A Guide to Technology Information Service

ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY

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ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY
Bangalore, India
1986

First Published 1986
Reprinted 1988

Foreword

In June 1982, the Asian and Pacific Centre for Transfer of Technology (then the Regional Centre for Technology Transfer) started a project on technology information. This project supported by the United Nations Interim Fund for Science and Technology for Development (UNIFSTD; later UNFSSTD) had the objective of strengthening national capabilities of the developing nations in the Asia-Pacific region for technology information sharing to encourage immediate transfer of technologies. This project was later generously supported by the United Nations Development Programme (UNDP).

Technology Information being a new field, where there were hardly any precedents to follow, it took four full years of experimentation, analysis and refining to develop a workable, low-budget technology information system that can be adopted by the countries in the region; an experience that would have been taxing for a technology agency in a developing country with scarce resources.

It was this consideration which prompted the Centre to arrange for the publication of a guide that would provide a practical approach to the establishment of a technology information service. This guide has been prepared by a team of experts under the overall coordination of Dr. W.A. Clemente II, former APCTT Adviser on Technology Information, who has been associated with the Centre's Technology Information project from its inception till October 1986. The team of experts consisted of: Mr. Benjamin H. Milano, Managing Director for Media Affairs, Technology Resource Center, the Philippines; Mr. Desmond Tellis, Manager, Information Services, Australian Mineral Foundation, Australia; Mr. C.T. Leung, Senior Consultant, Information Services, Hong Kong Productivity Council, Hong Kong; and Mr. Md. Shahabuddin Faruque, Industrial Development Officer, Technonet Asia, Singapore. APCTT is grateful for their most valuable contributions.

While this book cannot be claimed to provide readymade solutions to all problems associated with the establishment of a technology information service, it is hoped that it would be of help in as much as it provides a basic framework of all components essential to the successful functioning of a technology information agency, especially in the Asia-Pacific region.

Bangalore
November, 1986

M. Nawaz Sharif
Director, APCTT

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Overview on Technology Information Service

The importance of technology in accelerating national development has been acknowledged both by the public and private sectors in Asia and the Pacific for the past 25 years. It may be noticed that each succeeding meeting at the national or regional level on technology and development brings out a repeated plea to marshall technology to meet basic needs, create livelihood, expand productivity and upgrade the capability to compete in the international market. It is becoming common, to the point of being cliche, for proponents of technology to espouse the importance of being able to choose alternative technologies appropriate to the respective needs of developing countries in the region.

Championing the cause of technology and development, however, remains at the level of lip service not because of a lack of commitment but because of deficiencies in operationalising programmes on technology for development. When it comes down to the task of selecting alternative technologies, many developing countries discover that they are not really aware of the full range of alternative technologies and the conditions for transfer from around the world suited to their needs. They are not even aware of what is available from the neighbouring countries, much less, of what is already existing in their own country. The Asian and Pacific Centre for Transfer of Technology (APCTT), for example, still receives many queries from entrepreneurs for which the technology they require is available from a firm or a research and development institution right in their own locality. This condition persists because the countries have not organised, among others, a basic programme on technology information that could arouse more interest on technologies and be able to service queries adequately so as to upgrade technology and help syndicate technology ventures.

Various technology programmes, complementing each other, are needed simultaneously to accelerate technology transfer and development, or to put it

more urgently, to bring about the application of technology in the "here and now". In undertaking these programmes, the government usually assumes three roles. First, it sets policies and plans. Second, it provides regulations and incentives. Third, it engages in active developmental interventions that would strengthen organisational structures, expand markets and help create an environment conducive to attaining the development objectives.

Reflecting the first role of setting policies and plans are programmes on technology assessment and forecasting, and on technology policies and plans. Technology assessment is not concerned only with the technical evaluation of a particular technology but takes a more expanded view of the short- and long-range techno-economic implications of a sector, a sub-sector or a particular product or process. Its conclusions could guide policy makers and planners in formulating policies and plans and in setting regulations and incentives. They also help investors, firms and entrepreneurs decide which fields to enter, expand or avoid. The programme on technology policies and plans looks at organisational structures, policies and plans affecting technology transfer and development, both at the macro and micro level, with the aim of evolving and improving the framework for technology transfer and development.

Belonging to the second role of providing regulations and incentives are programmes on technology transfer licensing, patent law, and incentives for local innovation. In this role, the government applies the brake or puts on the accelerators as and when required to simplify and hasten technology transfer and development. It may be pointed out that many of the regulations and incentives crucial to technology transfer and development are not within the jurisdiction of the Ministry of Science and Technology but are administered by sectoral ministries - i.e. tax incentives and customs duty exemptions are under the Ministry of Finance, investment incentives and assistance to industries are under the Ministry of Industry, promotion of products and price support are handled by the Ministry of Trade, low-rate interest loans to help small-scale enterprises are under the jurisdiction of development finance institutions, etc. Because it is in the nature of an agency to administer first from its own perspective, the scattering of regulations and incentives among different agencies might result in deficiencies both in streamlining technology regulations and incentives and in implementing them.

As for the third role of being an active developmental interventionist, most governments are just familiarising with it. Technology programmes belonging to this role include technology information, technology venture promotion, technology extension service, technology commercialisation, and indigenous technology development. Technology information deals with the collection and dissemination of technology information. Technology venture promotion handles technology missions and technology expositions. It also complements technology information by taking over a segment of the queries identified as having a high potential for immediate technology venture syndication. Technology extension provides technical advice to firms and entrepreneurs on technical problems ranging from "band-aid" to "major-surgery" operations. It also helps in creating more awareness of technology options to various clients

out in the field. Technology commercialisation deals primarily in arranging funds for technology ventures. Indigenous technology development is a distinct programme that concentrates on bringing selected local technologies to the stage of commercialisation. While it is an essential programme for fostering self-reliance, its task is difficult. Not only does it take time to commercialise a technology but making a local technology in a developing country competitive vis a vis foreign counterparts is difficult.

While the technology programmes could be judged qualitatively and quantitativlely on their respective merits - i.e. sound policies, effective information dissemination, aggressive venture promotion, etc. - their test of effectiveness rebounds ultimately to how much they have led to the upgrading of technology and the syndication of technology ventures.

Technology Information Service: What and Why

Why Technology Information?

Technology information simplisitically means information on technology. This brings us to the question: "What is technology?" Technology is usually identified with science under the standard "S&T" banner, perhaps, rightfully so as both reinforce each other. Too often, the dividing line between the two becomes hazy. For the purpose of differentiation, science investigates, in a systematic way, the nature and behaviour of the natural and physical universe. Its aim is to gain new knowledge derived from such an investigation. Technology, while acknowledging the intrinsic value of such knowledge, is not interested in the knowledge *per se* or in the mere application of such knowledge to a given situation but is more concerned basically with the application of such knowledge in the context of trade and industry. In other words, applied knowledge, be it in the farm, household or enterprise, should help create livelihood or increase productivity if it is to be considered as technology.

Taking a mango juice formulation as an example, the scientist would be interested in looking at the combination of chemicals and their interaction and stability under different conditions. The technologist would be guided accordingly by the knowledge generated by the scientist. His main concern, however, is not in understanding the process for its own sake but in figuring out whether the formulation would suit the taste of the consumers and whether it could be mass-produced at a price acceptable to the target clients.

This is not to suggest that science information is only for the scientist and technology information is only for the technologist. Both science and technology information are useful to scientists and technologists alike. But each one is used for a different purpose. Science information helps gain better knowledge for its own sake. Thus, we find that most of its users are students, academicians, scientists and researchers. Technology information, on the other hand, is used for making a decision on investment or technology application. Thus, most of its users consist of investors, firms and entrepreneurs.

Because of the difference in their usage, there is a difference between science and technology information in terms of depth and items covered. In general, science information would have more depth on a particular subject. In improving the fruit juice formulation, for example, the scientist would require knowledge of R&D results, access to primary documents, and reams of bibliographic abstracts on the subject. The technologist need not delve that deep into the subject. He does not even need to look at most fruit juice formulations. He would only look at fruit juice formulations that are already in the stage of commercialisation. For technology information to support technologists, it would confine its data collection perhaps to only 5-10% of R&D results and patents which are deemed as having potential for immediate application in the context of trade and industry.

This difference in content was highlighted in a workshop on technology information when the participants asked: "When is an information considered science information and when is it technology information?" To this, the lecturer replied: "If the information can make money today or tomorrow, that is technology information. If it can make money only 5 years now, leave it with the science information people and we can revert to it 5 years from now if and when it could make money." Quite a capitalistic overture but a very practical guide not only on what technology information is but also on which ones to keep tab on.

While it may not have as much depth as science information, technology information covers more items. For the technologist to determine the techno-economic feasibility of the fruit juice formulation, he would require information not just on the formulation *per se* but also on other items such as equipment, technical service, main application, basic advantage, degree of commercialisation, source of technology, terms of transfer, economic size of production, and production inputs such as land, raw material, labour, capital and energy.

Technology information usually covers the techno-economic aspects of products, processes, equipment and technical services. It looks both at the hardware and the software aspects. Since technology operates in the context of trade and industry, it must keep abreast of activities and trends in trade and industry which affect technology. In addition, it would also keep information on organisational structures, policies and plans which have an impact on the technology.

Thus, if we organise information on a particular technology, we could go through three stages of collecting information. The first stage would focus on the techno-economic aspects of the technology - i.e. brief description, main application, basic advantages, degree of commercialisation, source of technology, terms of transfer, economic size of production, and production inputs such as land, raw material, capital, labour, and energy. The second stage would deal with marketing information. Initially, this stage would look at the current and potential demand and at the current supply. It can then refine this further by identifying the competitors and their respective share of the market. The

third stage could cover other items such as technology and economic forecasts, policies and plans, and regulations and incentives relevant to the future of the technology and its market.

Why technology information? Because of technology? Or information? Both. The world needs technology and information.

Technologies, both old and new, relevant to the needs of developing countries of the region, abound throughout the world. Thousands more are being generated every year. Just to give an idea of how much innovation is being generated, an invention is proposed every 2 miniutes around the world and half of the proposals is accepted as new and useful. There are over 27 million patent documentation covering published patents, inventors certificates, utility models and applications. This number increases by 1 million patent documentation per year representing some 350,000 inventions. If only 1-2% of these patents make it to the market, that is still a sizeable number of new technologies available for application.

Technology information also abounds. Product brochures and techno-economic feasibility studies needed by firms and entrepreneurs are just as plentiful as the thousands of commercial technologies available. The volume of information for researchers is even more staggering. In 1970, there were almost 2 million papers on science and technology and the number jumped to 6 million by 1980. Between 1965 and 1975, chemical abstracts increased from 34,926 to 201,663, physics abstracts went up from 34,000 to 87,636, and electrical and electronics abstracts doubled from 119,500 to 244,975. The United States alone produces some 400,000 articles and 15,000 books on science and technology every year. The rate of increase is such that papers on science and technology are expected to double every 10 years.

Looking at the socio-economic conditions of Asia and the Pacific, many developing countries are still struggling to overcome the old problem of poverty. Progress, in the 21st century, it seems, has barely improved the lot of the majority who are poor. The situation is exacerbated, on one hand, by a growing population with rising material aspirations, and on the other hand, by the low level of human, human-made and natural resources. This results in a vicious cycle of poverty breeding poverty.

As the developing countries enter the 21st century, they cannot afford anymore to plod along slowly in an evolutionary manner. The awareness of their people, through the mass media, of what is available elsewhere, particularly, the high material level of countries on the fast technological lane, and their imbibement of a materialistic culture, put pressure on the country's leadership to goad the country to make a quantum jump into the 21st century modernity. This ambitious goal requires a revolutionary change. The performance of the economy can no longer be measured in terms of the progress from yesterday but on how the present stacks up to the expectations of tomorrow.

To survive in today's fast paced, complex and highly interdependent world, developing countries need technology. The omnipresent technology may not be as omniscient as what an ad boldly announces that "for every challenge, we have the technology". Neither is it an all-cure panacea, a fact well known even before the industrial revolution. But a potent weapon, it is. As such, technology must be marshalled to the fullest to help attain national development goals. To a housewife, technology could ease labour and its drudgery, reduce household cost and perhaps, open the way to set up a micro-enterprise. To entrepreneurs, it could mean savings, higher productivity and new ventures. To export-oriented firms, it could spell the difference between survival and failure in a ruthlessly competitive international market.

Before one could use technology, however, one must know what it is and where to get it. Hence, the need for technology information. Looking at the vast number of technologies coming out every year and at the information explosion, we are reaching a point where knowing about the information on technology is becoming as important as the technology itself.

Why Technology Information Service?

Just as a good technology does not automatically reach an entrepreneur who could make full use of it, a good technology information does not automatically reach the person who needs it. There is always the possibility of an entrepreneur accidentally passing by a trade fair or meeting a technology agent and thus be exposed to the technology in the same way that many technology information users come across information through friends or in magazines. Leaving the exposure to technology information through random chance, however, is not the best way of bringing technology to the user. Not only would opportunities be lost but the exposure might be biased towards technologies with good advertisements but which may not necessarily be appropriate for the firm or the country. A better way of bringing technology information to the user is by establishing a technology information service.

The objectives of technology information service would be to generate interest on technology items and to be able to service queries arising therefrom adequately so as to inspire upgrading of technology and syndication of technology venture.

In the traditional and conventional way, an information service was based on the library. This is still very much the case with science information as academicians, scientists and researchers still rely more on the library as the main resource. Thus, information service tends to be associated with the library-based services such as documentation, document delivery, translation, abstracting, current awareness literature, photo-duplication and audio-visuals.

For technology information service, the library is not the main resource. First, hardly do the end-users of technology information such as investors, firms or entrepreneurs go to the library. They either go to the direct source of technology, send a query to a technology information bank, or maintain their own

in-house technology information service. Second, having a large library, powerful computer and a large data base does not necessarily create interest on technology items. A small technology information service with a small library but without a computer and a large data base might even do a better job than a large technology information service endowed with such resources, provided it knows how to reach the audience and how to find the information to service queries. Arousing the interest and servicing the queries depend largely on the inititative, skills and imagination of the technology information service staff. Thus, while a library, computer and a data base are useful resources, the main resource for technology information service are its staff.

To be able to generate interest and service queries, the technology information service has to undertake certain basic activities. It would collect information, which we will refer to as "sourcing" necessary both for producing the information packages and for servicing queries. The materials collected will then be processed as technology rather than science information. This means that classification, indexing and cataloguing would cover not only the technical description but would include also other items such as terms of transfer and production inputs needed for making a decision on investment and technology application. Information on certain interesting technologies would then be packaged in a language understood and in a style appreciated by the target clients. The packages will then be disseminated through intermediaries such as the mass media, trade expositions and trade and industry associations, and directly to end-users. Dissemination may also introduce continuing education programmes such as 2-day courses on various technologies ranging, for example, from snail growing to paint making. Finally, the queries resulting from the interest generated would be serviced.

As it is in judging the performance of technology programmes, the effectiveness of technology information service will not be gauged by how much and how well information has been collected or how aggressive is its dissemination but by how much interest has been generated on technologies and how well the queries are being serviced so as to inspire upgrading of technology and syndication of technology ventures.

Technology Information as Linker

People in the information business always justify their profession by reminding us that whatever job we may do, we always need information. True. It is hard to conceive of upgrading technology or exploring opportunities for technology ventures without information. Technology information is the start of the chain of processes that brings an idea to the stage of implementation. It is also the principal linker to other technology programmes in bringing about technology upgrading and technology venture syndication. If we can look at servicing a query for technology upgrading as a football game with the programmes on technology information and technology venture promotion playing as a team, technology information is the linker that brings the ball to a certain point (first response to the query) and passes the ball to technology venture promotion which would kick the ball to the goal (further follow-ups until a decision is made).

Important as it may be, we cannot conceive of technology information as carrying the ball singlehandedly. Even if the quality of information is good, it is not always sufficient to trigger off immediate technology upgrading or technology venture syndication. It is seldom that we come across someone who is able to start commercial mushroom production by reading a 1-page or 150-page literature on mushroom growing. But we know of many who were able to start mushroom production by having hands-on training under the guidance of experts or mushroom growers.

To increase the impact of information in inspiring technology upgrading or technology venture syndication, technology information service must work in tandem with other technology programmes. A programme closely associated with technology information is technology venture syndication. While most queries could be answered with one exchange of letters, there are queries that would require more exchanges of letters and a more involved follow-up. Such queries representing from 15-20% of the total queries are those considered as having potential for immediate technology venture syndication. A query, for example, that states that the party has $25,000 and wants to go into commercial mushroom production would be far ahead towards technology venture syndication than a general query about oyster mushrooms. Queries that are serious about venture syndication would immediately be passed on to the programme on technology venture promotion where each case would be nursed until a decision on investment or technology application is made.

Another programme closely associated with technology information service is technology extension service. Using again mushroom growing as an example, getting the venture started might be hastened through the intervention of a technical consultant. In such a case, the technology extension service would be in the best position to provide the assistance.

Technology Information Service as the Country's Investment

Technology information service is an accepted reality and better appreciated in developed countries where they need all the information on the latest state-of-the-art technology to stay ahead. This alertness to technology information is exemplified by the initiatives of the private sector. In Japan, there are over 120 private firms offering data bases tapping a domestic market worth $2 billion in 1984 and expanding at 29% per annum. Siemens of Germany employs 500 people just to monitor innovations around the world of interest to the company. A similar task is done by 250 people for Philips of the Netherlands.

Besides the initiative of the private sector, governments in developed countries also invest in technology information service. The National Technology Information Service (NTIS) in the United States is a large operation run by the Department of Commerce. In Japan, the Japan Information Centre of Science and Technology (JICST) employs more than 350 people and operates at an annual budget of $51 million.

It is the nature of information to peak and assume value only on the particular moment when it is used and would become valueless when it is no longer used.

Quite a redundant way of presenting the value of information, but a true observation nevertheless. For that particular information to be available and positioned for retrieval at the moment the query comes, many activities are undertaken all year round from sourcing, processing to storage, not just of this information but also of other information. Bradford's Law points out that only 25% of stored information account for 75% of the information that is being used. In other words, majority of the information, which account for most of the cost of collection and storage, are not being used and hence, on a fee-paying basis, could not generate income.

The nature of information usage explains why technology information service is hardly a profitable proposition even in developed countries. Fees for servicing queries are not sufficient to cover the cost for all the activities required to make the particular information available when the query comes. Dialog, a US-based information bank and one of the largest in the world, has posted losses in the last two years. One could expect technology information service to be even less profitable in developing countries which have comparatively a lower demand for information.

In view of the above, we hardly find private firms introducing this service in developing countries. With this void, the government has to step in. The consequence of not filling in the void is worse as keeping the country ignorant of technology options would not help the cause of hastening its technological progress.

If the government steps in, and it should, then it must be prepared to subsidise technology information. While the technology information service would try to recover much of its cost, the government should accept, based on the experience of technology information services around the world, that it is hardly a self-financing propositon. The Korea Institute for Economics and Technology (KIET), which services some 300,000 technical queries a year on a fee-paying basis, needs 50-70% subsidy. The Hong Kong Productivity Council (HKPC) depends on 50% subsidy to carry out its technology information service. Even JICST of Japan which operates in a very favourable information climate gets 25% subsidy. It is difficult to show cost-effectiveness in terms of fees covering the entire costs of the technology information service. But we could demonstrate cost benefits. Just like the investment in education where the country upgrades the vision and skills of each succeeding generation, government spending in technology information service could also be seen as the country's investment in raising the nation's technology consciousness and in providing options to upgrade technology and to syndicate technology ventures. In disseminating technology information through the newspaper, radio and television, we could show that a 10 cent investment reaches 200,000 readers and viewers. We can point out that if only two out of every 100 queries and 100 out of every 1,000 participants to the short courses on technologies would end up in a venture, create livelihood, generate income and open new market opportunities, it would more than compensate for the government's investment in technology information service. Moreover, the government will get additional bonus in terms of revenues from the venture, reduction of its burden to provide jobs, and avoidance of social tensions from those who otherwise would have been jobless if not for the venture.

Technology Information in Asia and the Pacific

Viewing the situation of technology information service in Asia and the Pacific, it appears that this service is absent in most countries. Where it exists, the service basically is weak. Except for Australia, Hong Kong, Japan, Korea, New Zealand, the Philippines, and to some extent, Singapore, the other countries do not have much of technology information service to speak of. Elements of technology information service do surface in some agencies but they did not emerge nor are organised as part of a defined technology information programme. For example, an agency promoting small-scale and medium industries or a science and technology information centre may be collecting technology information materials but mainly to beef up its library rather than to use the materials for developing information packages that could be disseminated to generate more interest on technology. Some Chambers of Commerce do some matching of foreign investors and local partners, but do this mainly as a trade rather than a technology information exercise. Many S&T agencies come out with newsletters and even with radio and video programmes but they view these more as a public relations activity for the agency rather than as an effort in disseminating technology information.

