enquiries	250	1,000
1. Installation fees (\$1.00-250)	0.00	0.00
2. Rentals (\$72)	0.28	0.07
3. Call charges (6 minutes)	0.60	0.60
4. Labour cost	1.00	1.00
Total cost per enquiry	\$1.88	\$1.67

Cost of providing information on a different number of papers in a day by using telephone.

Parameters: Puspatti to Bangi and in bracket to Kuala Lumpur and

* Penang*

No. of sending	1	5	10	100
1. Rentals ( $\$72 \div 365$ )	20¢	20¢	20¢	20¢
2. Call charges:				
Puspatti to Bangi 10¢ per call	.10	.10(1.00)	.10(2.00)	.10 (20.00)
Puspatti to Kuala Lumpur 10¢/min.	*1.60*	*8.00*	*16.00*	*160.00
Puspatti to Penang 80¢ min.				
1 page equivalent to 2 minutes				
3. Labour cost.				
\$6.25 per hour				
about 10¢ per minute	.20	1.00	2.00	20.00
Cost per sending	.50	1.80(2.20)	2.80(4.20)	20.30 (40.20)
	*2.00*	*9.20*	*18.20*	*180.20
Cost per page	.50	0.26(0.44)	.23(.42)	.21(.41)
(for Penang)	*2.00*	*1.84*	*1.82*	*1.80*

### Illustration 8

#### Costs on facsimile system

##### (A) Elementary costs.

###### 1. Equipment and supplies.

Largely due to the fear of obsolescence, most facsimile equipment is rented rather than purchased. The equipment rental charge is typically a fixed cost that is incurred monthly, regardless of the number of copies transmitted.

###### 2. Site preparation.

Cost for electrical accessories and furniture used for running the facsimile machine is not so much since it is only need one plug and a small table.

##### (B) Fixed costs.

It is the cost consumptions involved in maintaining the machine and the rental line ought to be paid annually. Since the telecommunication line is rental annually from the Telecommunication Department, it is no cost limitation on using the machine at any time. The more it is being used, the more cost benefit will be gaining from it.

##### (C) Stationery.

This will include papers and liquid toner have to be supplied to the machine and it depends on the type of machine itself. Since facsimile machine could not copy straight from the original copy, it has to be transformed into a sheet of paper or photocopy type first before to fit into the machine. Thus the information



needed to be transmitted have to be photocopied first.

(D) Labour costs.

Operator involvement in a typical facsimile transaction consists of:

1. Mounting the subject copy or copies at the transmitter.
2. Loading paper (if necessary) and removing completed facsimile copies at the receiver.

The annual salary of clerk is around \$2,500. Annual working days is about 250 days approximately.

1 day = 7 hours of working

250 days = 250 x 7 hours

250 x 7 hours = \$2,500

1 hour =  $\frac{2,500}{250 \times 7}$

5 mins. =  $\frac{5 \times 10}{60 \times 7}$

= 12¢

The costs involved in facsimile machine are explained in tables 1-1, 2-1 and 3-1. The leasing lines here are used for facsimile and voice transmission alternatively.

Table 1-1

(A) Elementary costs

	Cash outlay	Useful Life	Annual cost
1. Facsimile machine	M\$9,000	3	3,000
2. Site preparation			
(a) electrical	12	3	\$4
(b) Furnishing	\$20	3	\$7
TOTAL			M\$3,011

Table 2-1

(B) Fixed costs

	Annual Costs
1. Maintenance contract (10% from the purchase price	M\$900
2. Line rentals: from Bangi to Kuala Lumpur	
(\$2625/2)	\$1,312.50
3. Rates chargeable: line from Bangi to Kuala Lumpur	\$1,312.50
TOTAL	\$3,525

Table 2-2

Fixed cost.

	Maintenance Contract	Line & Rates Rentals	Total
Bangi to U.K.M.	900	420	1,320
Bangi to Serdang	900	1,400	2,300
Bangi to Kuala Lumpur	900	1,312.50 2625	3,525
Bangi to Ipoh	900	18,550	19,450
Bangi to Penang	900	29,085	29,985

Table 3-1

Stationery costs

1. Papers 10¢ per sheet
2. Photocopy papers 10¢ per page.

Table 3-2

Cost of sending different number of papers in a day by using facsimile transmission between Puspati to Kuala Lumpur and Puspati to U.K.M. in bracket.