That technology information service is weak is not because of a lack of appreciation for information *per se*. Many countries in the region invest millions of dollars per year collecting S&T information and maintaining S&T information facilities but are yet to establish an effective national technology information service. The problem basically lies in the orientation of most S&T agencies in the region to focus only on science. Whenever there is a training or a promotion programme on S&T information, one could notice that what is being referred to is basically science information. We could say that most of the S&T agencies in the region have not really been exposed to nor are familiar with the workings of a technology information service.

Due to the tendency to emphasise science, the structure and techniques for S&T information deal mainly with science information.

In sourcing, S&T agencies tend to concentrate on science and R&D results although there already exist many commercially viable and mature technologies for immediate application.

In processing, the conventional tasks of classification, indexing and cataloguing usually end with the technical details but do not cover other items such as terms of transfer and production inputs which are necessary to technology information users to make a decision on investment or technology application.

Packaging tends to concentrate on science information. The presentation remains drab. Even useful and competitive indigenous technologies are overlooked because they are presented in drab in-house newsletters. The language has not also graduated beyond the scientific and technical jargon. It may be understood by scientists but it sounds foreign to target audiences of technology

information such as households, small firms and investors. The style of writing is also uninspiring that even when the mass media would like to highlight technologies, it ends up discarding materials supplied by S&T agencies because it finds the prose to be dead and boring.

In dissemination, S&T agencies tend to rely on the library and on in-house publications such as newsletters, journals and books as the main vehicles, thus restricting severely the information outreach. They have not yet learned how to link up with facilitators/communicators such as the mass media, trade fair organisers, trade and industry associations, development finance institutions and promoters of small- and medium-scale enterprises who could reach a much wider audience.

As for servicing queries, only a few countries such as Japan and Korea service large volumes of queries. In general, most of the S&T agencies in the region service queries but most of these deal with science. As their data bases have not been organised for technology information, they are not in a position to service queries on technology.

Beside the problems brought about by the bias towards science information, developing countries of the region also face organisational difficulties in organising an information service. One problem is the inadequacy of hardware. While many information agencies in developed countries take for granted the availability of computers, micro-fiche readers, and facsimiles, many S&T agencies in the region do not even have an adequate number of typewriters. Another problem is the lack of funds for basic operations from sourcing to servicing queries. An agency may have the capability for packaging but not funds to secure materials. Alternatively, it may have the materials and capability for packaging but not provisions for stamps to distribute the packages. It may be able to go all the way from sourcing to disseminating information but does not have a photocopying machine which is essential for servicing queries.

Another problem is the reverse situation where an agency has resources far in excess of what is required. The agency may have a large library, powerful computer and access to large data bases but there are very few users. Inspired by the practices of the industrial countries where speed is of the essence in securing information, the agency may link up to an expensive satellite and telex-based information transmission system not realising that speed is not that crucial for businessman as well as the concerned bureaucrats in developing countries of the region who take time in making decisions. Moreover, unless the user is prepared to pay extra for the use of the expensive facsimile, telex transmission does not send technical diagrams and pictures which are necessary for technology information users.

Another organisational problem is the lack of trained personnel for technology information. Information specialists, librarians, and promotion and extension-service staff of most S&T agencies in the region are familiar with science information but they have not been exposed to the workings of a technology information service. Their training in information processing and

handling, which is largely predicated on the library as the main resource, does not necessarily equip them for technology information service. Technology information service requires a different orientation and skills for creative packaging and aggressive dissemination that would enable it to reach out and interest target clients on technologies and be able to service their queries.

Assuming that a basic technology information service has been set up, an obstacle that hampers the free flow of information is the poor communications infrastructure of most countries in the region. While industrialised countries are talking about office automation, on-line access to the computer, and satellite, telex and facsimile transmission, developing countries are still struggling with a mail service that is irregular and undependable, a power supply with erratic voltage fluctuations and which is constantly disrupted, and telephones that could hardly reach the party across the street.

Another fundamental and rather long-term problem to be overcome is the apparent lack of a technology mass culture in the region. With the exception of industrialised countries in the region such as Australia, Korea and Japan, the public of most of the countries in the region do not exhibit the "think technology culture" of the Western public which recognise the crucial role of technology and information in improving economic and social conditions. To create a technology mass culture would require the use of mass-oriented change agents such as education and the mass media. In this regard, the educational system and the mass media of developing countries in the region still have to take on the task of creating a technology mass culture.

While the situation of technology information service in Asia and the Pacific is rather poor, it may be pointed out that there are countries in the region possessing centres of excellence in technology information service. KIET of Korea, JICST of Japan and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) of Australia not only possess large data bases but they service hundreds of thousands of technical queries each year. HKPC of Hong Kong demonstrates effective sourcing, packaging and dissemination on foreign technologies to help Hong Kong manufacturers upgrade their technology and remain competitive in exports.

The Technology Resource Centre (TRC) of the Philippines has excelled in the use of mass media to disseminate technology information. It puts out technology columns and comic strips which appear in the four leading newspapers and 50% of the 307 provincial newspapers. Its print media packages reach some 8 million readers. Its packages for the radio include farm news programmes, field interviews, technology drama, news, commentaries, and 10-second technology jingles. In addition, TRC has programmes for the TV such as the 30-second "Techno-tips" inserts, a weekly 30-minute public service programme on technology and a weekly 30-minute "Techno-time" show which features commercial technologies. The broadcast media programmes reach 30 million listeners. The mass media packages collectively account for most of the 32,000 technical queries it receives per year.

Guided by the TRC experience, the Ministry of Science, Technology and Energy (MOSTE) of Thailand, has also put out a 2-minute technology plug on TV with sponsorship from a private firm and this, in turn, inspired other agencies to come out with their own technology programmes for TV.

Video-tape programmes on technology, a tool used commonly by firms in industrialised countries for briefing interested parties during visits to the company or in trade and technology expositions, are slowly taking root also in the region. In India, village discussions on village and agricultural problems are captured on video tape and this helps the villages in making decisions. The National Research Development Corporation (NRDC) of India and the National Science and Technology Authority (NSTA) of the Philippines are also using video tapes to present indigenous technologies. Their video tapes have been exhibited in trade and technology fairs.

At the regional level, APCTT, has been able to evolve a model of a technology information service using very limited budget and staff. Its technology information service is now being used for hands-on training by information specialists from within and outside the region. With a staff of eight people, its technology information service collects information on some 100 technologies per month from direct sources, prepares a bi-monthly technology periodical which is send to 1,500 decision-makers in the region, packages five weekly print media releases which are disseminated to 81 newspapers, magazines and press services in 31 countries, and services some 2,000 queries per year. Agencies such as the National Centre for Technology Transfer (NCTT) of Pakistan and the U.P. Institute for Small Scale Industries (UPISSI) of the Philippines which have adopted some of APCTT's technology information practices have seen significant improvements in their own operations.

The success stories on technology information service in the region are few but they provide enough inspiration. Despite the obstacles, technology information could be done. They provide a rich source of valuable lessons that would be useful to developing countries in the region wishing to start or strengthen technology information service.

Framework for Organising Technology Information Service

With technology information being a new field, techniques for organising the various components of technology information service have to be evolved, refined and popularised.

Value of Information is in Its Being Used

A good starting point is to be reminded that the value of information is in its being utilised. No matter how elaborate, accurate, current and useful it is, technology information would be useless unless utilised. To be useful, users

must know about its existence, must be induced to seek it, and when they seek it, the information being supplied must satisfy their requirements.

Technology Information Must be Demand-oriented

For technology information to have a high chance of usage, the supply side must be linked closely to the demand side. The technology information service should operate as if it has a heat seeking probe that homes in on what the demand side requires. Technology information should be sensitive to market pull and technology-driven forces. In a market pull situation, the market exists, it attracts many competitors, production of economic scale is possible, and the right technology is sought to make the firm competitive. Most technologies in developing countries in the region emerge due to market pull.

In a technology-driven situation, a new technology paves the way for a whole new concept and a new market as shown by the example of the Apple computer which started in a garage and went on to open a market for cheap but powerful micro-computers. In developing countries, the opportunities are less except perhaps in the case of biotechnology and genetic engineering which have to be suited to the tropical conditions. Technology-driven situations are more common in industrialised countries which possess most of the innovations and whose horizons are no longer in terms of satisfying basic wants but of satisfying dreams. Technology information service in this region, nonetheless must be alert to situations where technology-driven innovations could be introduced.

It would be a more practical approach to organise technology information starting from the demand side and then work back to the supply side. The usual approach of starting from the supply side is expensive and ineffective. Much of the information would end up like many useful technologies that are lying idle because they are not linked to an effective demand.

To talk about a demand-oriented technology information service is not startling as many information specialists are taught that information should be user-oriented. They are supposed to ask who the information is for, how users could access the information, and what kind of information should be delivered. Unfortunately, they do not bring this orientation to their work. They inevitably end up with a supply-oriented information system goaded by a "storekeeper" mentality of arranging things for the supply side. A quick scan of meetings on information, for instance, would show that most of the time, experts are preoccupied with questions of indexing, cataloguing and computerisation, chores for organising the supply side to the *n*th degree of refinement. Just as a well kept store does not automatically lead to sales, neither will a good supply of information necessarily result in it being used.

By directing technology information to an effective demand, namely users who are in position to use it for making a decision on investment or technology application and who are prepared to pay for the information, the work of technology information is simplified. Its scope gets defined. Wrong expecta-

tions both on the part of the clientele and the technology information service of what it could do would be reduced. Unnecessary collection and storage of information would be avoided. For example, there would be no point collecting information on agriculture for Singapore and Hong Kong which hardly have agricultural lands just as there would be no purpose served interesting a small Pacific country on the high-tech items which are the bread and butter of Hong Kong's exports. Irrelevant queries not tied to opportunities in trade and industry such as those coming from students or academicians could be eliminated or given a low priority. More importantly, it ensures that technology information could find immediate utilisation and that the service could generate income.

How does one organise technology information from the demand side? This will be elaborated upon when we discuss each component of technology information service from sourcing to servicing queries. To give the reader a general idea at this stage, let us illustrate a demand-oriented technology information service using low-cost construction as the priority area and brick-making technology as the item under consideration. Immediately, we can deduce that the demand side or end-users would be individual home-builders, contractors and brick manufacturers. The facilitators/communicators who could help the technology information service link to end-users would be the mass media, human settlements agencies, contractors' associations, industry extension services and development finance institutions.

In sourcing, we would be interested in seeking information on specific products, processes, equipment, technical service, terms of transfer, production inputs, market information, and other items such as policies and plans related to brick-making. The information required cannot be produced through the conventional way of stocking up on technical and scientific textbooks and journals on brick-making. Technology information users are interested not in a general technical description of brick-making which the textbooks could provide but on a specific brick-making process using a specific equipment at a certain production level at a given cost. A handbook or encyclopedia on brick-making might be needed for in-house reference, but beyond this the specific information required could only be acquired from the direct source of technology. Thus, technology information service would contact these sources asking for catalogues, pictures, technical descriptions, techno-economic feasibility studies and terms of transfer of their brick-making technology.

Processing of information would not be oriented towards the standard bibliographic reference used commonly for servicing a query on science but directed more at bringing a decision on investment or technology application. As such, the format will contain not only the technical description but also other items such as degree of commercialisation, countries where the technology is utilised, terms of transfer, etc. which are necessary for making a decision.

Packaging will be tailored to the needs of the different target clients. For direct home-builders who are probably in the middle class, the information

should be presented as current, simple and entertaining. It may reduce the text and rely more on graphics for easier understanding. For development finance institutions and industry extension service agencies that would help brick manufactuerers, the package would include technical and financial aspects of brick-making. A policy-maker interested in promoting the use of bricks would not find the time to read lengthy reports. For him, a 1-2 page executive summary, such as APCTT's packages "Tech Policy Alert" and "Tech Trends", would suffice. In packaging for mass media dissemination, the information on brick-making has to be "jazzed" up if it has to find a space among more sensational events such as politics, crime and calamities.

Dissemination will be organised according to the nuances of the target clients. Mass media people, for example, want to be guaranteed of a steady supply of material and ample lead time. Dissemination should be organised as such. Posturing before the target clients is also important. By being alert, the technology information service could earn the goodwill of a policy-maker's speech or provide him with information on low-cost construction technology. It may also make presentations on brick-making in meetings of contractors. Timing is also crucial. For example, the technology information service could gain more attention on brick making if it is able to release details of an earthquake resistant brick just after an earthquake.

Restrict the Scope of Technology Information

Another point to remember is the need to restrict the scope of technology information service in terms of its priority areas and target clients. It is not only because the technology information service, for most countries in the region, operates with a small budget, but it would also be impractical, if not foolish, to spread itself widely and thinly over various fields that in the end, it would not be able to do a decent work. It could end up with a hit record of 100% of nothing instead of 50% of something.

Develop a Network of Associates and Goodwill

The lack of resources also calls for the technology information service to build a network of associates within and outside the country that could help in the collection and dissemination of technology information. Once the technology information service has defined its priority areas, it could immediately try to cultivate and broaden its goodwill among potential sources of technology so that once a demand arises, prompt action could be taken to satisfy it. Sourcing from foreign data bases or purchasing foreign periodicals is an expensive proposition. The technology information service could develop some goodwill, as shown by the example of APCTT, by giving free advertisement of the data base company in the agency's newsletter. In exchange, the technology information service could have free access to the data base. S&T agencies could exchange periodicals. The technology information service should also be friendly with trade attaches and chambers of commerce so that it could have

access not just to catalogues but also to visiting businessmen. As reaching directly the end users is expensive and laborious, the technology information service should maintain friendly relationship with facilitators/communicators such as the mass media, trade and industry associations, and promoters of small-and medium-scale enterprises.

Technology Information Complements other Programmes

Another point to remember is that technology information service complements other technology programmes. We have mentioned earlier about how technology information works closely with technology venture promotion and technology extension service. This complementation must be kept in mind when organising technology information service.

Make Technology Information Accountable

Eventually, technology information service must account for itself to the users and to policy-makers. To end-users, technology information service should satisfy their requirements. Technology information must be relevant, timely and accurate. To policy-makers, it should show that its service redounds to the over-all technological and economic development of the country. It could cite how its intervention led to the creation of livelihood and the generation of income. Politicians would even be more pleased if it could be shown that such improvements affected their constituency.

In developing the framework, here are some checklist questions to be considered:

1. Have you limited the scope in terms of priority areas and target clients?

2. Have you identified the facilitators/communicators who can help link the information to the target clients?

3. Have you identified associates within and outside the country who could assist in the operations of the technology information service?

4. Knowing the end-users and the facilitators/communicators, are the various components of technology information service from sourcing to servicing queries being guided by their needs and nuances?

5. Is the technology information service being organised in a manner that it also complements other technology programmes?

6. Does the technology information service have provisions to demonstrate its effectiveness among end-users and policy-makers?

2

Planning Technology Information Service

Defining the Programme

Before the agency could embark on a programme on technology information, it would have to define first the programme.

If the agency is just starting technology information service, it would help if it familiarizes first with the technical aspects of the various components of technology information from sourcing, processing, packaging, dissemination to servicing of queries. The quickest way to learn is for the technology information service senior staff members to visit agencies which have a working technology information service.

Given the background information on technology information service, the agency can commence to define its programme on technology information. The steps are akin to those taken when preparing a project proposal. The first task is to set its objectives or general direction. It may define its objectives in relation to the national development objectives, the national S&T development objectives and the mandate of the agency it operates from. Should it be guided solely by the long-range national development objectives or should it concentrate on meeting the immediate needs of industry? Aligning the technology information service to the national development objectives ensures its contribution to national development efforts. However, most national development objectives and plans are not feasible and are subject to constant changes according to political fluctuations. Aligning it with the immediate needs of industry ensures an immediate impact. However, for industries in many countries that opt for wholesale technology imports in exchange for quick profits without taking efforts for reverse engineering or for developing indigenous technology, aligning technology information service to their needs perpetuates unnecessary technology dependence. A more pragmatic approach is to find a happy medium between the immediate needs of industry and the long-range objectives of national development.

Some countries have an S&T national policy and plan and this could serve as the guideline. But even this may not be adequate as there is a tendency for S&T national policies and plans to concentrate only on science. In addition, they may overlook other policies which are not normally under the jurisdiction of the Ministry of Science and Technology but which are even more crucial to the future of technology transfer and development in the country.

Since the agency that the technology information service operates from has its own mandate, setting the direction for the technology information service could be as simple as directing it to assist the agency attain its mandate. Thus, if the agency deals with agriculture, it would be logical to expect the technology information service to help introduce and popularise agricultural technologies.

Once it is clear on the general direction, the technology information service could plan out its work (1) as a programme by itself, (2) as a complement to other technology programmes, and (3) as a complement to the agency's corporate communications. As a programme by itself, each component from sourcing to processing would have to work out its own plan of action. As a complement to other programmes, technology service would see how its outputs and activities could re-enforce other technology programmes. In this regard, we have cited how technology information and technology venture promotion help each other. As a complement to the agency's corporate communications, packages disseminated mainly as technology information may also enrich corporate communications. The regularity of their releases and the instruction in the column that further queries should be sent to the agency maintain the high corporate profile of the agency in the same way that confidence in the agency as a technology resource centre, gained through effective corporate communications, also develops confidence in using the technology information service.

The general direction should be refined in terms of long and short-term objectives. Long-term objectives are of a general nature and have a longer period such as 5 years. Short-term objectives are more specific and have a shorter period of 1-2 years. Short-term objectives are designed to contribute towards the achievement of long-term objectives. Taking the example of the agricultural agency, the long-term objective of its technology information service would be to collect and disseminate information to help popularise various agricultural technologies relevant to the country. The short-term objective, however, may focus the information activities on just a few technologies to be popularised in 1-2 years. Alternatively, it may wish to popularise a wider range of agricultural technologies but initially from just a few sources – i.e. local technologies.

After setting the long- and short-term objectives, the next step is to identify outputs. Thus, the outputs for the short-term objective could be collection and packaging of information on, say, two rice varieties and two corn varieties and the dissemination of the information in 250 farming communities.

After outputs, the activites have to be identified. Each component of technol-

ogy information service involves several activities. In sourcing, for example, collecting information on two rice varieties might involve first getting addresses of various R&D institutes and commercial farms, preparing the sourcing letters, and then sending the letters. In packaging, it would depend on how much information is available and the mix of dissemination vehicles to be used – i.e. newspapers, radio, fairs or agricultural extension service.

The activities will then be spelled out according to a schedule or what we refer to as a workplan. For example, sourcing information on corn technology may take the first three months, packaging can commence on the fourth month and dissemination can begin on the fifth month.

The manpower and financial resources needed to carry out the activities would then have to be worked out. Beside the personnel, there would be provisions, among others, for experts, if required, travel, meetings, expendable and non-expendable equipment, and miscellaneous expenses required to carry out all the components from sourcing to servicing queries.

While the resource requirements may not be clear until the programme is defined, it would help if the agency could intimate even before the technology information programme is formulated the resource ceilings so that the technology information service could adjust accordingly its objectives, outputs and activities.

Once a decision is made to implement the workplan, then the manpower and financial resources would be mobilised to implement the programme. The programme should have mechanisms for monitoring and feedback to help in making adjustments in implementation and in defining future activities and strategies. Regular self-assessment helps. The technology information service should ask: Where are we now? How did we get here? How do we proceed from here? Where to? How do we go there?

While the steps to be taken in defining the programme and resolving the substantive issues covered by each component of the technology information service may not be clear to those not familiar with project formulation, the steps will get clearer as the technology information staff goes through regular planning exercises and review of the programme.

Proponents of planning may insist on having first well thought out or elaborate action plans before a programme on technology information is implemented. It would help if outputs are clearly quantified and that the plan could be spelled out in charts. But one must not be carried away with over-planning. Keeping in mind how the ever changing political and bureaucratic environment in this region derails plans, implementation rather than planning is the more crucial task.

Limiting the Scope

The exercise in defining the programme could be elaborated further by looking at how the scope of technology information service could be limited in terms of priority areas and target audience.

Defining the scope is a dynamic process which sometimes could be problamatic. Let us look at a situation requiring a decision on how the scope is to be limited in terms of priority areas. One school of thought would favour limiting the scope to a few priority areas while an equally persuasive opposite position would recommend covering as many subjects as possible. A limited scope faces the problem of not being able to service many queries especially those falling outside of the priority areas covered. On the other hand, covering a wide range of subjects runs the risk of spreading resources too thinly so as not to be able to do a decent job on the various aspects of technology information service. There is also the danger of expensively storing a large data base which in the end may not be used extensively.

The lure to cover a wide range of subjects is ever present. Queries from entrepreneurs and firms range from simple technologies such as fruit juice formulation and fish drying to high-tech items such as robotics and biotechnology. Since one would like to have ready information at one's fingertips when a query comes, there would be a natural preference to have as much information stored on various subjects.

As it is with producing or marketing an item, technology information cannot just take on simultaneously a vast range of items from high-tech robotics, perishable bananas, designer clothes, fast changing consumer electronic products to trend-setting cars. The expertise for collecting information on one item to the other could vary just as the packaging and dissemination of information would have to be adjusted according to the different items and target clients. It would also be more difficult to monitor and show the impact of technology information service if it spreads itself thinly over many items. Thus, when tempted to expand coverage, it would be a more practical approach for an agency starting or wishing to strengthen technology information service to focus on a few priority areas.

Limiting the scope is not the mandate of the technology information service. This requires a policy decision by the agency. It would be advisable that the policy decision be arrived at after consulting potential users both from the public and private sector. During the dialogue, experts could be invited. The dialogue not only helps limit the scope but ensures the future involvement of potential users in using the information.

How would the scope be restricted? In looking first at what priority areas are to be covered, the technology information service could be guided by the national development objectives, the national S&T objectives and the mandate of the agency that it operates from.

At the macro-level, the five year national plan, the sectoral targets of ministries, livelihood programmes, import substitution targets and export targets could be good starting points to identify the priority areas. The country may wish to create rural industries, increase good production, provide more basic health service, expand non-traditional exports and reduce imported raw materials and equipment for certain industries. The technology information service may identify priority areas relevant to most of the above objectives or just zero in on a few priority areas of relevance to a few of the above objectives. The problem of selecting the priority areas may just be simplified if the technology information service is tasked to support the mandate of the agency it operates from. Thus, if the agency deals with agriculture, then the technology information service will be confined to this priority area.

If the technology information service has an open choice, low-cost construction, food production and processing, and renewable energy would be safe choices as people need a shelter, have to eat and require energy. But even such basic needs, as priority areas, have to be refined according to the end-users' requirements. For Pacific countries that do not have raw materials or a large domestic demand to warrant local manufacturing of low-cost construction materials, what they might need more would be information on low-cost construction material supplies and suppliers. The storage space that would have been occupied unnecessarily by information on low-cost construction technologies could be taken up by technology information on fisheries and agriculture whose utilisation in most Pacific countries would have higher probability.

At the micro-level, the priority areas could focus on sub-sectoral or product specific items. A country like Malaysia, which produces 45% of the world supply of rubber, would benefit from technology information focusing on rubber. As natural rubber faces stiff competition from synthetic rubber due to the decline in oil prices, Malaysia will have to find ways of increasing the value added on rubber-based items. An example is a car suspension made of rubber. The situation of rubber finds similarities with other commodities for which developing countries have a large share of the world supply.

For countries with little domestic raw materials such as Hong Kong and Singapore, technology information may have to focus on items for which the local manufacturers could add value-added and could be competitive in exports. Thus, HKPC of Hong Kong, for example, actively disseminates technology information on micro-electronics, toys, floppy discs and metal products.

On the other hand, social and health oriented agencies may push technologies on drinking water system, herbal medicine and cooking stoves using organic waste, technologies that may not have high commercial or industrial value but which are useful in uplifting community and social welfare.

The scope could further be limited in terms of target audiences. TRC of the Philippines has a bias towards households/micro-enterprises which represent a large segment of what is referred to as the hidden or informal economy. In

Brazil, 91% of the enterprise in 1984 were micro-enterprises numbering 2.8 million. They employed 8.6 million representing 26.5% of the total wage-earners. In India, some 2.4% of the rural households in 1971 were engaged in artisan-type enterprises accounting for 6% of the GNP. Micro-enterprises encourage intensive employment, utilisation of local resources, decentralisation of job opportunities in rural areas, and complementation to agriculture. In addition, some of the skills are transferrable to larger enterprises — i.e. drawing of clothing to drawing of electrical wiring, brass-button making to brass components for automobiles, blacksmithing to manufacturing components for the machine tool industry, etc.

KIET of Korea, on the other hand, puts the emphasis on small- and medium-scale industries (SMIs). Countries have different ways of classifying SMIs based on the level of employment, capitalisation and value of production. In the Philippines, an SMI would have less than 100 employees and not more than $125,000 capitalisation while in Korea, an SMI would have less than 500 employees and not more than $650,000 capitalisation. A simple rule of thumb definition of an SMI is one where the President, Production Manager and Treasurer are the same person.

SMIs are a formidable force representing the backbone of industrialisation in many developing countries. In number, SMIs represent 90% of industries in the Philippines. In terms of employees, the share of SMIs in Korea is 49%, while that in the Philippines is 50%. In terms of exports, the share of SMIs in Korea is 31%, while that in India is 20%.

Since SMIs operate at an enterprise level with a ready organisation as contrasted to households/micro-enterprises, the chance of technology information directed at SMIs leading more quickly to a decision on investment or technology application is better.

Once the scope has been determined, the priority areas would then be put under the category of "active areas". These are the areas that technology information service would take the initiative in collecting and disseminating the information. Queries falling outside of the "active areas" would be classified under "reactive areas" and be given a low priority. When the queries on certain technologies under the "reactive areas" become more frequent, then the technology information service may review its priority areas and consider adding such technologies to its "active areas".

In defining the technology information service programme, here are some checklist questions.

1. Did you base the definition of the objectives of the technology information service on national development objectives, national S&T objectives and the mandate of the agency from which the technology information service operates from?

2. Have you defined the objectives in terms of long-term and short-term targets?

3. In planning out the various outputs and activities, are you planning technology information service as a programme by itself, as a complement to other technology programmes, and as a complement to the agency's corporate communications?

4. Have you specified the desired outputs, preferably in a quantifiable way, of the different components of technology information service from sourcing to servicing queries?

5. Have you identified the various activities to achieve each output?

6. Are the activities spelled out in a workplan?

7. Have you worked out the manpower and financial resources needed to carry out the programme?

8. Are there provisions for monitoring, feedback, and review of the programme?

To limit the scope, the following checklist questions may be considered.

1. Have you reviewed the national development objectives, national S&T objectives and mandate of the agency to guide you in limiting the scope of technology information service in terms of the priority areas and the target audience?

2. In deciding on the limited scope, did you consult potential users and experts from the public and private sector?

3. Are the priority areas those where technology information service could demonstrate immediately its impact?

4. Are the priority areas directed at target clients who need and are prepared to pay for the information?

3

Knowing the Audience

Technology information service is a service. Information is its commodity. Just like any service or commodity, there must be some "selling" of the service or information if technology information is to be known to, desired and used by the potential users.

Knowing what the information priority areas or "commodity" as we may put it, and who the target clients or customers as we may refer to in marketing, are is not enough. In selling a commodity, the job calls not just for delivering the commodity but for satisfying the customers.

To be able to satisfy the customers, we must know more about them. INTIB of UNIDO knows that 28% of its users are industrial enterprises, 16% are information service centres, 14% are UN organisations, 9% are R&D institutions, 8% consist of engineering and consulting firms, 7% are policy-makers, 7% are universities, 6% are professional organisations, 2% are development banks and 3% are others. At APCTT, 33% of its clients come from households/micro-enterprises, 28% are business firms and individuals who wish to start new ventures, 21% are manufacturers, 10% are government agencies, 3% consist of R&D institutions and another 3% are students and academicians.

While we may know the different types of clients we are targetting, we must delve deeper to know who they are. Like the salesman, we may have to identify who are the influencers, deciders, purchasers and users. They may be the same person or different. The Technology Transfer Institute of Japan, which tries to match the source with the user of technology by sending "Technocard" messages on behalf of a foreign client to 10,000 Japanese firms knows that of the departments in companies being reached, 40.3% are technical, 24.5% are in design, 20.6% are in production, 11.2% are in management, 2.1% are in purchasing and 2.3% are others. Of the 50,000 key persons it is reaching in these companies, 12.3% are executives, 14.3% are general managers, 38.6% are

department heads, 27.7% are section heads and 7.1% are the general staff. Knowing who the target clients are helps us avoid wasting resources reaching people who do not have the need, will not have the need, do not have the money or do not have the authority to spend.

Having identified who they are and where they are, we will delve deeper to know more about their needs and nuances. As a salesman is trained, we have to know what kind of a person the client is, what is his temperament, what could be his needs, what are his interests, what is his background and what is his business. Using again INTIB of UNIDO as the example, it knows that of the information required, 43% are on manufacturing process and know-how, 33% are on equipment and machinery suppliers, 6% are on R&D activites, 2% are on raw materials, 1% is on quality control, 1% is on marketing, 1% is on patents and 13% are on others.

The target clients profile will guide us on how to organise the various components of technology information service. In sourcing, for example, there would be no point gathering highly technical literature if the audience has a relatively low technical familiarity. Neither would it be useful to store information on technology venture opportunities for which the start up capital is beyond the capacity of potential local partners or for which certain terms of transfer may not be acceptable to the national technology transfer licensing regulations. There would also be no purpose served gathering information on meat products for an audience that is vegetarian, or to gather information on agro-based technologies for a Hong Kong or Singapore audience. In a reverse fashion, the high-tech information being collected and disseminated in Hong Kong may not find a ready audience in many Pacific countries.

In packaging, the format and style of language would be adjusted to suit the requirements of each type of target clients. Technical people can live with highly technical literature but the average housewife may prefer technology information presented in "how to do it in 5 easy steps" using few texts and relying more on graphics. Executives do not have time for long reports and would therefore prefer 2-3 page executive summaries on technology policies. Hong Kong entrepreneurs who are constantly on the edge trying to compete in the international market will have no time to go through massive packages unless directly related to the enhancement or survival of their business. Thus, the package being offered must contain information that could be digested and integrated into their daily business operations.

Similarly in disseminating information, different audiences and facilitators-/communicators require different ways of reaching them. Mass media people, for example, have their own nuances. They are more at home with news on politics, crime and calamities. Thus, technology items that could be presented as being sensational or as news may find a good chance of finding a space. Mass media people also require long lead times and assurance of constant supply of material. If they are to be lured into carrying technology items, one-shot deals would not attract them. Rural folks may need a little bit of circus or fanfare before they would be attracted to technology information. Thus, a roving

technology fair for towns may have to put entertaining movies before going to technology items. Radio and TV audiences also require some "cosmetics", and hence, getting movie stars to plug technology information may get their attention. For farmers who have to live with the vagaries of nature, demonstration under local conditions is necessary if they are to be convinced of the usefulness of technology.

Knowing the clients' profile can improve the servicing of queries. It would certainly help the Query Section if it knows what technologies small enterprises may need and what is their financial and industrial capacity. By anticipating what queries might likely come from target clients, the Query Section can advice the Sourcing Section to collect and store the required materials thereby reducing the response time when the anticipated queries come.

Formal and Informal Surveys

How do we go about knowing more about the target audience? The most formal way is to go through a survey. In business, a firm introducing a product usually commissions a marketing or consulting firm to conduct market research and do sales forecast. The study, among others, identifies the general demand, isolates the "effective demand" or that segment of the demand side that is prepared to consider the product, segments the effective demand further into groups using indices such as age, sex, income, profession and geographical location, and tests how the product, given its pricing, packaging and promotion, is received by the target clients. A similar exercise could be done for technology information. Thus, when TRC of the Philippines defined its programme on technology information dissemination, it also hired a consulting firm to do a study as to which priority areas TRC might likely be able to demonstrate immediate impact and who the target clients are. Based on the study, the technology information programme was defined.

A survey is a more reliable way of knowing what the target clients want. No matter how knowledgeable and experienced the information managers are, they will not always know what the target clients want.

The survey could be used by all components of technology information service. In sourcing, a survey could be conducted among potential users to find out what are the priority areas and the specific products/processes of interest to them. In packaging, survey forms could be sent to readers to get their reactions to the items being featured and the style by which they are being packaged. In dissemination, regular liason, for example, with the print and broadcast media people would give an idea of their requirements and nuances and how technology information items could find a slot vis a vis senstional news-items. For queries, survey forms could be sent to enterprises asking what they need and about their industrial and financial capacity. Feedback forms could also be sent along with the queries asking about the usefulness of the material sent.

At a future time, follow-up surveys may be required so as to capture the changing needs and nuances of target clients.

A formal survey, however, can be costly and may be beyond the means of low-budgeted technology information service. In a commercial technology information service, the survey could take as much as 15% of the cost of servicing a query.

If the survey is not affordable, then the technology information service will have to rely on more informal ways of knowing the audience. It may visit trade and industry associations such as chambers of commerce and manufacturers' associations. It may also attend meetings of professional associations. It could also visit trade fairs and observe what products appear to be popular. The technology information service may also cultivate friendship with knowledgeable businessmen, professionals and government officials who could provide free advice.

It may also just have to make its own guesswork based on its reading of the market, the opportunities, and the requirements. In a highly industrialised society, technology information demand would tend to be slanted towards certain sectors. In Japan, for example, the queries addressed to 120 databanks were distributed as follows: 38% deal with domestic and foreign economic and product news, 37% cover natural science and technology (space, patents, physics, electronics/computer science, chemistry, and life sciences/medicine, biology/pharmacology), 9% seek information on social science and humanities, and 1% is on others. In the Pacific, it would be safe to assume that technology queries would center around agriculture, forestry and fisheries.

Sometimes, the technology information service is set up and then left to find out what its business is all about. If it does not have time or resources to conduct surveys, it need not despair. Based on its guesswork as to what the priority areas and who the target clients are, it would commence its activities modestly. Within six months, it should be able to get some valuable feedbacks on its packaging, dissemination and servicing of queries which could guide it in its various activities. At APCTT, for example, the Centre commenced with low-cost housing, renewable energy and food processing on the common-sense approach that people need housing, energy and food. For the target audience, it addressed its messages to communicators such as the mass media, and to end-users such as households and small/medium scale enterprises. As time progressed, the type of clients, their requirements and nuances became clearer. Builders and human settlements associations were interested in getting information. Facilitators such as development finance institutions and chambers of commerce were also interested in helping disseminate the information. It then became evident that each type of facilitator/communicator and end-user required different packaging. It also became clear that APCTT's way of sourcing was inadequate. Whereas earlier sourcing was covering only technical description and applications of the technology, queries from manufacturers asked also about the terms transfer and production inputs. Thus, sourcing and

processing had to be modified to cover other items such as degree of commercialisation, terms of transfer and production inputs, items which are necessary for making a decision on investment or technology application.

Agencies just commencing technology information service may just have to go through a similar teething period.

To know more about the audience, below is a checklist of questions to ask.

1. Have you identified the different types of audience (direct end-users, communications, facilitators)?

2. Within each type of audience, are there sub-groups (end-users broken into households, small-medium firms, and large firms)?

3. Are the requirements and nuances of each type of audience identified?

4. Have you done a formal or informal survey on the target clients?

5. Are you organising the different components from sourcing to servicing queries according to the needs and nuances of the target clients?

4

Sourcing Technology Information

In science information, the library is the main resource. This is where scientists and academicians go for their information needs. Thus, sourcing of information would be geared towards collecting materials for storage and retrieval. In technology information, however, the library is not the main resource or the main arena as hardly do technology information users such as investors and entrepreneurs visit it. The main technology information transactions occur when the technology information staff are reaching out to target clients, through packages and dissemination, and are servicing their queries. Thus, sourcing of technology information is geared more to preparing the packages and for servicing queries rather than to expanding and maintaining a library in its traditional form.

Strictly speaking, a technology information service could survive even with just a small library and even without a computer and large data base, provided its staff know where to locate the information within or outside the agency and it has access to the information for preparing the packages and for servicing queries. HKPC of Hong Kong, for example, does not operate with the support of a large in-house library. Its small library keeps mainly technology journals, directories and related books that could point to where the relevent information sources are, Technonet Asia and APCTT operate along the same line.

Given the scope of technology information in terms of the priority areas and the target clients, and guided by the technology information service action plan in terms of long- and short-term objectives, outputs and activities, sourcing can commence.

Sources of Technology Information

Technical textbooks, manuals, encyclopedias and technical periodicals are useful as in-house references on the technical aspects of a product or process.

If the technology information service is dealing with food processing, it would be useful to the food information specialists to have manuals, let us say, on food preservation and packaging. However, they are inadequate and do not represent the bulk of technology information. As mentioned earlier, the queries of technology information users are rather specific - i.e. a particular process utilising a particular raw material within a specified cost range - and such queries could not be answered by the general description found in technical manuals, but mainly by the technical details provided by the sources of the technology required. Such details will have to be secured on a product-to-product basis from individual sources of technology or from sources of technology information.

We are presenting a list of sources of information according to the type of technology information required. The listing is presented in alphabetical order and not necessarily in the order of priority. Neither is it exhaustive. The purpose is to give a technology information service the sources it could scan to determine what information it could immediately secure and to plan how it could source other information.

Products, Processes and Equipment

Appropriate Technology Groups

Appropriate technologies may not always be commercial from an industrial user's point of view, but they could be sufficiently mature to help uplift village or social conditions. For example, technologies on drinking water, stoves, pumps, medicinal plants and food preservation may not have a large domestic market, but they would have relevance to households, micro-enterprises and villages.

Appropriate technology groups come from both the government or the private sector. Usually, government S&T agencies have a section on appropriate technology to promote appropriate technologies resulting from government R&D activities. In the private sector, non-government organisations dealing with appropriate technology abound in communities or at the national, regional and international levels. These non-government organisations usually have good publications. Some have good data banks and information networks, such as Socially Appropriate Technology Information Service (SATIS). Volunteers in Technical Assistance (VITA) and Transnational Network for Appropriate Technology (TRANET).

Some of the newsletters put out by appropriate technology groups include "Approtech News" (Asian Alliance of Appropriate Technology Practitioners), "Sciences for Villages" (Sciences for Villages, India), "Soft Technology" (Alternative Technology Association, Australia), "Yun Kirupen" (Liklik Buk Appropriate Technology Network, Papua New Guinea), "SATIS Newsletter" (SATIS), "Appropriate Technology" (Intermediate Technology Development Group.

United Kingdom), "Foco de Technologia Apropiada" (Vivendas Cetavip. Dominican Republic) and "Reseaux Technoligie et Development" (Groupe de Recherche et Echange Technologiques, France).

The appropriate technology groups also come out regularly with handbooks covering topics ranging from pumps, stoves to food processing.

The publications are reasonably priced. Due to their commitment to popularising appropriate technologies, these groups are eager to know about how other groups are handling this operation through the exchange of publications. TRANET has even gone a step ahead by donating books worth thousands of dollars to agencies in developing countries engaged in promoting appropriate technology.

Catalogue Exhibitions

The most ideal way to show a new technology is to show the plant design, the production process and the end product. Trade exhibitions usually just show the end product. But even this could be expensive. Thus, some companies present catalogue exhibitions. The trade attache of an Embassy or the local chamber of commerce may sponsor a catalogue exhibition showing catalogues of various products. The exhibition sometimes includes video presentation of company operations and of new technologies. A visit to a catalogue exhibition could provide new leads to sources of technology.

Current Awareness Literature

Libraries or the information service of agencies dealing with research, training, trade, industry and technology usually come out with current awareness literature to help users update on new materials and on interesting information. As a practice, libraries usually exchange current awareness literature. Having access to current awareness literature helps the technology information service learn from the experience of other agencies on how they are expanding their data especially along the priority areas covered by it and thus be guided accordingly. The current awareness literature also alerts the technology information service to the areas where it might be weak. APCTT, for example, short-cut the process of selecting titles by acquiring and using the list of acquisition of S&T information centres in the region. When an information official from the National Centre for Technology Transfer (NCTT) of Pakistan finished his hands-on training at APCTT, he took with him APCTT's list of 450 journals of which 400 are received on a complimentary basis. Within three months, NCTT was able to secure more than 50 journals free of charge.

Current awareness literature useful to technology information service involves three types: (a) list of acquisition and bibliographic abstracts of journal articles, reports and books, (b) abstracts on technologies and (c) list of catalogues of products and processes.

Examples of bibliographic abstracts are "SENDOC Current Library Acquisitions" (Small Industry Extension Training Institute, India), "Current Awareness" (Industrial Development Board, Sri Lanka), "BACA" (National Scientific Documentation Centre, Indonesia) and "List of Publications" (International Trade Centre). Librarians are most familiar with this type of current awareness literature.