No. of sending	1page	5pages	10pages	100 pages
1. Elementary cost (Table 1-1) prorated: $\$3,011 \div 365$	8.25	8.25	8.25	8.25
2. Fixed costs (Table 2-1) prorated leased line $\$3,525 \div 365$ (1,320 $\div$ 365 (table 2-2)	9.90  (3.70)	9.90  (3.70)	9.90  (3.70)	9.90  (3.70)
3. Stationery - photocopy cost	.10	.50	1.00	10.00
4. Labour cost 1 min. per page	.024	.12	.24	2.40
5. Cost per sending	18.27 (12.07)	18.77 (12.37)	19.39 (13.19)	30.55 (24.35)
6. Cost per page	18.27 (12.07)	3.75 (2.51)	1.94 (1.32)	0.31 (0.24)

Comcentre  
31, Exeter Road  
Singapore 0923  
Republic of Singapore

Telex: RS 33311  
Telegraphic Address: Telecom Singapore



# Telecoms

Date: 30 December 1981

Your Ref:

Our Ref: BTS/S5/60/82/B/NQ

11 Judges Street  
Loughborough  
Leics LE 11 1 RU  
England

Attn: Mr M I Samat

Dear Sir


## TELEPAC SERVICE

This has reference to your letter of 21st December on the above mentioned service.

Enclosed, please find a service write up for your perusal and retention.

Please note that access from Malaysia is subjected to the Malaysian Telecoms Authority's requirements. The charges and conditions stated herein are applicable at the Singapore end only.

We thank you for your interest in our service.

  
Tan Teck Li  
for Manager  
Business Telecommunications Sales Dept.



## ANNEX A

TELEPAC SERVICE

## The Service

Telepac is a computer access service enabling a user connection to his host computer(s) for retrieval of data base information or for data processing. The service is provided via a packet switching exchange. Access to a host computer may be by the following means:-

- dedicated access: the user is connected to the packet switching exchange by a dedicated line. He can therefore command the exchange to connect him to his host computer as and when he wishes.
- private dial-up access: the user establishes a connection to the packet switching exchange by dialling to a private "dial-up port" (a telephone number) over the public switched telephone network (PSTN). Only registered private users can gain access via such a "port".
- ✓- public dial-up access: like private dial-up access users, a user in this case dials to a public dial-up port over the PSTN. Similar public dial-up access users gain access to the packet switching exchange via a common group of dial-up ports.
- telex access: a telex access user gains access to the packet switching exchange by calling the telex access port over the public switched telex network.

Except for dedicated access users who can be readily identified, all dial-up or telex access users have to be issued with user identities (UI). Dial-up or telex access users may originate calls from any appropriate terminal. Upon receipt of a call, the packet switching will acknowledge the connection. The user will key in his UI and the "address" (a code) of the required host computer. After the validity of the UI is checked, the packet switching exchange will proceed to establish the connection of the user to his host computer. Once the connection is established, the packet switching exchange will be "transparent" to the data exchange between the user and his host computer (i.e. the connection behaves as if the packet switching exchange is non-existent) until a clearing signal is received from either party. The connection is then cleared.

Technical information such as interface protocol, data transmission speed, operation mode etc. are given in Annex I.



- 2 -

## HOST COMPUTERS

Host computers accessible via Telepac service are those connected to a similar packet switching exchange in other administrations with whom Telecoms has established a relationship, or those connected directly to Telecoms' packet switching exchange as hosts.

Each host computer has a unique "address" for identification and calling purposes.

The Singapore packet switching exchange is initially connected to Telenet and Tymnet of USA and plan is at hand to establish connections to UK, Japan and Europe. Telecoms is also encouraging computer vendors to be connected as hosts to the Singapore packet switching exchange.

## APPLICATION

An intending user will have first reached agreement with his host computer before approaching Telecoms for service. Application is to be made on a prescribed form on which all required information necessary for provision of service are specified.

An intending dedicated access user will also apply for the data line, modem, and associated terminal equipment. A range of data terminal equipment offered by Telecoms is given in Annex II. In the event that the data terminal equipment required by the applicant or its equivalent is not offered by Telecoms, customer-owned equipment may be considered on a case by case basis, on terms determined by Telecoms.