Abstracts on technology may cover a wide range of sectors such as those found in the "Korean Scientific Abstracts" (Korea Institute for Economics and Technology) and "Technology Process" (National Science and Technology Authority, Philippines) which deal with topics from pharmaceuticals, low-cost construction to metals. Then there are the abstracts on specific technologies such as "Abstract of Science and Technology in Japan — Agro-industry" (Japan Information Centre for Science and Technology), "Asset" on solar energy (United Nations University) and "Food Technology Abstracts" (Central Food Technology Research Institute, India).

The listing of catalogues of products/processes is a more recent development that emerged in recognition of the importance of catalogues in providing a quick overview of the techno-economic aspects of a product or process. Industry and trade periodicals such as "Food Technology" (USA) and "Chemical Manufacturing" (UK) devote a few pages listing product catalogues that readers could avail of. The "Industrial Literature Review" (USA), which appears quarterly, is a catalogue of catalogues covering more than 500 items.

Companies and Entrepreneurs

Having a direct link to individual firms and entrepreneurs that are sources of technology would be very ideal. Maintaining cordial relationship ensures a steady supply of information on the firm's products and processes and facility in acquiring additional information.

Firms usually have a public relations or corporate communiations section which puts out newsletters, annual reports and press releases on new products, processes and equipment. There is also a marketing section which puts out catalogues and advertisements on new products. These are the sections that could be tapped to provide materials on new products, processes and equipment.

Beside the catalogues, advertisements and press releases, the technology information service could also secure newsletters and annual reports of companies. The newsletters give an update on the firm's position on technology policies and technology trends and on its new products and processes. Examples of such newsletters are "ASEA Journal" (ASEA), "Battelle Today" (Battelle), "Connexion" (Ericsson), "HP Chips" (Hewlett Packard), "Hitachi Review" (Hitachi), "Direct from Midrex" (Midrex), "NEC Research and Development" (NEC), and "Philips" (Philips).

It would be important to the technology information service, in terms of maintaining its integrity, that the companies it deals with are reliable. As a

safety measure it would be practical to start sourcing first from the top 25 companies in each product line in the country. These companies could be identified through the industry profile carried by the annual report of the Securities and Exchange Commission, company features in newspapers and magazines and the size and regularity of company advertisements.

The top 25 companies are usually the giants in the field. It would not of course be the intention of a technology information service to be stuck pushing the technologies of giant firms. They may not even need its help. But dealing with them initially gives the technology information service some confidence over the reliability of the technologies. It also gives it a state-of-the-art sense. For developing countries, there would, however, be more virtue in pushing technologies from and for small- and medium-scale industries in the context of a free market. Such technologies abound but are not easy to document and secure information because these agencies usually are not in a position to provide nor are concerned about maintaining information kits or promotional materials. It is even more difficult to push their technologies across the national boundary as they are not concerned about expanding their operations to other countries.

The technology information service will have to devote more effort and perhaps more resources to secure information from local small- and medium-scale industries. A budget may have to be alloted just for documenting the technologies from these industries.

If the technology information service wishes to contact companies outside the country, it is likely to encounter two problems. The first problem is language. Even large companies from non-English speaking countries, such as Korea, do not have enough material in English to disseminate, much less a staff proficient in English who could attend to queries in English. The second problem concerns small- and medium-scale industries. As mentioned above, these enterprises do not maintain adequate briefing materials and product catalogues even for local consumption. APCTT, for example, spends 10 times more effort and resources trying to secure materials from small- and medium-scale industries in the region and still end up getting a lower percentage of responses as compared to sourcing material from large companies.

Development Assistance Agencies

Development assistance agencies, mainly from developed countries, fund projects in developing countries wherein new technologies might be introduced. Reports on such projects could be found in their newsletters and annual reports. Development assistance agencies also come out with books on various development topics.

A quick way to get a feel of the extent of involvement of development agencies in a particular country is to get hold of the UNDP annual report on development cooperation, prepared by the UNDP Resident Representative, which lists the donors and the projects being funded. If some titles in the list of

projects would clearly intimate certain technologies, then the technology information service could immediately send a sourcing letter specifying the technology. At the very least, the technology information service would know about the existence of development assistance agencies and the slant of their funding of projects.

Newsletters of these agencies provide a wealth of information. "GATE", the newsletter of the German Agency for Technical Cooperation, for example, is rich with information on appropriate technology. Such newsletters could be availed of on a complimentary or exchange basis. Other similar newsletters are "AID Resources Report" (USAID), "Dimension 3" (Belgian Administration for Development Cooperation), "Letter" (Ford Foundation), "Overseas Development" (Department of Overseas Development Administration, U.K.), "IDRC Report" (International Development Research Centre, Canada), "Development" (External Aid Division, Ministry of Foreign Affairs, New Zealand) and "Development and Cooperation" (German Foundation for International Development).

Development assistance agencies also maintain data banks. USAID and GATE, for example, have technology information banks and assist inquirers seeking technology information.

Development Finance Institutions

With old industries becoming crowded and obsolete, new product lines emerging rapidly and the market getting more competitive, development finance institutions and venture capitalists increasingly have to keep abreast of trends in technology. In their role as facilitators to syndicate technology ventures through the lending of funds, they are basically users of technology information. The section providing loans to projects would be on firmer ground, for example, if it has updated information on alternative technologies.

Development finance institutions, however, have many information useful to a technology information service such as information on market and industrial trends. This background information is a must to technology information service as it would be unwise to promote technologies for which there is no market or an industrial base. Such information is supplied by the development finance institutions regularly through economic reports, newsletters and annual reports. The Bank Bumi Daya of Indonesia comes out with "Economic Review", Korea Development Bank releases the "KDB Report", while the Carribbean Development Bank puts out "CDB News", "Technology Energy Unit Newsletter" and "Carribbean Technological Consultancy Services Network". The Asian Development Bank puts out "ADB News", "ADB Quarterly Review", and "ADB News Release". The World Bank publishes technical reports, journals, books and newsletters such as "Research News" and "International Development".

A quick way to plug into development finance institutions in Asia and the Pacific is to link up with the Association of Development Finance Institutions in

Asia and the Pacific (ADFIAP), through its Secretariat located at the Private Development Corporation of the Philippines, Ayala Avenue, Makati, Metro-Manila, Philippines.

Directories

There are many directories readily available dealing with subjects ranging from products, processes, manufacturers, traders, exporters, corporations, experts to R&D institutions. They are reference tools for a quick scan of technologies and their sources. Some directories even provide preliminary screening of dependable companies. The exporters directory, for example, could identify manufacturers who, by virtue of being exporters, might be more reliable in terms of quality control and of meeting deadlines.

These directories are published by government agencies, international organisations, non-government organisations and publishing houses dealing with science, technology, trade and industry. The Chambers of Commerce, Exporters' Associations and Manufacturers' Associations usually come out with annual directories covering a broad range of products and processes. Specialised trade, industry and technology associations publish sector or product specific directories.

Europa Publications provides a good directory of government agencies and trade and industry associations around the world. Kompass, Thomas and ABC publishing houses have voluminous directories of business addresses around the world.

Among the directories published by trade and industry agencies and associations in Asia and the Pacific are: "Thailand Industrial Buyers' Guide" (Ministry of Industry), "Directory of Exporters" (Ceylon Chamber of Commerce), "Fiji Products Directory" (Economic Development Board), "Directory of Manufacturers of Papua New Guinea" (Department of Labour and Industry), "New Zealand Manufacturers Buyers' Guide" (New Zealand Manufacturers' Association), and "Pacific Islands Business Directory". In Japan, United States and Europe where the export drive is aggressive and business rather brisk, the major cities also publish buyers' guide to manufacturers in the respective cities.

For specific priority areas, sourcing information from the sector-specific directories would make the work easier. Such directories are put out by the specialised associations. In electronics, for example, the Singapore Electronics Association brings out the "Singapore Electronics Buyers' Guide" while the Electronics Industries Association of Korea comes out with "Electrical and Electronics Manufacturers in Korea". Publishing houses put out specialised directories such as "International Biotechnology Directory" and "Chemical Manufacturers."

On R&D institutions, APCTT has come out with a compendium of S&T institutions in Asia and the Pacific dealing with food processing, electronics, low-cost construction, renewable energy, metals, waste utilisation, and aro-

matic and medicinal plant products. At the national level, the Austrialian Scientific Industry Association has published the "Scientific and Technical Research Centres in Australia".

There are also directories on information sources by product line. UNIDO's "Guide to Information Sources" by product line ranging from leather to furnitures is a very good reference source.

Directories, as intended, provide only the starting point. More information on the technical and economic aspects of a product or process would have to be sourced after the initial contact.

Embassies

A few years ago, a Filipino entrepreneur, with backing from a financial institution, wanted to import foreign goat breeds to improve the Philippine native goat stock. His first move was to contact sources in the United States. This was natural as most of the literature on animal husbandry come from the United States. Moreover, with the United States being a traditional trading partner, transaction was expected to be easier. A technology promotion agency came to know of this plan and advised the entrepreneur to try seeking goat breeds first from Asia and the Pacific. Not only would the goat breeds be more suitable to the tropical condition of the Philippines but the price of the animals and cost of transporting them be cheaper. The entrepreneur was receptive to the suggestion but did not know how to go about locating sources of goats in the region. As the agency did not also know the sources, it advised the entrepreneur to contact the agricultural or trade attache of embassies of countries from the region. From them, the entrepreneur was able to locate suitable suppliers of goats.

Embassies provide a gateway to technologies available in their respective countries. The science, agricultural and trade attaches have the task of promoting trade and industry and they would therefore be more than happy to assist a potential user interested in a technology or product from their country.

Visiting foreign businessmen usually coordinate closely with the trade attaches. Thus, keeping good contact with trade attaches could increase the chance of meeting business missions.

In addition, embassies come out regularly with information packages that promote the trade and industry of their respective country. Such publications are readily available upon request free of charge. The United Kingdom High Commission, for example, releases "British Industrial News," "Economic Digest," "Spectrum - British Science News," "British Information Service" and "Made in Britain". The United States embassy distributes "Span" and "USA Commercial News". Other examples of publications put out by embassies are: "Austrian Economic News" and "Austrian Economic Bulletin" (Austria), "Holland Info" (the Netherlands), "Soviet Export," "Soviet Land" and "Soviet Feature" (USSR), "German News" (Federal Republic of German), "Hungarian Press" and "Hungarian Business Newsletter" (Hungary), "Norinform" (Nor-

way), "Newsletter from Sweden" (Sweden) and "Swiss Economic News" (Switzerland). Publications of embassies of developing countries include "Malaysia Digest" (Malaysia), "News from Israel" (Israel) "Pakistan News" (Pakistan) and "News from Argentina" (Argentina).

Embassies, through the cultural or information attache, also maintain a small library. Some of the duplicate materials such as country guides, directories, magazines and newspapers could also be availed free of charge*.

In view of the rich source of information on technology, trade and industry that could be availed of in embassies, it would be very beneficial to the technology information service to develop a good liason with the trade, agricultural and science attaches.

Industry Agencies

The Ministry or Department of Industry, particularly the sections dealing with small- and medium-scale industries and with investments, provide useful information on technologies *per se* and on trends in industry. The industrial extension service, for instance, would have information on alternative technologies. It also has video training material a copy of which could be secured. The Board of Investment puts out rules and regulations on investments and a listing of ventures that could receive incentives.

More information could be gained from the agency's newsletter and annual report.

Industry and Trade Associations

Industry and trade associations consist mainly of two groups: general groups such as Chambers of Commerce, Manufacturers' Association and Small Industry Association, and sector or product specific groups such as on food processing, steel, aluminium, medicines and fisheries.

Industry and trade associations started as and would continue to be primarily lobby groups to protect their economic and other interests. Some of the associations, however, are beginning to take a more pronounced technology orientation. This is maintained in the agenda of annual meetings, in the addition of a special section on technology in the newsletters and in the programmes on trade and industry promotion that these associations participate in.

A standard source of technology information coming from material regularly published by these associations would be directories and yearbooks.

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* It may be noted from the examples above that most of the materials come out of embassies of developed countries. That the dissemination of information on the country's trade, industry and technologies is not yet widespread among embassies of developing countries might be due to their lack of appreciation of embassies serving as a two-way window to promote and source technologies.

In addition, some of these associations could be approached for leads on technology since they provide referral service to match supply with demand. The Hong Kong Federation of Manufacturers, for example, assists some 100 active transactions a month.

The newsletters provide information on technology trends, policies and products and processes. The newsletters of the Confederation of Asian Chambers of Commerce and Industry, Pakistan Chamber of Commerce and Ceylon Chamber of Commerce, for example, have sections on technology based on material regularly supplied by APCTT and other agencies. The newsletters also provide information on forthcoming technology, trade and industry events. In addition, they also list opportunities for technology exchange.

Some of the newsletters put out by general industry and trade associations: are "CAI News" (Confederation of Australian Industries), "The Bulletin" (Hongkong General Chamber of Commerce), "Journal of Japanese Trade and Industry" (Japan Economic Foundation), and "NAYE Newsletter" (National Alliance of Young Entrepreneurs, India).

Examples of newsletters put out by sector or product specific industry and trade associations are "Fishing Technology" (Society of Fisheries Technology, India), "Food Technology in Australia" (Council of Australian Food Technology Association), "Steel Today and Tomorrow" (Japan Iron and Steel Exporters Association), and 'Soyfoods" (Soyfoods Association of America).

Intergovernmental Bodies

Intergovernmental bodies are also ready sources of information pertaining to their respective areas of responsibility. The information they could provide range from technology trends, policies to products. The information is usually carried in newsletters, reports and other publications.

As it is with industry and trade associations, the covereage of information would range from general to sector or product specific items. The range of information offered could be gleaned from a sampling of newsletters: "APO News" on productivity (Asian Productivity Organisation), "OECD Observer" on various sectors (Organisation for Economic Cooperation and Development), "ISO Bulletin" on standards (International Standards Organisation), "Africa Techno Development" on various sectors (African Regional Centre for Technology), "Newsletter on New Technologies and Innovation Policy" (Commission of the European Community) and "Technonet Asia Newsletter" on small-and medium-scale industries (Technonet Asia).

Sector specific information is found in newsletters such as "ICLARM Newsletter" on fisheries (International Centre for Living Aquatic Resources), "Centrepoint" on vegetables (Asia Vegetable Research Centre), "SHP News" on mini-hydro (Asia-Pacific Regional Network for Small Hydro-Power) and "AIRD News" on rural development (Asian Institute for Rural Development).

These intergovernmental bodies, particularly those dealing with specific

sectors, maintain either an in-house data bank or a network of information banks. Thus, organisations such as Southeast Asia Research Centre for Agriculture, ASEAN Food Handling Bureau and Southeast Asia Fisheries Development Centre would be able to assist in locating technology information in their areas of responsibility.

Magazines

To serve a portion of the general reading public keen on technology information, there are popular industry, trade and technology magazines for laymen and practioners. Examples of general type magazines are: "Technocrat" (India), "Far Eastern Technical Review" (Asia), "High Technology" (USA), "Digest of Japanese Industry and Technology" (Japan), "Industrie" (Austria), New Scientist" (UK), "Business World" (the Netherlands), "Korea Business" (Korea) and "Island Business" (Pacific).

Sector specific magazines include "Asian Construction" (Asia), "Australian Electrical World" (Australia), "Computers" (India), "World Wood" (USA), and "International Agricultural Development" (UK).

General interest magazines also devote a section or column to technology. The section features new products and processes and trends in technology. The section carries headings such as "Shorts" (South, UK), "New Products and Processes" (Newsweek, USA), "New Ideas" (Asiaweek, Asia), and "Innovation" (Gentleman, India).

Newspapers

Technology information is found in various sections of newspapers. The sections on trade and industry usually feature new products and processes, technology trends and technology policies. Technological break throughs sometimes get prime space on the front page.

Some newspapers devote a specific column to technology under various titles. "Asia-Tech", a weekly compilation of products and processes in Asia and the Pacific, and "Tech-World", a similar compilation of technologies outside the region, both comprising part of the information packages released by APCTT regularly to the mass media, reappear under new titles such as "Products and Processes" (Businessday, Philippines), "Look Around the World" (Daily News, Sri Lanka), "World Tech" (Deccan Herald, India), and "Bits and Bytes" (The Straits Times, Singapore).

Advertisements also provide technology information. A product advertisement immediately alerts the technology information service to the product. From there, the technology information service could ask more information from and ascertain whether the company is interested in selling the product, sharing know-how and providing equipment to manufacture the product. Advertisements for job openings also provide leads as they usually give a brief background on what the company is engaged in. Another kind of advertisement which also provides leads would be compliments given by companies to

another company relating to the completion of a project, the company's inauguration, etc. Usually, this advertisement carries the addresses of the companies thus giving the technology information service additional sources to seek technology information from.

Patents

There are over 27 million patent documentation. The world patent data base grows by one million documents each year.

Patent search can uncover inventions, including those not protected by the national patent law or those with expired patents, which therefore makes them available for local manufacture without the need of licence or royalty fee. It identifies which countries and companies are dominant in particular technologies. It also identifies the most productive researchers, and gives an update on the state-of-the-art of patent-based technologies that could guide firms and entrepreneurs as to where their business concerns could lead as well as encourage innovators to stimulate their creativeness or to rekindle old ideas.

While a rich source of information, patent literature, however, is very much underutilised. At UNIDO and APCTT, queries on patents constitute less than 1%.

Why there is low usage of patents could be traced to the nature of industries in developing countries of the region. Many of the industries cater primarily to a domestic market characterised as a sellers' market with a weak consumer protection culture. As quality could be compromised in such a situation, the industries could afford to use technologies that may be a few years behind as long as the operation could show profits at the bottom line. Such companies are not under pressure to keep abreast of the state-of-the-art of technologies that be contained in patent literature.

Of the few industries engaged in exports, many are under joint venture and buy back arrangements wherein the technologies to be utilised have been prescribed by the foreign partner. The local partner usually carries out "screwdriver" operation using local cheap labour to assemble knocked-down components for the mother company. As modifications on upgrading the technology depends on the instructions of the mother company, such companies are also not motivated to keep abreast, on their own, of the state-of-the-art of technologies found in patent literature.

The case of Hong Kong, Japanese and Korean manufacturers would be different. As their survival as well as that of the national economy depend on exports, the manufacturers have to keep abreast of the latest trends in products, processes, equipment and design. As such, they use patent literature extensively.

The posture of many firms in developing countries of not keeping abreast with the latest trends in technology is not constructive in the long run. A country would be better off if its technological manpower, from researchers,

inventors, investors to entrepreneurs, keep abreast of the latest in technology of which much of the information is captured in patent literature.

Although patent literature is currently underutilised in the developing countries of the region, new clientele for patent-based information is expected to emerge as this region is experiencing the greatest economic growth in the world. Interest will not be confined only to new patents sought by Hong Kong, Japanese and Korean manufacturers so as to remain competitive in the export market. There is also a large potential for using expired patents. A Filipino entrepreneur using expired patents on pesticides, for example, started backyard pesticide manufacturing with $40 and has grown to become the largest pest control company in the Philippines, supplying even some raw materials to multinational companies that manufacture pesticides.

The technology information service could secure materials from patent offices. A patent office comes out regularly with official gazettes and patent abstracts which could be availed of free of charge or at a nominal fee. It also maintains a large library that it uses for patent search which is open to the public. In addition, it also has a referral service that assists the public. In some patent offices, such as the Australian Patent Office, they have a technology information branch promoting patent-based technologies. If the request for information is not large, patent offices are prepared to help service queries. Some patent offices are even prepared to spare extra copies of patent documents.

Free servicing of queries on patents could be secured from The World Intellectual Property Organisation (WIPO) and the International Patent Documentation Centre in Vienna, which have alloted a certain quota for servicing queries from the developing countries free of charge.

Patent based information could also be secured from international data base suppliers, such as Derwent and US Claims, but for a fee which could cost US$6-20 just for a 10-minute search. The technology information service could serve as an intermediary for clients who are prepared to pay the fee to secure patent-based information from these data bases.

Technical Periodicals

Publishing houses and technical and industrial associations come out with technical bulletins and journals directed at the specialists. Examples of such periodicals are "Agricultural Mechanisation in Asia and the Pacific" (Asia), "Asian Agribusiness" (Asia), "Food Trade Review" (UK), "Furniture Design and Manufacturing" (USA) "Pakistan Leather" (Pakistan), and "Canada Plastics" (Canada).

Science and Technology Agencies

Science and technology agencies provide a rich source of information although there is a tendency for these agencies to store up data more on science rather than technology information. These agencies have data banks and they publish newsletters, reports, technical bulletins and books.

The topics covered by such agencies would range from general to sector-specific items. Among the general publications are: "Technology Digest" (National Research Development Corporation, India), "Technology Indonesia" (Indonesian Institute of Sciences), "INTI Bulletin" (Instituto Nacional del Technologia Industria Argentina, Argentina), "Technology Ireland" (Institute for Industrial Research, Ireland), "Israel Journal of Technology" (Weizmann Institute of Sciences, Israel), "New Zealand Journal of Science" (Department of Scientific and Industrial Research, New Zealand), "Science Dimension" (National Research Council, Canada), and "NSTA Technology Journal" (National Science and Technology Authority, the Philippines).

Sector-specific publications include "Electronics Bulletin" (Hongkong Productivity Council), "Rural Research" (Commonwealth Science and Industrial Research Organisation, Australia), "CAB Newsletter" (Centre for Advancement of Biotechnology, India), and "Food" (Institute of Food Research and Production Development, Thailand).

In addition, science and technology agencies also have an information service that could be tapped to provide information especially on R&D activities being undertaken by these agencies.

Science and Technology Associations

Complementing the government science and technology agencies would be the science and technology associations. On several occasions, these non-government organisations prove to be more active in disseminating technology information.

Examples of newsletters covering general and sector specific items are: "Mushroom Newsletter" (International Mushroom Society for the Tropics), "ASIA Bulletin" (Australian Scientific and Industrial Association), "Journal of Science" (Science Society of Thailand) and "Interscience" (Interscience Association of America).

Because the members are also experts in their own fields, these associations could be tapped when locating leads on a particular technology or to get advice on experts who could provide technical consultancy.

Sectoral Agencies

Sectoral agencies such as ministries of transportation, communication, energy, health, agriculture and human settlements do more of actual technology promotion and utilisation than the science and technology agencies. In fact, it is in sectoral agencies where the main action in technology transfer and development occurs. Most of the World Bank and Asian Development Bank aided development assistance projects to set up infrastructure or improve agricultural and industrial productivity are implemented through these sectoral agencies.

Information on their developmental activities could be gleaned from their annual reports, newsletters and other publications. Their extension services, for example, in agriculture, would also have additional information, specifically on technologies, necessary to undertake the extension work. These agencies could also be tapped for experts from the government who could provide technical consultancy. In addition, these agencies also have an information service that could attend to queries.

Many of the agency newsletters could be availed free of charge or on an exchange basis. Examples of these newsletters are: "Masalah Banguna" (Directorate of Building Research, Indonesia), "Dairy Science and Technology" (New Zealand Diary Research Institute) and "Building Research News" (Central Building Research Institute, India).

Sectoral Associations

The non-government sectoral organisations consisting primarily of professionals and practitioners complement the government sectoral agencies. These associations put out newsletters, journals and books. Some newsletters are available on complimentary or exchange basis. Some of the newsletters are: "AAPH" (ASEAN Association for Planning and Housing), "Build" (Building Research Association of New Zealand), "IEI Bulletin" (Institution of Engineers, India), "SRA Robot Digest" (Singapore Robotic Association), and "Building Engineers" (Material Engineering Society of Malaysia).

Supermarkets

APCTT receives queries now and then about food processing from entrepreneurs wishing to introduce a product in the market. It comes as a surprise to entrepreneurs when they are advised to review once more their plan of manufacturing the product as 2-3 brands of the same product are already in the market.

During a visit by an APCTT official to an R&D institution in an Asian country, a senior official of the institution mentioned about a new indigenous technology on coconut cream and went on to point out that once commercialised, it would allow instant preparation of coconut-cream based dishes as well as alter the cooking habits of households. The APCTT official agreed with the observation and he mentioned that the same product has been available in Thailand and the Philippines for the last five years. But what surprised the official most was when he was told by the APCTT official that the technology is already commercialised in the local market with the product appearing under two brands.

How did the APCTT official know of this? Simply by going through the useful habit of surveying the product lines available in supermarkets everytime he goes to a country. Such an informal survey gives a quick image of the demand on consumer products and which product lines are manufactured by the country. If technology information officers go through the same habit, they may glance upon new products, and they could contact the source of the technology from the addresses in the label.

Technical Experts

When in difficulty in understanding technical details, in finding the source of information or in solving a technical problem, one must resort to the use of technical consultants. Technical consultants could provide from "band-aid" to "major surgery" assistance. Since they too are human, they could also mess up things.

If one were starting from zero, getting hold of a directory of experts might help. Many directories of experts are being brought out by professional associations and the United Nations on the assumption that they would be useful. But how useful they really are is still open to questions, especially in Asia and the Pacific where securing services is done in a rather personalised way or through the old school-boy ties rather than depending on a directory.

Professionals and retired practitioners from developed countries are rather active in offering their consultancy services. Some of the consulting organisations from these countries include Senior Experts Service (Federal Republic of Germany), Swiss Contact (Swiss Foundation of Technical Assistance), Echanges des Consultation Techniques Internationaux (France), Netherlands Management Consultancy Programme for Developing Countries, and Australian Executives Overseas Programme.

Before resorting to foreign consultants, it would be practical to use local talents. Local consultants could be located in consultancy agencies, R&D insitutions and in universities. Engineering and business administration professionals usually do side jobs individually or as part of a corporation.

Since the rates of technical consultants are rather high, it is to the advantage of the technology information service to maintain friendly relationship with such consultants on a personal level so that they could give information for free or for a nominal fee.

Technology Syndicators

Technology syndicators are the people who match technology supply with demand, nursing transactions up to the stage where a decision is made on technology upgrading or technology venture syndication. Technology syndicators are found both in government and in the private sector. Government R&D institutions usually have a section that promotes the utilisation of the R&D results. Government financial institutions also have a section that gives loans for small- and medium-scale enterprises which assists the borrowers in syndicating ventures. Since the government institutions are covered in other sections, we will discuss in this section only the technology syndicators in the private sector.

Technology syndicators in the private sector are found mainly in large accounting offices, venture capital companies, management consultancy offices, technology promotion agencies, information resource centres and law offices specialising in patent application and licensing.

The more established firms come out with publications that provide information on technology trends, policies, products and processes. Two such publications are: "Japanese High Technologies" (Japan Information Centre, Inc.), "World Technology Patent Licensing Gazette" (Techni Research Associates, USA).

Genard Money International (France) tries to syndicate ventures from patents on drugs. Sycip, Gorres and Velayo (the Philippines), a large accounting firm serving many multinational corporations, also engages in syndicating new technology ventures. Business International Asia/Pacific, based in Hong Kong, comes out with guides on ventures in countries such as China.

Trade Agencies

Unknown to many people in science and technology agencies, trade agencies are far more active than science and technology agencies in promoting technologies. In fact, even many trade officials are unaware of their contribution as they see their efforts more as the promotion of trade. But the promotion of trade, seen from a different angle, is also a promotion of technology. In technology transfer, the product often serves as the starting point which eventually leads to technology transfer decisions. An entrepreneur who comes to know that another product is far ahead than his own would have to reflect whether he would like to continue competing in the same line and if so, how he could upgrade his product. Upgradation may simply involve the purchase of an equipment, let us say a testing gadget or a more accurate weighing machine or it may involve the transfer of know-how and equipment. For example, a Filipino entrepreneur who has been working unsuccessfully on an electronic choke for fluorescent lamps came across a sample of a Korean choke at APCTT and after testing, he decided to go and meet the Korean firm to seek licensing for the manufacture of the product in the Philippines. Alternatively, if an entrepreneur comes across a different product that is appealing, it might inspire him to go into a new venture and thus start him off on a search for the technology required. An Indian industrialist, for example, chanced upon a Filipino gasoline saving device for cars and samples of some Thai food products. After testing them, he has gone ahead to seek licensing for the manufacture of the products in India.

Since trade affects technology and vice versa, it is important to keep abreast of information put out by trade agencies. The information is contained in agency reports, newsletters, product catalogues and other publications. China's Foreign Trade Ministry has been wooing investors and buyers through magazines such as "China's Foreign Trade" and "China Traders". The Hong Kong Trade Development Council helps Hong Kong compete in the international market with publications such as "Hong Kong Trader" and "Hong Kong Enterprise" showcasing Hong Kong products. Fiji's Economic Development Board puts out a monthly newsletter entitled "Trade and Investment News". India's Trade Development Authority releases product catalogues and the "Trade Intelligence Bulletin".

JETRO of Japan and KOTRA of Korea, the two most active trade agencies in the region, come out with product catalogues, buyer's guides and schedule of trade fairs.

From trade agencies outside the region also, the technology information service could secure free of charge some of their publications. Some examples include "GDR Export" (Ministry of Foreign Trade, German Democratic Republic), "Soviet Export" (Vneshtorgreklama, USSR), "CBI News" (Centre for Promoton of Import from Developing Countries, the Netherlands), and "USA Commercial News" (USA).

Trade agencies also have exhibition centres displaying export products. In addition, they have referral services to help businessmen link up with sources or buyers. They also have good libraries which are sometimes open to the public.

Trade/technology/Exhibition

Closely associated with trade agencies would be the trade/technology expositions. Trade/technology expositions come very near to creating the proper atmosphere for getting interested parties together to syndicate ventures. The products and the technical descriptions are on display, giving a quick view of the technology. There are also seminars on new trends to update the audience on the new technologies. Meeting rooms are also provided to enable sources and potential users to come together to discuss possible joint ventures.

Expositions also indicate which agencies from abroad are serious about and are in a position to come to the region. Rather than depend on a list of Canadian firms that would, for example, be interested in having ventures in Asia and the Pacific, it would be more reliable to keep an eye on Canadian firms that send business missions to or participate in trade/technology fairs in the region.

The technology information service should keep a tab on advertisements or announcements of trade/technology fairs of relevance to its priority areas. Whenever possible, it should send an officer to attend the fair and collect materials. It would even be better if it could have a booth at the fair to alert both the visitors and the exhibitors that there is a resource in the form of the technology information service that could disseminate technology information and service queries.

The technology information should maintain liason with the trade/technology exposition organisers. These organisers come out with notices of forthcoming events as well as newsletters, and they could welcome interfacing with another entity that could draw additional attention to the events. Some of the trade/technology organisers in the region are Cahners and Associated (Hong Kong), Interfama Ltd. (Singapore) and Interfair Sdn. Bhd. (Malaysia).

Training Institutions

Training institutes and universities undertake R&D as part of the academic programme or as a contract work for outside sponsors. Pharmaceutical companies and defence establishments, for example, contract R&D projects to the academia. Besides R&D activities, the teaching and research staff of these institutions regularly publish technical papers. In addition, some of the staff serve as a secretariat for scientific and technology associations.

Universities also have a unit tasked specifically for this purpose to promote commercialisation of R&D results.

The quickest way to get a feel of the activities of these institutions is through their newsletters and journals. Examples of such publications are : "Philippine Agricultural Mechanisation" (University of the Philippines), "AIT Review" (Asian Institute of Technology), "Kenshu" (Association of Overseas Technical Scholarship, Japan), "Journal of Scientific Research" (Chulalungkorn University, Thailand), "Research Policy" (University of Sussex, U.K.), "Research and Science News" (Hebrew University, Israel), and "Touchstone" (University of Wisconsin, USA).

United Nations Agencies

United Nations agencies are sources of information in their respective areas of responsibility. They produce technical reports, newsletters, books and some also have video tape production. They also maintain data banks - i.e. AGRIS for agriculture (FAO), INTIB for technologies (UNIDO), etc.

United Nations publications are priced. However, some materials such as newsletters could be availed of on complimentary or exchange basis. A sampling of UN newsletters and journals include "TIES Newsletter" on technology transfer policies and news on electronics and biotechnology (UNIDO), "Impact of Science on Society" (UNESCO), "UNU" (United Nations University), "Development Forum" (UN Division of Economic and Social Information), "UNCTAD Bulletin" (UNCTAD), "Cooperation South" (UNDP), "Forum" (ITC), "ILO Information" (ILO), "Ceres" (FAO), "Industrial Property in Asia and the Pacific" (WIPO) and "Update" (UNCSTD).

UNEP, ILO, WHO, FAO, WIPO, UNCTAD, UNIDO and UNDP, to mention a few, maintain good data banks and they would be happy to service queries falling in their respective areas of responsibility.

Data Banks

Data banks are listed last for a purpose. While they are being projected as all-knowing sources of information, they do not necessarily always have the required information to service a technical query. When sourcing from data banks, APCTT notices that the information provided is full of bibliographic abstracts describing briefly the process and identifying the author or researcher

but is sadly lacking in explaining the technology, its advantages, the sources and the terms of transfer. The reason is simple. As most of the data banks have been organised mainly for researchers and scholars, much of the information they store is dovetailed more to the needs of science rather than technology information users.

Sourcing from data banks could also be expensive. Depending on the data base, a 10-minute search could cost $6-20. When printing, handling and other costs are added, the cost of servicing a query could be rather stiff for most potential users in the region. For Hong Kong manufacturers, whose survival depends on their competitiveness in exports, are prepared to pay for the information from international data bases. In servicing their requirements, HKPC depends largely on the international data bases. HKPC finds the use of international data bases to be an efficient and effective way of meeting the needs of the manufacturers. It also finds the pricing reasonable as payment is made only when the date base is tapped while the cost is passed on to the information user.

Updating information from data banks through the regular supply of tapes or discs can be expensive. A yearly supply of information on 30,000 technologies recorded in tapes could cost a subscription fee of US$15,000-30,000. Before going into this, the technology information service must ensure that there is enough demand to justify this expenditure. Developed and newly industrialised countries (NICs) in Asia and the Pacific may find this investment useful as they need a major inflow of technology information from the West to help them keep abreast with the latest and make their exports competitive. Other countries in the region might just be better off investing on magazines that features technologies and indicate the sources and then writing directly to the sources. They could also secure more material by visiting technology/ trade expositions.

Instead of maintaining a large but expensive in-house data bank, the agency may just install a telex and tap international data bases if and when a need arises. The technology information service could serve as a nodal point or broker, as HKPC does, for clients requiring information from international data banks for which they are prepared to pay.

Dvorkovitch of USA maintains a large data base on new technologies available for technology transfer. Dialog, Control Data and Tymnet of USA, just to mention a few, provide search service over various data bases ranging from business management, agriculture, fisheries, hydromechanics, chemicals, US patents, engineering, energy, pharmaceuticals to medicine. The European Space Research Institute information bank based in Italy maintains over 65 data bases and have on-line access to other data banks throughout the world. CSIRO of Australia has introduced AUSTRALIS, a computerised system containing 13 data bases on Australian scientific and technical developments which could be accessed on-line.

In the region, KIET of Korea is prepared to search information for users from

the region. JICST of Japan would be ready to provide information in English available from its data bases from 1986.

Technical Services

Many of the sources of information on products and processes such as technology, trade and industry agencies, classified advertisements and companies, as mentioned above, provide information on sources of technical services. Mention has also been made of directories of consulting firms and of experts.

Care should be taken in using directories as they are dated - i.e. the consulting firm might have closed down or the consultant may not be practicing his profession anymore.

Technology Policies, Plans and Structures

Similarly, many of the entities aforementioned provide a good source of information on technology policies, plans and organisational structures. Newspapers report on technology policies and trends. Newsletters of companies reflect the management thinking on certain industrial policies. Science and technology related agencies come out with journals on technology policies. United Nations agencies such as WIPO, UNESCO, UNCTAD, UNIDO, UNCHS, ILO, UNFSSTD, UNCSTD and ESCAP also publish newsletters, journals, reports and books which deal with technology policies and plans.

Technology policies, plans and programmes are carried out by organisations. Besides knowing about the policies, plans and programmes, it is also important to know about the organisational structures that implement them. Information on such organisational structures can be found in brochures and annual reports of the agencies concerned.

Over-all, more information needs to be generated on technology policies and plans, particularly on the items and on the systems for formulating technology policies and plans in developing countries. While S&T ministries come out with S&T policies and plans, one may notice that the policies and plans deal primarily with science and hardly on technology. It is normal for an S&T ministry to plan only the resources it has control over which are mainly the resources for science and R&D. Technology transfer and development spans across various ministries. What would be the general framework for technology transfer and development, what would be the respective roles of different ministries, and how are they to synchronise their efforts? These are some of the questions where information is much lacking. APCTT has made a start in getting some of the questions clear by making country studies on technology policies and planning in the region and through a reference manual on technology policy formulation and planning.

Sourcing as Teamwork

Sourcing cannot be the responsibility solely of librarians as they are not the

technical experts. Moreover, unless the programme staff or specialists are brought in at the initial stage of the sourcing exercise, there is no guarantee that even with good material, the programme staff would be using them as they may not frequent the library nor would they be familiar with the material available.

To ensure effective sourcing and use of material, sourcing should be the collective responsibility of management, programme staff looking after certain specialisations, the section engaged in packaging the information and the person in charge of sourcing who sends the sourcing form letters.

In securing catalogues, for example, APCTT follows a simple routing practice of periodicals that involves all the key sections in sourcing. Once a periodical or product catalogue is received, it is first recorded by the Librarian. From there, it circulates to management. The interest of management is to monitor the nature and extent of material being sourced in order to have some basis in planning and implementing sourcing activities. There could also be information on technology policies, trends and technology fairs for which a management decision or institutional commitment is required. The material then moves to the programme staff or specialist(s) concerned. Names of specialists who have no relation to the material are crossed out by the Librarian to hasten the circulation. The specialists concerned would study the material, mark the interesting items and jot down the page and additional instructions on the space assigned to the section packaging the information and the space assigned to the sourcing person. The instructions may alert the section packaging information to consider the item or, as in the case of the sourcing person, ask him to get additional information or documents. Usually, just jotting down the page is enough to alert the section packaging the information or the sourcing person on what has to be done. The material then moves to the section packaging information where a copy is made of the page if the item is to be considered for future releases. The material then goes back to the library where the sourcing person would send the appropriate sourcing form letters.

This routing practice may be difficult to implement in a large agency where many people would be involved. The chance of a breakdown along the line or of the periodical being lost is high. In such a case, the routing could be done among the specialists within the technology information service.

In ordering books and periodicals as contrasted to securing catalogues, the Librarian compiles a list in a format that includes the title, cost, number of books and periodicals per priority areas, existing budget and expenditure to date. The list is circulated to a committee, comprising senior programme staff and the Librarian, which would meet once a month to make recommendations to management for future procurement.

In mapping out the sourcing plan of action for the next year or cycle, the Query Section's inputs, for example, are very vital. Its monitoring sheet would show how many of the queries are being serviced using materials such as the information from the "Tech-Offer" forms, catalogues and technical descriptions which are secured free of charge from sources of technology. It would

indicate what percentage of in-house materials are used. It would also show in which priority areas in-house material is lacking. The Sourcing Section can be guided accordingly. It is interesting to note that at KIET, Korea, more than 85% of its materials are sourced for a fee and that the servicing of queries uses mainly the paid materials. In contrast, 85% of APCTT's materials are sourced free of charge from sources of technology and most of the queries are serviced from these materials.

The head of the technology information service would almost have to be a jack of all trades who has to familiarise with the subjects and the sources and be able to work out a plan of action for sourcing materials in an efficient way. As the saying goes, he would have to be like a duck: be able to swim but not as good as a fish, fly but not as good as a bird and walk but not as good as a horse. The need and the skill to be eclectic are impressed not only on the head of the technology information service but also on the rest of the technology information service team. Staff meetings and collaborations during the operation would encourage cross fertilisation which not only enhances skills but also fosters teamwork.

Steps for Sourcing Information

Sourcing material is an expensive proposition. The rise in printing cost has put up the cost of journals and books. Thus, even if the same volume of periodicals is to be maintained, the annual budget would still increase by 15-20% just to cover the yearly appreciation in price. The cost of sourcing technology information would go even 5 to 10 times more if the technology information service is to secure data from computer tapes. In view of the rising cost of securing material, it is therefore necessary to evolve schemes to secure material cheaply and where possible, free of charge or an exchange basis. The technology information service would also have to strengthen its linkages with other technology information agencies that could provide information especially on items wherein the technology information service does not posses in-house information.

There are a few points to consider in evolving the strategy and steps to be taken in sourcing material.

(1) Develop a "bait". Advertising agencies refer to the "weasel word", a jingle or assertion about a product which is not exactly true nor exactly wrong but enough to attract attention. This is not to suggest that the technology information service should make false claims. Rather, it must come out with a line attractive enough to bait the sources of technology to part with their material, preferably free of charge or under reasonable terms. A company would not part with brochures if you write to it saying that the material is needed purely for academic purposes. It would not lose time, however, to make them available if it sees a chance of doing business.