Dial-up and telex access applicants if not already are datel or telex subscribers will also have to apply for the respective service.

Computer vendors interested in becoming hosts to the Singapore packet switching exchange are requested to write to:

Manager,  
Business Telecommunications Sales Department  
Comcentré II  
31 Exeter Road  
Singapore 0923



- 3 -

# CHARGES

Telepac charges comprise a monthly subscription charge for gaining access to the packet switching exchange, a duration charge and a volume charge, which are usage charges. These charges are as follows:

<u>Access charge</u>	<u>Transmission speed (bps)</u>	<u>monthly rate</u>
dedicated (*)	300/1200	\$150
	2400	300
	4800	450
	9600	600
private dial-up (*)	300/1200 (+)	150
public dial-up (per UI)	300/1200	50
telex (per UI)	(50 baud)	30

(*) For dedicated and private dial-up access, the monthly rate would include the port, modem and telephone at the packet switching exchange where applicable.

(+) For private dial-up, a maximum of 3 private user identities at the rate of \$10 each per month can be provided.

<u>Traffic Charge</u>	<u>National</u>	<u>International</u>
Duration Charge	10¢ per block of 3 minutes	50¢ per block of 1 minute
Volume Charge	12¢ per kilo segment	24¢ per block of 10 segment

For the registration or change of user identity/ private user identity, a charge of \$20 for each identity will be applicable.





## Annex I

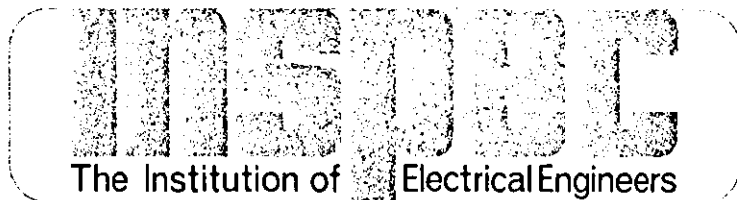
	<u>Speed available</u>	<u>Type of connections available</u>
Asynchronous data transmission	300/1200 bps	Dial-up and dedicated line
Synchronous data transmission using CCITT X.25 protocol	2400/4800/9600 bps*	Dedicated line

- * Commissioning of synchronous data transmission using CCITT X.25 protocol is subjected to successful testing between the packet switching exchange and host computer.



## Annex II

<u>Terminals (300 bps)</u>	<u>Rental</u>	<u>Installation Charges</u>
KSR - 80 column	\$200 per month	\$100
KSR - 132 column	\$200 per month	\$100
KSR - 80/132 plus Single Magnetic Tape Accessory	\$300 per month	\$100
KSR - 80/132 plus Dual Magnetic Tape Accessory	\$300 per month	\$100
KSR - 80/132 plus Paper Tape Accessory	\$280 per month	\$100



Station House Nightingale Road  
Hitchin Hertfordshire SG5 1RJ  
Tel: 0462-53331 — Telex 825962

QUOTATION

Mr. M.I. Samat  
11 Judges Street  
Loughborough  
Leics. LE11 1RU

24th June 1982

Combined Subscription to Physics Abstracts,  
Electrical & Electronics Abstracts and Computer  
& Control Abstracts

Current Subscription (1982)	£1310
1981 Subscription	£1165

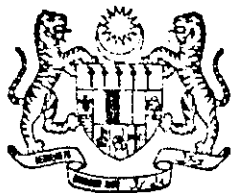
Back Issues to Physics Abstracts 1970-1980	£2600
Back Issues to Electrical & Electronics Abstracts 1970-1980	£1894
Back Issues to Computer & Control Abstracts 1970-1980	£1200

Total Subscription 1970-1982 inclusive	<u>£6969</u>
----------------------------------------	--------------

Cumulative Indexes to the above 1977-80	£2200
1973-76	£1372

Total subscription including Cumulative Indexes	£10,561
-------------------------------------------------	---------

This quotation includes the cost of delivery to any address in Malaysia not including any customs charges or import duties levied by the Malaysian authorities. These prices will remain in force until the end of 1982 after which some revisions may have to be made. Our terms of business are payment with order or to our pro forma invoice for non-credit customers.