APCTT operates along this line. Its bait to sources of technology is the opportunity for more business if they make information on their technologies

and the conditions of transfer available to APCTT to help it in its role as a broker matching supply with demand. APCTT makes it clear to sources that it actively disseminates technology information to newspapers/magazines in 31 countries, opens technology venture opportunities through technology missions and expositions and assists in technology venture syndication. And just to make it more pleasant, the source is informed that this service is being provided free of charge. With such a "come-on bait", no company would be foolish not to take full advantage of the opportunity to advertise for free its technologies in Asia and the Pacific through APCTT.

(2) Closely associated to offering a bait is the need to project a corporate image as a technology broker or pusher. Too often, government agencies overlook this by thinking that as part of the government, there is no need to project a corporate image. Projecting the corporate identity is needed for two pruposes. First, the clientele would know that the agency exists. Taking APCTT's example, its existence was not even known during its first 4 years of existence to the residents of the city, where the Centre is located. A weekly technology column prepared by the Centre was later introduced to a leading local newspaper. The same column was then carried by other newspapers and magazines from around the world. Since then, queries from far-away places and daily visits to the centre by entrepreneurs have become routine.

Second, the clientele need an image with which it could identify the agency. In the case of ACPTT, it is that of a technology broker. This corporate identity is carried in APCTT's sourcing letters, information packages and in other releases. Once the reputation is built, technology information comes easily. Companies send catalogues even if not solicited. Business missions take side-trips to the agency to explore how their offers of or requirements for technology could be met.

(3) Prepare sourcing form letters for different sources. There should be different sourcing form letters for companies, R&D institutes, and trade, technology and industry associations. The form letter sent to a company asks for details on a specific technology while the form letter sent to associations seeks assistance from its members for information on certain technologies. The technology information service may not have in-house information to service a query about a technology on brake-lining from Korea. To get a lead, the technology information service could send the sourcing form letter to Korean auto parts manufacturers' association, or to the Chamber of Commerce asking assistance in identifying sources of the technology.

The sourcing form letter sent to the source of the technology must be very specific about the technology. It must also ask for details on the application of the technology and terms of transfer which are necessary for making a decision on investment and technology application. Such details are covered by the "Tech Offer" form which is attached to the sourcing form letter The sourcing form letter should also ask for catalogues, technical descriptions, feasibility studies and pictures, if available. It could also request for copies of the patents pertaining to the technology.

The sourcing form letter must also incorporate the bait - "have more business" - and the corporate image of the agency to attract the source to part with the information.

(4) Prepare a "Tech Offer" form that should be sent along with the sourcing form letter. Technology venture syndicators, technology promoters, matching services in trade expositions, and small and medium industry extension services have standard forms for "Tech Offer". Among others, the "Tech Offer" asks for details such as: areas of application of the technology, its advantages, degree, years and places of commercialisation; land, raw material, labour, equipment and operating capital inputs required; terms for transfer; and contact address.

(5) The most important thing is to make a beginning at sourcing information; even if a clear-cut strategy for the technology information service is lacking for the time being. This would not only make a starting point but also provide a feel of the things. The only way to learn swimming is by getting into the water. By going immediately through the exercise of sourcing, the technology information service gets to know what is and what is not possible. The lessons learned from the initial sourcing exercise would be very valuable when the technology information service tries to cover more ground in the future.

(6) Build up and update a list of sources of technology and of technology information. This, again, is not the responsibility solely of the Librarian or the sourcing person but requires the input of the programme officers covering the priority areas or certain specialised subjects. The division engaged in extension service, the division in charge of syndicating ventures, or the technology information section engaged in servicing queries may come not only across new sources but could also give an idea, for future sourcing, of the type of materials that are constantly used.

(7) Be prepared to spend more for sourcing if the technology information service wishes to use technology information from the South. As mentioned earlier, there is a language problem. Many of the small- and medium-scale industries in the South do not have catalogues and other briefing materials to spare. Moreover, there are very few agents of technologies from the South operating in developing countries. Possible leads would the trade, technology and industry agencies and associations from the developing countries and UN entities such as ILO, UNIDO and APCTT and the UN project on Technology Information Pilot System (TIPS).

(8) Interact on a personal level with officials of the chambers of commerce, manufacturers' associations, small and medium industry promotion agencies, agricultural and industrial extension services, trade attaches and visiting businessmen. Once a good relationship has been established, these entities would be happy to refer technical queries and opportunities for technology venture to the technology information service.

(9) Frequent trade/technology exhibitions, catalogue exhibitions and libraries of companies and R&D centres and bookshops. APCTT has even stumbled

across new material from shops selling second hand magazines. It is not enough to rely on the current literature awareness material. Seeing the products and processes on display, and catalogues and materials existing in libraries gives a better feel of the trend than just looking over a list of library acquisitions.

(10) Work out an exchange arrangement to lower the cost of aquiring information and publications. The agency may exchange an advertisement with other agencies in their respective publications. APCTT, for example, has an exchange arrangement in advertising its "Asia-Pacific Tech Monitor" with "Asiaweek" and with the "Asia Conference and Exhibition Review". The agency may put an ad for a Chamber of Commerce in exchange for its ad in the latter's newsletter seeking technology information from the members. The agency could also put out an ad for a data base company, as APCTT has done for Dvorkovitch and Associates, in exchange of free information to help in servicing technical queries. As for publications, the most common practice is to exchange. About one-half of APCTT's periodicals, for example, have been acquired on an exchange basis.

(11) Develop technology information packages for dissemination. This recommendation is more appropriate to discuss under the chapters devoted to packaging and dissemination of technology information but has to be mentioned this early in relation to its relevance to sourcing. The technology information packages help establish the corporate identity of the agency. They also demonstrate to sources that the information being provided by them is being utilised. The packages would attract other sources of technology information to share their material in the hope that their technology being featured.

As a review, here is a checklist to go through when organising sourcing of technology information.

1. Based on the definition of the technology information programme in terms of objectives, priority areas, target clients, outputs and activities, have you identified the materials required and the sources of such materials?

2. To secure such materials, have you developed a "bait" to attract the source to part with the material for free or at a nominal cost?

3. Do your sourcing form letters and the information packages project the corporate identity of the agency as being engaged in matching technology supply with demand?

4. Have you prepared different sourcing form letters for different sources?

5. Are you testing your sourcing with different sources so as to get a feel of their nuances and what is possible?

6. Are you updating the list of sources of technology and of technology information?

7. Are you going out to the field to interact on a personal level with entities such as Chambers of Commerce, Manufacturers' Associations, etc.?

8. Do you visit technology/trade exhibitions, catalogue exhibitions, libraries of firms and R&D centres, and bookshops to get a better feel of the new materials and information trends?

9. Have you worked out exchange arrangements with other agencies so as to lower your cost of acquiring information and publications?

10. Is the agency developing technology information packages so as to demonstrate to sources information they provide is being put to use?

5

Processing Technology Information

In processing information, we are concerned with organising material for current and future use. This involves transferring information from a generator of information to a requestor of the information. To enable the delivery or "switching" of the information, the materials or documents such as books, journals, product catalogues, reports, standards, patent abstracts, etc. have to be organised in some helpful way so that when required, not only could the document but the information contained therein could also be retrieved quickly. The organisation of the materials has been usually done manually. With automation being the way of the future, many libraries are now using computers to organise the materials.

The materials being recorded have two main attributes: the physical entity and the information content.

How the physical document is to be arranged and stored is determined by the nature of the document and its anticipated use. Thus, journals are expected to be stored separately from books. The journals might be arranged in alphabetical order by their titles. However, if retrieval to the journals are to be done by priority areas, the journals may just be arranged according to the priority areas. To take another case, if certain journals are necessary for a project, such journals may just be placed separately for quick access for the people who need them.

The best way to store a document so that it could easily be found when needed is to give it a unique "address" or place. It works in the same way that we locate a person through his address or telephone number. The address or the telephone number has no significance in itself other than identifying uniquely where the person stays and in which telephone he could be reached.

Classification helps give the document its unique address. It takes into consideration the information content allowing for documents having the same

topic to be kept together. This allows people who are looking for a particular topic to zero in immediately on materials grouped according to the topic.

To put us one step further in retrieving information, we would not just be interested about the document *per se* but would like to know more about the information contained therein. Indexing simplifies this by giving the subject or topic of the document a series of keywords representing the profile of the information. Thus, a document about gasoline-saving device for automobiles could be assigned keywords such as "gasoline", "automobile" and "energy-saving device".

To put everything together, we need to create a document record. This consists of a short description of the document which could be arranged in different ways to permit multiple access to the document. The most common example of a record is the library card where many copies of the same card are made and filed at different points to permit multiple access. In a computerised system, the record has even greater potential for multiple access as the computer permits every word or character to be accessed from one point.

A record is created by putting together a series of elements to make up the total record. Below is an example of a record of a report.

Element 1: Author
Element 2: Title
Element 3: Publisher
Element 4: Year of publication, number of pages, etc.
Element 5: Keywords
Element 6: Address/number of storage location

The composite record could look like this:

"Industrial profile of fibreboard panel processing" by C. Flynn and A.J. Hawker, London: Tropical Products Institute, 1980. 100 pages.

Fibreboards/panel fabrication/panels/boards - 691.14 N 80.

In library science, there are conventional methods for handling most types of documents such as books and journals for storage and easy retrieval. Technology information, however, involves more variety of information materials. Thus, while conventional methods would be useful, some adjustments might be required to handle the materials.

Let us illustrate these principles in greater detail by examining the more conventional tasks of classification, indexing and cataloguing the material. Classifi Classification is the first step wherein the information is divided into groups usually on the basis of subject matter with each material being assigned a distinct code or number. Thus, information dealing with agriculture would be listed separately from information on energy and given a distinct identification code. The next step is indexing, which adds more identification to the information by describing it using the standard technique of giving keywords or subject

descriptors. If the information being indexed refers to a solar powered water pump, it would be assigned keywords such as "energy", "renewable energy", "solar pump" and "water pump". The third step is cataloguing which puts the bibliographic details of the information in a unit record such as a catalogue card which could be filed for easy reference. In addition to the classification code or number of the material and the keywords assigned by classification and indexing respectively, cataloguing may involve adding a few more fields or tags which incorporate additional details. In cataloguing books, for example, the conventional practice is to have fields, among others, for author, title, publisher, place of publication, year of publication, number of pages, and classification number. Quick identification, storage and retrieval can be done through the code or number assigned to the subject by classification, the keywords provided by indexing or the fields and details incorporated by cataloguing.

As students of library science would tell you, there exist already standard techniques and formats on how to do processing of information. These techniques and formats have wide application in processing both general and specialised information and the processing of technology information could be simplified by adopting many of these techniques and formats.

How technology information eventually is processed depends largely on the mandate of the agency, the range of activities being undertaken and the type of audiences to be reached. For example, in cataloguing information on a particular technology, a science-oriented agency may find it sufficient to have fields only for the title, keywords and brief description of the technology. Likewise, an agency that is concerned mainly with technology policies and plans would find the above fields sufficient as it need not know about specific details on specific technologies. On the other hand, an agency engaged in the promotion and application of technology would require more fields, such as main application, advantages, terms of transfer, etc., to cover the items necessary for making a decision on investment or technology application.

If an agency's concept of information service is restricted to the library as the main arena for information transactions, then the standard formats for classifying, indexing and cataloguing documents would suffice. On the other hand, if the agency organises its information service along the components which we have described from sourcing to servicing queries, then adjustments have to be made. It is not just a matter of adding more fields to enable the Query Section to service queries adequately. The formats and systems have to be arrived at also collectively by all the Sections as they will be complementing each other and using each other's data bases to do their respective assignments. (For example, packaging cannot proceed without sourcing). Thus, it is important that both sourcing and packaging sections agree on the same formats and systems for processing the information.

If an agency focusses its programmes around a few priority areas or sectors, more detailed classification and indexing might be required for information relating to the priority areas while a more generalised classification and indexing might suffice for information falling outside of the priority areas. Classifying

information for a technical audience would require a more detailed division of subject matter down to the micro level, whereas the classification of the same information for a household audience might better be understood if presented in a few general groupings. For example, a food research institute may have as many as 60 subject categories for food processing technologies. Meat-related technologies could be assigned under headings of "dairy," and "poultry." For households, the 60 categories could be compressed perhaps to just 10 general subjects with all meat-related technologies assigned under the general heading of "meat." Indexing information for a technical audience would veer towards the use of technical jargon, but when indexing the same information for a household audience, using simple layman's terms for the keywords would be more effective. What is "sodium chloride" to technical people can be presented as "common salt" to the housewife.

The technology information service aims to provide current as well as retrospective information on technologies ranging from new products, processes, equipment to services. To do this, it must maintain an in-house collection of materials and have access to outside sources. Having the ready access to information from within and without enables the technology information service to package technology information and to respond quickly to queries.

Various materials could be sources as explained in the chapter on sourcing. Among the more common technical information and reference files for day to day activities of the technology information service are:

1. product catalogues from manufacturers
2. patents and inventions
3. results of R&D
4. technology briefs
5. techno-economic profiles
6. feasibility studies
7. compendia of technologies
8. technical articles in books
9. technical articles in reports
11. handbooks, encyclopedias and manuals
12. publications from S&T agencies
13. publications on trade and industry
14. directories of sources of technologies and of technology information.

These materials have to be processed and organised for easy storage and retrieval. The technology information team has to go through the steps of classifying, indexing and cataloguing together. As it is with sourcing material and the activities undertaken by the other sections of the technology information service, togetherness is the order of the day. A Librarian trained in library sciences may have the initial advantage of being exposed to the standard techniques and formats for processing information but he could not and

should not be expected to do the job of processing information alone as he would not be familiar with the different sectors, technical terms, and fields and keywords convenient to use and remember from the point of view of the other sections utilising technology information. If the agency has a computer and wishes to computerise the information, the presence of the computer staff is also desirable right at the start to ensure that the information is presented in the format acceptable to the computer.

Classification

Everyday, when we make a decision, we go through a process of identifying and classifying the key elements involved. It is here or there, black or white, or option A or B. If it is as clearcut as this, then a decision could easily be made. As it is in life, many things, however, do not readily render themselves to an "either or" choice but are in gray areas or are straddling several areas. In such cases, we provide an allowance for cross references. The same pattern of shifting through and then identifying and classifying the elements applies in the classification of technology information.

The standard practice is to classify the information by subject matter. Thus, as in the example given earlier, information on agriculture would be listed seperately and given a distinct classification code from information dealing with energy. As agriculture is quite a broad subject, storage and retrieval could be facilitated if its broken further into sub-sectors and down to the micro-level. Going down the hierarchy, horticulture is a branch of agriculture and this could be divided into plants grouped according to different uses such as medicinal and aromatic plants, cash crops and plantation crops, then coming down to a single plant, say, peanut. From a single plant, there would be sections on cultivation, harvesting and processing of the plant. The section could further be divided into subsections - i.e. cultivation may have sub-section on propagation by tissue culture.

From the demand side, the more specific the inquirer is about the technology he needs, the easier it is to serivce the query. This would entail a corresponding specificity, at the supply side, in the processing and storage of the information to enable quick retrieval. There is indeed an advantage in breaking the subject matter down to the micro-level. However, we must caution against being too specific. The usage of information, especially in retrieving it to service queries, would be a good gauge as to how far refined the classification of information should be. While one could come wout with 60 categories in classifying information, perhaps 10 categories would suffice. It would be a waste of time and resources as well as a dent on the morale of the technology information team if it feels that it is being over-burdened in having to provide so many details which in the end do not find much practical use.

When specifying groups or categories of information, there should be consistency in the parity of the categories in relation to hierarchy. Broad sectors can

be listed along with each other in the same way that sub-sectors could be listed alongside each other but it would not be conventional to list a broad sector beside a sub-sector. For example, if we put agriculture, which is rater a broad sector, as a category, then we would be consistent listing energy, also a broad sector, as another category. It would not be conventional, however, to list horticulture, which is part of agriculture, alongside agriculture as a separate category just as renewable energy cannot be listed alongside energy.

When the general headings are made - i.e. agriculture, energy, transport, etc. - there should be consistency in the hierarchy of information belonging to each heading. As in the example given to agriculture, the hierarchy goes down to horticulture, as a branch and finally down to a single plant.

In addition, there should also be consistency in generic groupings under each heading. As the saying goes, wolf does not mix with sheep just as apple is different from oranges. Thus,while fossil fuel may be part of energy, it cannot be listed under renewable energy.

Some variations or concessions may be necessary, especially in cases where the agency may be restricting its interest on information to a few priority areas. The priority areas do not necessarily conform to the same hierarchy. For example, the agency may have as its priorioties agriculture, which is a broad sector, microprocessing for medical instruments which is a sub-sub sector, and home solar heating which is a very specific technology. In setting categories, it would be impractical to draw the hierarchy, let us say for home solar heating, by starting with energy, down to renewable energy, then to solar energy and finally to home solar heating. As far as the work of the agency is concerned, home solar heating, as a priority area, will have equal parity with agriculture and microprocessing for medical instruments.

Fortunately, there is no need to start new schemes as there already exist standard classification schemes such as the Dewey Decimal Classification (DC), Universal Decimal Classification (UDC) and Library of Congress Classification (LC). Subjects from the macro to the micro levels are given standard decimal assignments. Here is how Universal Decimal Classification progressively identifies and classifies Ferrocement (UDC No. 691.328).

6	Applied sciences
69	Building industry, material, construction
691	Building materials
691.3	Concrete
691.32	Reinforced concrete
691.328	Ferrocement

Conventional materials in the form of books, reports, and proceedings or articles therefore do not pose a problem in classification. One can fall back on any of the standard classification systems and choose the one that is most appropriate for one's needs. Other materials such as patents are special documents that do not render themselves readily for classification under the above schemes. For patents, one has to use the International Patent Classification

(IPC) which is applied to all patents throughout the world. Here is how IPC identifies and classifies "baking oven using radiant heat" (A21 B 1/06).

A	Human necessities
A2	Food stuffs and tobacco
A21	Baking
A21 B	Machines for baking
A21 B 1/00	Ovens
A21 B 1/06	Ovens heated by radiators

Except for countries competing in the international market, for which knowing the state-of-the-art through patents is vital for survival, most of the technology information required by countries in the region deal more with commercial technologies. For products, processes and equipment, the International Standard Industrial Classification (ISIC) and the Standard International Trade Classification (SITC) are ideal. These schemes are easy to use and simple. coding. The agency will have to select which scheme is more appropriate. Trade associations such as chambers of commerce tend to approach products, processes and equipment from a trade angle and therefore use the SITC scheme. Technology agencies such as APCTT approach the same item from a technology and industrial point of view and therefore find it more convenient to use ISIC. In some countries, the Bureau of Standards come out with a national standard industrial classification, and this scheme is utilised by some national technology agencies.

In classifying "building bricks" from the trade point of view, SITC gives it a code of 662.41 which was arrived at by going through the identification process shown below:

6	Manufactured goods classified by material
66	Non-metallic mineral products
662	Clay and refractory construction material
662.4	Non-refractory ceramic bricks, tiles, pipes, etc.
662.41	Building bricks

Bread manufacture, seen from an industrial point of view, is given by ISIC the code of 3117 using its own identification process as shown below:

3	Manufacturing
31	Manufacture of food, beverage and tobacco
311	Food manufacturing
3117	Manufacture of bakery products

Indexing

Indexing describes the document using keywords or subject descriptors. Before the indexer could assign the keywords, he must first examine the contents of the document and identify the principal concepts. From there, he

can then proceed to record the concepts according to the indexing language. Let us take as an example a catalogue about a non-fired soil brick produced by an Australian company. The indexer would read the contents focusing primarily on the description of the technology. After getting a feel of the concepts involved, he would then proceed to assign keywords such as "ceramics," "building material," "bricks" "soil bricks" and "non-fired bricks".

Indexing usually takes into consideration broad term, narrow term and related term.

Range of term	Subject	
	Vegetable oil	Food sterilisation
Broad term	edible oil	food technology
Narrow term	olive oil palm oil castor oil	pasteurisation
Related term	oil plant oil seed hydrogenated oil	food food irradiation food processing

In some case, several terms might refer to the same item i.e. "journal" and "magazine" referring to "periodicals" or "groundnut" referring to "peanut." In such cases, the preferred term is indicated and the synonyms are pointed out as cross references.

The keywords would try to incorporate the range of terms and the synonyms. Thus, information on olive oil would include keywords such as edible oil (broad term) and oil plant (related term).