## Appendix K

PUSAT PENYELIDIKAN ATOM TUN ISMAIL  
KEMENTERIAN SAINS, TEKNOLOGI dan  
ALAM SEKITAR, MALAYSIA  
NO. 1, JALAN 14  
BANDAR BARU BANGI, SELANGOR

Telefon: 341510/341511  
Kawat:

Ruj. tuan :  
Ruj. kami: *PUSPATI P. 030*  
Tarikh : 6hb. Januari, 1982.

Encik Mohd Isa Mohd Samat,  
11 Judges Street,  
Loughborough,  
LEICESTER,  
ENGLAND.

Saudara,

Terima kasih di atas surat saudara bertarikh 10hb. November 1981 yang dialamatkan kepada Prof. Noramly yang mana telah dipanjangkan kepada saya untuk tindakan.

2. Saya mohon maaf kerana kelewatan membalasnya, oleh kerana surat tersebut tiba ke tangan saya pada awal Disember dan saya terpaksa menunggu maklumat yang didapatkan oleh Encik Ramli Baki dan juga Encik Shamsuddin Ahmad sebelum ianya dapat saya beri perhatian. Walau bagaimanapun bersama-sama ini saya catitkan maklumat yang diperlukan dan juga cadangan saya terhadap susunan bab-bab dalam tesis saudara. Ini adalah hanya pendapat saya sahaja. Maklumat yang dimaksudkan itu adalah seperti berikut:-

### 1. Perbelanjaan:

(a) BILD Coupon	- £39.40 (20 per book)
(b) BILD Form	- (tak ada jual)
(c) Sampul surat udara 4x9 harga satu	- 1.2 sen
(d) Sampul surat besar 10x4 " "	- 4 sen
(e) Harga sebuah terminal komputer	- \$35,000 (IBM system 3 model 8)
(f) Harga sewa sebuah terminal komputer	- \$1,000/- sebulan 'for 3 years agreement (IBM)'
(g) Harga membeli dan menyewa modem	- (tak ada jual)
(h) Harga membeli dan menyewa facsimile machine	- \$13,000/- (tak ada sewa)
(i) Menyewa lori harga sebatu	- \$6.67 sen sebatu
(j) Minyak petrol segalen/liter	- \$106.71 sen seliter
(k) Harga ILL yang dibeli dari UM	- \$10/- sebuah buku (50 keping)

## 2. Gaji Kakitangan:

(a) System Analyst	- \$1,000/-
(b) Programmer	- 585/-
(c) Information Scientist	- 880/-
(d) Library Assistant	- 370/-
(e) Office Boy	- 250/-
(f) Typist	- 300/-
(g) Despatch Rider	- 250/-
(h) Research Officer	- 1,000/-

Berhubung dengan susunan bab-bab di dalam tesis saudara, saya berpendapat susunan yang ada seperti di dalam surat saudara itu kurang memuaskan dan saya cadangkan susunan seperti ini;

1. Information Science In Malaysia
  - 1.1 Librarian as information source
  - 1.2 Use of computers
  - 1.3 Data communication
2. Nuclear Information In Malaysia
  - 1.1 PUSPATI, history, role, scope
  - 1.2 Other nuclear Centres
  - 1.3 Need for nuclear information
3. Method of Obtaining Nuclear Information

-  
-  
-

dan lain-lain bab seperti yang diperlukan iaitu 'cost comparison' dan sebagainya. Walau bagaimanapun ini adalah cuma pandangan dari jauh dan saudara perlu berbincang hal ini dengan lebih mendalam dengan 'Supervisor' saudara.

Akhir kata saya mengucapkan selamat maju jaya dan berharap supaya saudara tidak bimbang mengenai hal perjalanan Bahagian Sains Penerangan pada masa ini dan kita akan fikirkan bersama-sama mengenai kedudukan Bahagian berkenaan di masa hadapan apabila saudara pulang nanti. Sepertimana saudara sedia maklum, saya sendiri berpendapat di masa akan datang Bahagian Sains Penerangan patut diletakkan di bawah Bahagian Kendalian atau di bawah Bahagian Penyelidikan.

Sekian.

"BERKHIDMAT UNTUK NEGARA"