Information about a technology could be located by using broad and narrow term keywords. Using the example of the non-fired soil brick, information could be retrieved by using broad category keywords such as "ceramics," "building material" and "bricks" or narrow category keywords such as "soil bricks" and "non-fired bricks."

There would be some limitations posed by keywords for the simple reason that people may refer to the same thing using different terms. "Non-fired bricks" is known as "air-dried bricks" to others. Cassava could be tapioca or manioc depending on the place. It would help the different sections of the technology information service, especially in using each other's technology information files, if they could agree on some uniform terms. For this, they could refer to a thesaurus.

A thesaurus is a structured vocabulary control device which is used for indexing documents. It displays the terminological relations between preferred terms, synonyms, related terms, narrower terms and broader terms. There are many thesauri developed for different subjects by S&T agencies and other academic bodies. The KWIC (keyword in context) Index developed by the International Standards Organisation (ISO) offers a comprehensive and easy to use thesaurus. Other thersauri include SPINES (UNESCO), those of UNIDO, ITC, Macrothesaurus (OECD) and TEST (IEEE), just to mention a few.

Information agencies would have to select the thesaurus suited to their needs. Some which cover specific fields may need only one thesaurus. For others covering various fields, they may require more than one thesaurus and may have to add their own keywords. Whatever is the final scheme, it is important that the keywords be uniform, consistent and easy to use from the point of view of the various sections of the technology information service, and appropriate in undertaking the objectives and programmes of the agency.

Cataloguing

Cataloguing puts into a unit record the bibliographic details of an information. In addition to the classification code and keywords, the record produced out of cataloguing may include other fields. We have mentioned the example of books. For technologies being promoted for transfer, the fields may include title, brief description, main application, advantages, degree of commercialisation, years and places of commercialistion, types and cost of inputs from raw materials to operating cost, terms of transfer, and contact person.

For conventional materials such as books, journals and reports, there are standard formats available for codifying bibliographic information. Among these are the International Standard Bibliographic Description (ISBD), the Anglo-American Cataloging Rules (AACR), British Library Cataloging of Publication Data and the Library of Congress Publication Data.

For technology information, the above formats may not be adequate. When recording a book, we could easily perceive a difference of orientation between a Librarian familiar with the above formats but not exposed to technology information and a Librarian who deals with technology information. The former would approach cataloguing of books more as stock-taking, in which case, the standard fields for author, title and so forth would be adequate. The latter is less interested in having a record of the collections in the library for use in the library as his interest is more in locating information in the books to help in producing technology information packages and in servicing queries. In case, if there is a query on solar-powered water pump, the cataloguing of the books should make it easy to identify the article, the book and the location.

Some technology and trade related agencies have evolved their own scheme for cataloguing their material and it would be useful for an agency just starting to process its technology information to get a sample of the formats for catalog-

uing. Some of them are Socially Appropriate Technology Information System (SATIS), Technology Transfer Centre of the Korea Institute of Machinery and Metals (technology profiles), NRDC of India (technology profiles), Innovation of France (Technotrade), UNIDO (investment profiles), and APCTT (Tech-profile).

Physical Organisation of Material

The physical organisation of documents on the shelves usually follows the schemes being used. Documents classified according to decimal classification would be stocked in sequence. Journals/periodicals/magazines might be kept in alphabetical order by their titles. Reports might be kept in alphabetical sequence by their issuing authority and sub-arranged by the individual report numbers. Standards and patents are usually kept under their respective issuing authority series and sub-arranged by their respective standard or patent numbers.

If a technology agency has certain priority areas, a variation can be adopted wherein material pertaining to the priority areas could be assigned the front shelves for quicker access. Rather than depend mainly on the codes, there could be display signs announcing the materials displayed in a particular section.

For periodicals or journals used regularly as references, there could also be colour tags representing the subject matter clipped to the appropriate page for easy identification. Alternatively, a paper indicating the necessary articles could also be pasted in the inside of the front page. The agency could adopt various ways to effect immediate identification of material to supplement what could be done through classification, indexing and cataloguing.

The ultimate purpose of processing is not to have a stock of materials neatly classified and stored for its sake, receiving high marks according to international techniques and formats, but rather to have a stock of materials organised in such a way as to facilitate and speed up the storage and retrieval of information to meet the needs of the agency. The processing has to be simple enough but at the same time useful from the point of view of the various sections in technology information service that would make use of the information. There is no purpose served by spending additional time and resources in making processing more elaborate and complicated than what is needed. To arrive at the proper mix of schemes to process technology information requires keeping an eye on techniques developed by other entities such as trade and industry institutions engaged in technology transfer and utilisation, doing periodic scanning of information and going through regular review exercises of the processing schemes.

In processing technology information, here are some checklist questions to consider.

1. Do you have some elementary notion of classification, indexing and cataloguing?

2. Do you have some tentative idea on how the materials relating to the priority areas and those outside of the prioirty areas are to be organised?

3. Before you go into actual processing, have you examined various schemes in classification, indexing and cataloguing?

4. Are the various sections of the technology information service involved in defining and implementing your schemes for processing technology information?

5. Are the terminologies and schemes known to the various sections of the technology information service that they know where the information is and how to retrieve it?

6. When processing information on a particular technology, are you processing it as technology rather than science information by looking at other details such as terms of transfer and production inputs, necessary for making a decision on investment and technology application?

7. Do you scan other schemes and review your own scheme now and then so as to simplify the processing of technology information?

6

Packaging Technology Information

Developing countries possess many indigenous technologies that help in national development. Not only are these technologies comparable to foreign counterparts but they are appropriate and cheaper. Think of the many household technologies that could help a housewife - say, an improved cooking stove that is relatively smokeless, uses recycled agricultural residues and saves 15% on energy, or a fruit juice preparation that could preserve many of the excess fruit harvests that otherwise would go waste. Think of technologies that could uplift conditions of villages, like solar-powered technologies for drying agricultural produce and for pumping water, and 10 hp multi-purpose tractors appropriate to small farms. Think of many small-scale manufacturing technologies from developing countries that should find immediate application in other developing countries with similar conditions. Then think why many of these technologies never got off the ground? Why? While some of these technologies have been brought to the attention of potential customers, they hardly registered. Part of the reason is that they were presented in a manner which did not catch the fancy of the customers. In other words, packaging was poor. To prove this point, take a look at many newsletters of S&T agencies in developing countries which feature many useful indigenous technologies. One look at the drab presentation and we forget both the indigenous technologies and the newsletter.

Now, let us shift our attention to technologies from industrial countries. There is no question that many of these technologies are more advanced. But we can also show that there are some which are not appropriate. In certain cases, we can also site indigenous technologies that are comparable technically and more appropriate to the local condition. Yet, not only do we remember the foreign technologies but even in cases where comparable indigenous technologies exist, we end up using the foreign technologies. Part of the answer lies in presentation. These technologies are presented in such sleak and glossy brochures and press kits that at least the style, if not the content, would leave an impression.

Unaccustomed to the Madison Avenue techniques of advertising, refined to a high level of sleekness and subtleness by the cut-throat and highly competitive market of the West, packagers of technology information in developing countries continue to present technologies from the point of view of the source - i.e. an inventor or researcher - using technical jargon that could be understood by scientists and researchers but not by the target clients. If they were to write about a new woodstove, they may highlight that the stove saves 15% on energy and hence, in the name of energy conservation, they would then ask the housewife to use it. Mentioning 15% savings and appealing to patriotism have no meaning. But if the message they convey is that the woodstove costs only $12, is efficient, smokeless and convenient, uses agricultural residues and saves $100 on wood fuel per year, then they can get the attention.

Product advertisements illustrate the importance of knowing how to package the message. In viewing ads in developing countries with a seller's market, one could notice that the message is muddled with so much text and visuals and the ads take a lot of print space and broadcast time. Where one-eighth of a newspaper page or 15-second spots on TV would suffice, the ads may occupy a page or take a full minute to deliver the message. An ad presented in this manner would not be effective in a developed country which has a buyers' market. First, print space and broadcast time are so much in high demand and expensive that no company would want to take more space or time than required. Second, the consumers, who by now would have developed a keener sense of aesthetics regarding ads due to their daily dosage, might find cluttered ads insulting to their taste. After seeing crisp ads which, collectively, are already an imposition on their time, they may not also find the patience to read or look at long messages.

The task of packaging is to make the message or content appealing to the user. As an old saying goes, the bait must be appealing to the fish, not to the fisherman.

The process of making a technology information package attractive to the user does not just involve composing the content. If this were so, having the technical proficiency and the artistic touch to compose the text and the visuals would suffice. Packaging is part of a more complex and involved process to deliver the right message in the right format to the right audience at the right time. Presenting the right image in the right format requires knowing what the audience needs and appreciates at a given time and circumstance. For example, low-cost construction technologies that make houses resistant to earthquakes would find an audience in earthquake cities and would find an even enthusiastic audience if presented right after an earthquake disaster. Advertisers who know the pulse of the audience could even sell products under rather ludicrous conditions. To feel the pulse requires taking advantage of opportunities or creating them where they do not exist.

The ramifications of packaging would be elaborated further in the succeeding discussions.

A Conceptual Framework

Packaging of technology information proceeds from a clear understanding of the needs and wants of the users of information. As mentioned in Chapter 3 on knowing the audience, the technology information service must know about the needs and nuances of the target clients. Packaging technology information just for the sake of it will go nowhere. There are many interested parties who are fighting to get the attention of the information user. Packaging must be worked out so as to get the information user's attention. In marketing, there is a saying that getting the attention of the customer gets half of the job of selling done. Information, as a commodity, must appeal to the senses of the end-user. Packaging helps create that appeal.

Creating an "information" product appeal involves creative techniques, timing and programming of appeal messages, and mixing of media to ensure optimum impact and maximum mileage.

There are no ready-to-use strategies for creating the "information" product appeal. As knowing the audience is crucial, the technology information service may have to do first a survey of the target clients and from there, evolve the strategy for packaging. In addition, it may have to test samples of its information packages to get a proper reading of the market temperament and its potentials. The pre-sell testing is standard in selling consumer items such as toothpastes and soaps. Technology information being more an intangible product, the pre-test of the packages is essential so as to capture what appeals to the end-users.

The target audiences have to be segmented with the marketing thrust adjusted accordingly. If we cover the whole market, we may dissipate resources and end up without a share of the market. How to package the information will get clearer as soon as we know the segment of end-users that we are addressing. If we want to reach decision-makers in industries and in government, we must contend with the fact that they are all very busy people. Sending voluminous reports would not interest them. On most occasions, they simply file away thick reports containing information which, if read, are valuable. But they welcome 2-3 page executive summaries. Similarly, the information being sent to, say manufacturers, must be immediately relevant to their trade and must be presented from the business angle.

Information Packaging Principles

In packaging technology information, there are some basic steps to follow. First, we must know the product - i.e. its contents and unique features. Second, we have to identify the target clients. Third, we have to isolate the selling points of the products which appeal to the target clients in terms of meeting their needs and wants. Fourth, we have to select the language and style that is understood best by the target clients. Fifth, we have to decide on the media mix that could deliver well the message.

The product we are dealing with is technology information. What the scope would be depend on the needs of the target clients. For a curious individual, giving him the technical description of a technology, let us say, guava juice formulation, would suffice. If the target clients are entrepreneurs, the technical description will not suffice. It must be accompanied by other details such as advantages, economic size of production, production inputs, and terms of transfer, necessary for making a decision on investment or technology application. If the client is a development finance institution that provides loans for small enterprises, the above details would have to be supplemented with information on the market so that the lending officer could properly guide the potential borrower whether to start or not a venture.

The next step is to identify our target clients. Knowing about the needs and nuances of the target clients has been discussed at length in Chapter 3. Knowing their needs and how to reach them would help in designing the package. What are their habits, needs, wants, psychology, weaknesses and points of resistance?

After knowing about the product and the target clients, we can now look at the selling point. The traditional and most dependable approach is in using the bait "What is in it for me?" We have to isolate the elements that would click with the target audience. There is sometimes a tendancy to cover so many items and this could end up in counting the trees and missing the forest. As the attention span is limited, it would be practical to focus on a few items for easier memorisation and recall.

From here, we can now proceed to look at the language and style. The language and visual reinforcement should blend harmoniously that the message touches the heart and mind of the user. Whatever the message and however it is crafted, its presentation should be adequate to enable the user to make a yes or no decision.

The target client determines the level of language and visuals to be used in packaging technology information. For example, in provinces or districts, packaging may have to be done in the vernacular language.

The jargon is also crucial. Businessmen would be comfortable with business jargon just as engineers will be with technical language. For laymen or housewives, packaging will have to be done in layman's language as they may not understand jargon.

Another critical element is the length of the material. We often come across criticisms of two extremes: the material is too short to provide information of any consequence, or it is too long to retain the attention span.

Length depends on the media and the audience. For print media, which caters both to the general public and entrepreneurs, and where technology items compete for space with more earthshaking news, presenting the technology item in a short, crisp, simple and entertaining format is necessary.

For broadcast media, where the time slot is in great demand and expensive, encapsulating a technology message in 30-second or 1-minute "stingers" and broadcasting the message ten times a day would be more effective than preparing a 10-minute message broadcasted once a day.

For technology folios, which are sent to agencies and development finance institutions promoting small-scale industries, the material can be not only longer but contain more technical and economic details.

Like the other considerations, what is crucial when looking at length is to get the attention rather than educate the audience with the total ramifications of the technology. There is no question that a 100-page material contains more information than a 2-page material on the same subject. But whether a 100-page material is sufficient to start a venture in contrast to a 2-page material is debatable. If the attention is captured and the inclination is there to pursue the matter further, the user will locate the necessary assistance by way of seeking more information or by asking a consultant to help syndicate the venture.

The last consideration is the choice of media or tools to use for technology information package delivery. The range of mass media tools available has to be fully studied prior to the production of technology information packages. The creative form inherent in the type of medium also has to be considered in the packaging process. Written language is quite different from spoken language. Therefore, when one envisions putting out print packages, he has to choose descriptive words that capture aptly the content of the information. On the other hand, when one has to use audiovisual media, which allows for sight and sound, he has to do away with elaborate language and sentences decked with modifiers and say his point directly.

Techniques in Information Packaging

The kind of media determines the techniques that one has to use in information packaging. Creativity, however, makes the difference in the use of these techniques. How one puts together the package that strikes a lasting impression on the target public or audience is the result of a creative exercise. The beauty of language and wisdom of ideas that catch the user's attention and make him desire the product are marks of packaging craftsmanship. We will not go into the discussion of the creative process as this is not the subject of the book. With the help of established procedures, one can actively hit a gold mine of brilliant ideas for product packaging. Constant practice and a lot of exposure will make creativity a second nature.

Let us examine techniques of packaging by looking at packaging for the print, broadcast and special purpose media and at some in-house publications.

Print Media

The most widely used form of mass media is still the print media. Because the life span of content of the print media is permanent, even developed countries

rely heavily on it for information dissemination purposes. The electronic or broadcast media enjoys awesome reach and wider coverage but there are built-in limiations like ephemeral lifespan of content, availability and costs. Among developing countries, print media recieves priority attention as its multiplier effect presents distinct advantages over the electronic media. Duplication of copies is simple. Printed information is storable and retrievable. The success in the use of print media, however, depends on the target public literacy and capacity to comprehend visual elements.

Let us discuss some of the familiar forms of print media: newspapers, magazines and periodicals, and bulletins and newsletters from industry, trade, science and technology associations.

To package information for newspapers, one has to understand the characteristics of the medium. Newspapers are the mainstream of print media. The basic objectives of newspapers are to inform, instruct and entertain the public at large. There are a set of criteria by which the content or news for a newspaper is selected. The person who makes this selection is the editor, and hence the news on a given day for a newspaper is what its editor says it is.

News is current; anything that happened last month is history and not news. The dictum "news late is news lost" sums it well. So anything that is packaged for the newspaper should be fresh. Another important thing to remember is that a newspaper is also a business like any other. So an editor too measures the information supplied in terms of its effect on sales and readership, both of which generate advertising which is the lifeblood of all newspapers.

Here are some pointers on packaging technology intormation for newspapers:

(1) Editors are under no obligation to use a contributed information pacakge; one has to think for and with the editor when he does the topic selection, editorial preparation and stylizing of the copy. Studying the writing style of the newspaper helps a great deal in ensuring publication of the information package. It helps the editor make a fast and favourable decision on the contribution. Often, this contribution is sent under the headings of "press release" "news release", "backgrounder" "situationer", "information alert", "news brief", "newsgram", "straight from the source", etc. The use of special letterhead is part of the packaging process. It immediately identifies the source and the nature of the story, and therefore, helps catch the attention of the editor.

What goes into the information package, however, should not read like a paid advertisement. It is observed that generic names instead of brand names in a technology story receive favourable editorial consideration. Another observation is that the use of analogy or similar editorial devices especially with the general reader in mind merits editorial approval. For instance, instead of saying "we consume millions of tonnes of writing paper a year", we say "if you put used writing paper in one year, end-to-end, our consumption is the distance

between the earth and the moon". A little exaggerated and impractical perhaps, but certainly it jolts the reader to attention. And as said before, getting the reader's attention is difficult to achieve but once the reader's attention is won, half of the communication is completed.

(2) In a newspaper there are sections that are devoted to special fields of interests or sectors. For instance, one will find a page for construction and industry, a page for agriculture, a section on business, a marketing page, a regular column on technology, etc. Normally, there is an assigned page and an editor to look after the content and presentation of the stories of that page or section.

As a packager of technology information, one has to know these pages and sections thoroughly if he wishes to get his contributions published in them. One has to find out about the editorial policies, the time at which the section editor "closes" the page and priority areas or emphasis, among others.

With such knowledge, the information packager may now meet the editor and arrange some kind of agreement on or accomodation for his technology information packages.

In most instances, the editor accomodates the request on the condition that he be given enough technology stories, normally four thought stories (researched features) in advance to choose from every cycle. If the technology page appears weekly, it means that four stories must be filed or banked three days before deadline.

It is not necessary to put the arrangement in writing as this will connote obligation on the part of the editor. However, the editor will usually expect the supply of technology stories to be constant and consistant. Off-and-on supply creates problem for the editor.

Oftentimes, writers maintain opinion columns in special pages or sections of the newspaper. The best that the technology information packager can do is to break into these columns with two or three lines or a mention, at least, because these columns have a very high readership.

(3) Liaison or constant meetings with the editor of newspaper or his colleagues and associates improve the relationship between the information packager and the newspaper. Called sometimes as media relations work on the part of the information packager, this enhances the chances of getting more editorial support and cooperation in his technology information dissemination activities. It also contributes to rapport and closer coordination in terms of editorial requirements and other matters. Nothing beats face-to-face communication.

Sometimes meeting the criteria of the editors is not a guarantee that the story will be published. An editor may not have enough of it to see the relevance of the story, or the editor who gets the story is not the right person.

Here timing and targetting come in : knowing who is the right person to give the story to and when. This is the reason why it is so important to have a

personal relationship with the mediamen. A story coming from someone an editor knows might get looked at and thought about while one from a stranger might not. Yours is only one of the many stories they will see in a day.

It is also important to get to know the feature writers and reporters covering specific beats because it may be more effective to offer them stories directly, on occasion. But never give a story to several people in the same newspaper because of the danger of duplication. If your story shows up twice in the same edition, your name will be blacklisted by that paper.

Now, let us examine another form of print media, magazines. Most magazines are published either weekly or monthly. Majority of the articles are 'thought' pieces interpreted to reflect a certain emphasis or bias. These function more as entertainment, educational and opinionated information packages. There is more room for discussion, elaboration and interplay of visual elements in these 'thought' pieces. The "currentness" is of less importance, but the "relevance" is of great value. Interpretative or developmental writing is very much evident in magazines.

Except for the general interest magazines such as *Newsweek*, *Asiaweek*, etc., most magazines have a well-defined readership and limited scope in terms of coverage and circulation. In fact, that is what makes them very specialized. For instance, one will find *Asian Business* as focusing on business, financing and banking in Asia, *Tech Monitor* as emphasizing technology opportunities for licensing, ventures and transfer in the Asia-Pacific region, fashion magazines for jet-set groups and gardening magazines for hobbyists. These publications cater to special interest groups classified according to trade, sex, geographical consideration, buying habits, etc.

Unlike newspapers, magazines rely heavily on contributed articles or commissioned write-ups from specialists, experts and freelancers. The narrowed scope and defined focus of magazines present opportunities for the technology information packager to seize. Slants or angles could be worked out to suit the editorial policies and readership biases of these publications.

A comparative advantage of magazines over newspapers is the fact that the former zero-in on a segment of a market and maintain a high storability value. One will find copies of magazine editions bookbound and stacked in private and public libraries. Such characteristics allow a longer life for the packaged information and offer possibilities for more use and re-use by the readers.

Here are some suggestions on how to use magazines as outlets for packaged technology information:

(1) Just like newspapers, magazines have their own set of editorial policies which one has to be acquainted with in order to use them efficiently. But what might serve as a better mechanism for "inspiring" full length stories in these magazines is the use of "fast facts" sheets, background on status and impact (socio-economic) and facilitation of one-on-one interviews with experts involved in the projects. It is suggested that no "press release" type of feed be

made to the magazine. However, story sessions or briefings could spark a few inspired stories to be published in future editions. All writers for magazines, being different from newspaper reporters, see stories from different perspectives. They see deeper and take longer to arrive at a thought-provoking story in an issue of the publication. The "fast facts" sheets offer hard information in their barest form which could provide entry points for a magazine story.

(2) In another instance, the technology information packager might do his own research, interview experts and write contributed by-lined articles. Normally, if the article fits the theme of the magazine for the particular edition, this will be picked up and used. Authored stories are always encouraged, but a thorough checking of facts by the author should be done. If the story results in an embarassment for the magazine, the technology information packager or contributor would be, in all probability, blacklisted for ever.

There are publications produced by professional, trade, industry, science and technology associations. If one puts together the circulation figures of all these publications, he will realize that its readership is equal to if not larger than commercial mass-circulated magazines or newspapers. These publications address very small and homogenous groups of readers bound by common professional objectives. Yet these are assured of good captive readership. Food technologists read food processing periodicals to know the latest trends just as civil engineers read building periodicals to know what is latest in prefabs. Information in these periodicals is usually in concentrated form and presented in the jargon of the profession.

A technology information packager may find a very good opportunity to disseminate information to selected groups through these professional journals. Slants, however, will have to be incorporated in the technology information packages to make them usable for publication in the journals. For instance, a technology information package on biogas might have to be written up with a commercial slant if it has to be sent to a chamber of commerce journal.

While the circulation of a trade publication is small compared to a mass-circulated magazine, its potential is strong. Most professionals who are members of a chamber or association keep copies of their professional journals as reference materials for keeping abreast of the development in their profession, keeping track of the growth and accomplishments of these associations or even monitoring the activities of their peers in order to stay ahead.

Advertisers in trade publications are information suppliers and recipients as well. While they inform or push their services or products to readers, they also absorb information contained in these publications. Thus, it can be said that trade publications are "cliquish" since its readers, writers, and advertisers belong to the same profession, club or clique. Such a situation is a plus factor in technology information dissemination.

Some points to remember while dealing with this type of print media are:

(1) Trade publications run by enterprising publishers without financial help

from professional, trade or industry associations are much easier to deal with than those managed by members of associations. There are a good number of policy considerations in the latter. One will find himself straddling forces most of the time. There is also a tendency for the association journals to gravitate on internal stories.

The technology information packager will have to do some fine-tuning of strategy of placing his stories in these media outlets if he wishes to be on target.

(2) Because of lack of resources, most trade publications come out once in two months or four times a year. Frequency has always been a real problem among trade publications, especially those which depend on advertising revenues. It is therefore important to prepare stories that are "timeless" or printable at any given time or issue of the publication. In this regard, it is not advisable to incorporate in the stories issues and events which can easily go stale.

(3) To go into formal long-term editorial arrangement with a trade publication is risky in the sense that the technology information packager might be limiting the options for media placement and might get too involved. Since most trade publications suffer from financial problems, it is not unusual to find them folding up after twelve issues or even less. Selecting the trade publications with track record and high credibility is imperative. "Fly-by-night" publications proliferate and their activities are highly questionable.

In summary, newspapers, magazines, and periodicals of professional, trade, industry, science and technology associations are some outlets for technology information packages. These provide wide coverage, long reach and high recall value of information. Choosing which of the innumerable publications around demands a lot of scanning of the field, checking and counter-checking of strengths and weaknesses, and a lot of personal legwork to create a viable and lasting personal relationship with the people of media. There are some danger areas but these are easily overcome with vigilance.

The key to a successful use of print media for technology information dissemination is the proper media mix, which is the matching of packages with the appropriate media tools and outlets as shown in Figure 1.

Broadcast Media

With the advent of electronic communication technology, it is now possible to report events as they unfold with all the freshness and the drama of the unexpected. The world has become "smaller" because of the modern means of communications. It is now possible to have a teleconference of experts from different countries without their having to converge in one place. Human drama and historical events are captured on tape or moving pictures and relayed to diverse audiences in different places with eloquence and vividness. Such is the awesome power of electronic media. What once was a gleam in the eye of a dreamer has become a living phenomenon today.

Figure 1

Print Media Mix - Matching of Packages with Outlets

Media \ Packages	Tech News/back-grounder/situationer	Technology profiles	Tech success stories	Tech who's who/ experts' directory	Technical papers/ proceedings	Technology search reports/files	Public
Newspaper	×	×					General
Magazines		×	×				General
Trade Publications							Industry Business
Science Journals		×		×	×	×	Experts
Economic Publications			×		×		Entre-preneurs
Corporate Publications			×				Corporate
Source	Priority areas	Solicited	Commissioned	Registry	Reports	Collection/ data bank	

For our discussion, we shall limit ourselves to two types of electronic media: radio and television. We shall focus on the various tools for information packaging suited to radio and television.

Since the first radio broadcast was aired, man has quickened the pace of development and opened new horizons for growth in practically all fields of human endeavour. In many parts of the underdeveloped and developing countries of the globe, radio reaches the remotest village to bring them closer to the core of civilization. It makes information known and people optimistic of a better future. Radio receivers or transistorized radio sets are ubiquitously present in every home as a permanent household item and source of news and entertainment. The cost of a radio set is negligible as it is now within the economic means of millions. UNESCO statistics estimate that in 1979 there were 113 million radio receivers in Asia, 454 million in North America, 30 million in Africa, 58 million in South America, 28 million in Europe and 14 million in Oceania.

In developing countries of Asia and the Pacific, the popular appeal of radio cannot be disputed. It is the only medium that we can truly call as "mass" as a large portion of the population can be reached by radio.

Some ideas on how to package technology information for radio are given below:

(1) Excluding commercials which are in the form of spots, radio could use the voice of a technology expert as an "actuality", as an interview segment of a talk show—with or without listener phone-ins and as a public service announcement. Actualities and interview segments normally fall under the purview of the network's news department, although some disc jockeys or announcers place calls to news-makers for either informational or gag value. Public service announcements should be directed to the programme director of the network.

The technology information packager must either arrange for the technology expert to be on the live talk or produce ready-to-air edited radio programmes that suit the programming schedule of the network. Here familiarity of the network's priorities and audiences is critical. In a music station, one cannot expect to have his packaged interview segment aired.

(2) There are other possibilities for inserting technology information packages in a radio station's programme. For short teasers, one can use station breaks to insert short quick messages. These are called stingers. For example, TRC of the Philippines, in cooperation with the government-run Voice of Philippines station, has successfully been using station breaks for the 15-second "For Your Information" series. Occasionally, if there are idle time slots, these radio spots are aired on a floating schedule from sign-on to sign-off.

Another possibility is to produce a drama programme following a technology success story line. Although subliminal in nature, this helps create popular

consciousness of the technology, thus contributing to the development of a mass technology culture.

(3) Public service shows are very popular among developing countries. If one studies rural broadcasting in these countries, he will discover that a large proportion of programming time is devoted to public service. Public service shows are hybrids of institutional advertising and public relations. A non-profit organization enjoys more latitude than a profit organization. Public service messages are spots to be read by disc jockeys, or an elaborate professionally produced radio commercial. In the Philippines, TRC has produced over 120 public service spots as commercials on various technologies in seven major dialects aired nation-wide by some 200 radio stations. These are also supplemented by ready-to-read public service spots which are usually one paragraph in length. Another government institution doing a similar job is the National Population Commission (NPC). It puts out printed radio plugs, to be read by radio announcers, and radio topics to comment on for radio commentators. Here, however, the concentration is on population control, family planning, hygiene, etc.

Public service announcements should not be thought of as free commercials. If the technology information packager sends material that is too commercial, he is likely to get the material back by return mail along, probably, with the radio station's advertising rate card and an ad solicitation letter. To win public service status for his technology information package, the technology information packager must do the public a service. He must use his experts to develop information that will help or alert the listeners. Information stories on technology subjects will probably earn more air play. So will information about a nationwide problem that a technology can solve. He must resist the temptation to use brandnames or slogans of his technology service agency.

In general, by working at it, the technology information packager can get airtime for his packages. But airtime is money. To get something of value from radio stations, one has to give them something of value to their listeners.

Television is another type of electronic media that has revolutionized the lifestyles of people in many parts of the world. With the satellite communication technology, millions of people in different parts of the world could watch same programme simultaneously. In a way, it has made the world smaller, just like another village. Television, because it can show vivid pictures of actual events as they happen, where they happen and how they happen, can sway millions to hysteria, bring them to tears, exhort them to move, and tease them to laugh.

This age of television dawned in the 1930s in Europe and since then phenomenal advancement in visual communication has been achieved. In 1970, more than 100 countries were transmitting television programmes and today a total of 138 countries are transmitting regularly television programmes. On a worldwide basis, the number of television receivers run to a formidable 400 million.

In some developing countries, however, television is just starting. Oftentimes, it addresses only the needs of a few, the eilte of society. This is so because, in contrast with radio, the cost of acquiring a television receiver is beyond the income of the average family. There is also the high investment needed for the infrastructre to transmit programmes. The limited range of television reach is available principally to urban centres and a negligible portion to rural areas. Of course, there are other factors for such a slow assimilation of the television in these countries. Among them are political, religious and cultural considerations.

While the use of television for rural areas is distracting in the sense that the television itself removes the audience's full attention from the content of programmes due to the "culture shock" it brings, at certain levels of the viewership totempole television works at its best. The ease and speed of its operation and transmission of messages boost the capabilities of developing countries to catch up in information with the rest of the world.

Here are some suggestions on how to make full use of television and ensure positive results that will enhance the technology information dissemination process.

(1) Cost is the primary consideration in using television. The cost of production is high and the cost of transmission is equally prohibitive. Technology information packagers must study carefully the short- and long-term implications of using television. If resources are scarce, co-sponsorship schemes with the network, a particular industry or philanthropic foundations can be worked out. In the case of Thailand, 2-minuters have been produced and used on television with the financial support of private corporations. By appealing to the social conscience of these large corporations, one can easily elicit financial assistance for technology information dissemination on television. A similar method was done by a number of technology institutions in the Philippines but more on the basis of tax incentive schemes offered by government.

(2) Competition is tough in the television business. Entertainment is the number one money-earner as this is most attractive to advertisers. Canned shows imported from production companies abroad are dominant features in television programming in developing countries. To pit local technology shows with such types of programmes is outright disaster. What takes place in developing countries most of the time is the blocking of certain viewing hours of the day for certain shows catering to certain segments of the viewership. One will find, for instance, religious and educational shows lumped together in the early morning, and feature shows in the evening. During weekends, special and musical extravaganzas and variety shows dominate the lunchtime and evening time blocks. News programmes are aired, generally, late evening (7 p.m. to 9 p.m.) or before sign-off.

For the technology information packages to be in these time slots, one has to pull connection with the networks and its sponsors, match the packages with

the creative requirements of these shows and spend more time and resources in "liaison" work.

(3) If it is not possible to break into the television show, one might as well produce his own with support from philanthropic organizations or the network itself. However, such a show will have to be planned on a self-sustaining basis. This means it has to sell time for advertisers to use for their products to recover the costs. If done otherwise, one risks the possibility of running a short-lived show.

(4) Another factor for success of a television show produced for technology information dissemination is the content planning and "cosmetics".

Content planning basically calls for lining up of experts and resource personalities who can discuss with authority and eloquence the topics for the show. Timing of airing is also critical. For instance, if there is an epidemic outbreak, the producer of the show must be ready to put on air something that currently touches on the subject of epidemic. Having a line to experts in various fields would be of immense help during such occasions. Though one cannot cover all the subjects, having a bank of pre-recorded shows on a variety of items also would be helpful to keep the show topical and maintain the tempo. The "cosmetics" simply refers to the "star personalities" that will help carry the show through for the time slot it has been assigned by the network. Other gimmicks that spice up viewers interest and improve rating are part of the cosmetic elements needed.

Overall, television can make a project a phenomenal success or a dismal failure. Professionals in the television business have to be called in from time to time to help put together the show and keep it on the air. One should also be flexible and practical in managing such a project. Once the peak of a campaign has been reached, it would be wise to take it out of the air. It is better that the viewing public remembers your project when it is working good. Psychologically, it makes coming back on the air the second time around a welcome occasion.

In conclusion, we can say that much will depend on the media mix (see Figure 2) of radio and television packages that meet media requirements and viewing public habits and aspirations. To force the message through is to antagonize and hurt the sensibilities of your target audience and viewership.

Special Purpose Media

As the name connotes, "special purpose" media are designed for special cases which cannot be lumped together with traditional or conventional mass media. These are devised by the agency to reinforce, supplement or accelerate the process of information dissemination to selected groups which have high probability of spreading the information within its purview of influence. Generally, these are events or projects orchestrated by agency to generate maximum impact that is envisioned to prompt action or reaction.

To present a few examples, let us narrow down our discussion to extension service projects, technology fairs and conferences.

The experience of the Philippines is worth noting in the area of technology information packaging for extension service purposes. The more frequently implemented projects along this line are the mobile teams for information dissemination and technology demonstration. The Nutrition Center of the Philippines has its Nutri-bus project and TRC the Technobus. The show-and-sell method stimulates greater curiosity and subsequently awareness of "what's new and what's up" among the rural population. Lately, the Philippines has launched the Barangay Video Project (village video project) which set up community centres in remote villages for teaching-learning technology activities, including film and audio-visual showing of government projects and accomplishments and technology documentaries. Normally, commercial film features precede the showing of government film-documentary materials.

The University of the Philippines at Los Banos also has similar extension service project, spearheaded by the UPLB Office of Extension and Development Communications Department. Some of the projects of the university are the school-on-the-air radio programmes combined with extension project teams fanning out into the farming communities in the university's outlying provinces of Laguna, Quezon and Batangas. Early 1985, the university entered into a tripartite agreement with TRC and the Federation of Rural Broadcasters (FRB) for the technology outreach programme, a communication-cum-extension service project for farming and fishing communities. The vast R&D resources of the university combined with TRC's organizational and communication clout and FRB's 200 affiliated radio stations made up a formidable mechanism for sustained and far-reaching technology information dissemination to the countryside of the Philippines.

In the urban areas, TRC launched in 1978 the Technoclub project which organizes students and out-of school youths and their parents into community groups. These are tasked primarily to receive new and improved technologies for livelihood and propagate the same among their members. These Technoclubs conduct demonstrations of livelihood technologies which can easily and immediately be adopted for income-generating purposes by the Technoclub members. A spin-off of the community Technoclub project is the Samahan ng Kababaihan ng Metro Manila (SKMM). Composed mainly of housewives in the communities, SKMM holds trainers' training, in cooperation with TRC and other government agencies, on various appropriate technologies like food processing and preservation, stuffed doll making, soap-making, mixed gardening, etc. TRC also assisted these housewives get small loans to start off small businesses.

The common strategy among the government agencies involved in technology extension work is the building up of cadres who in turn can develop others. Technology activities, for instance, are geared towards training trainers on variety of technologies in order to provide the communities a pool of resource persons who can be tapped for involvement in technology application projects.

Figure 2
Radio/TV Programme Mix

Packages / Types of Program	Technology News	Documentaries Field Reports	Technology Demos/ Learning-teaching	Documentaries	Commentaries	Info stingers	Technology programs	Public
News	×					×		General
Educational/general awareness shows		×		×		×		Specific public
Economic/business programs				×		×		Industry Business
Public Service			×	×	×		×	General
Variety Shows		×	×					General
Entertainment			×					General
Media	R/TV	TV	TV	Radio	Radio	R/TV		

Technology fairs and conferences also function as special purpose media in the sense that they provide conduits for communication or exchange of ideas on interpersonal basis. These functions are necessarily organised by the agency that the technology information service operates from.

When using fairs and conferences, the technology information packager has to be selective. Picking out the right opportunity at the right time and place will go a long way in enhancing the technology information dissemination process. Instinct and sense of being around when the opportunity knocks on the door are of prime importance. These, of course, are developed through years of involvement in technology dissemination work.

A few ideas on how to use extension service projects, fairs and for technology information dissemination are presented below:

(1) When organizing technology extension service projects, one should not be limited to the objective of making immediate impact, but also consider the institutional mechanism that will ensure the continuance of the projects on self-propelling basis. One must infuse an "ideological" spirit into it to maintain its momentum for growth. Somehow, the "ideological" component of the project puts the so-called braces that will keep it together in the midst of the changing temperament and priorities of the times.

A movement which is fired up by a burning commitment to an ideological objective lives beyond the limit set by its initiators. In technology information dissemination, the "ideological" spirit is the desire to make technology work for the people to improve their livelihood and enhance their productivity.

Often, this "ideological" spirit is expressed in such terms as volunteerism, self-reliance, self-help, self-sufficiency, etc. This gives the extension service project a sense of mission, thus refuting the perennial accusation by its critics that extension service projects are "brushfire" activities.

(2) The most important consideration in any extension service project is people. Leaders must be developed to carry the project through. Initial activities, therefore, have to concentrate on building the leaders who will provide the vision, the morale, the will to fulfill and source of strength for others to persevere.

After all, the best technology information package is useless if not delivered to its user. In the case of technology extension service, the information is delivered through cadres and technology catalysts or agents in the community. McLuhan, the Canadian sociologist, has a line for this: the medium is the message.

(3) Fairs are basically shows where people converge to buy and to sell. Sense of opportunity, therefore, is of prime importance when one is considering using fairs as a medium for technology information dissemination. Fairs carry certain themes which should provide the guidelines for making a decision whether to participate or not. In the case of conferences, similar principle

applies, that is finding the right opportunity to disseminate technology information to the right people at the right time. Here again, we talk of finding a focus and limiting of scope for technology dissemination. Indiscriminate participation in such activities results in distorted perception of the message one wishes to convey to his target clientele.

In-house Packages

Most of the science and technology agencies in developing countries rely on in-house publications to draw attention on the activities of the agency and to disseminate S&T information. The common publications include agency annual reports, books, periodicals and reports.

In general, the packaging of in-house publications of S&T agencies in the region tends to be drab. Too often, the value of the information contained therein is lost due to the poor presentation.

If planned and implemented well, in-house packages provide valuable information that could help technology information users upgrade technology or syndicate technology ventures. We will mention a few in-house technology information packages of some agencies which are relatively well-known among the clients.

AT APCTT, its in-house packages consist mainly of books, monographs, directories, reports and the *Asia-Pacific Tech Monitor*. The *Asia-Pacific Tech Monitor* is a 44-page bimonthly periodical. It covers news on trends in technology transfer and development around the world, update on technology policies, views of leading technologists on current issues, briefs on new processes, technology offers and requests, and technology events/fairs.

TRC of the Philippines has various in-house packages directed at different clients. It has Enterprise Development Kits which deal with various technologies. The kit has three sections: technology, market, and tips on how to run a small business. Among the technologies covered include non-traditional export products such as onions, seaweed, mushrooms, shrimps, snails, etc. Over 2,000 copies of these kits have been sold to firms, entrepreneurs and professionals.

TRC also puts out Poptech brochures containing 102 titles on items such as cheese-making, Lorena stoves, herbal medicine, soap-making, waste recycling, vermi-composting, etc. The brochures are directed at households and micro-enterprises. The presentation is simple showing "how to" steps supplemented with illustrations.

Another TRC in-house package is the 3-volume Survival Catalog. Each volume contains 300 pages of information and illustrations on various technologies. It is quite popular among extension service workers.

HKPC of Hong Kong is one of the few S&T agencies in the region that excel in in-house packages for manufacturers. HKPC puts out Patent Update, Toys,

Innovations in Consumer Electronics and Product News - Domestic Appliance. The packages contain the latest release of patents and registered design along with the diagrams and illustrations, and news on technology and market trends. Unlike the in-house packages of APCTT and TRC, HKPC's packages are almost like technology and market intelligence information and as such, they have to be updated constantly to apprise the clients of the latest trends in technology and market. The information is secured from international data bases such as Derwent World Patent Index, US patent data bases, Infadoc, etc. The packages are disseminated only to the manufacturers who subscribe to them.

Overall Approach

Whether one is packaging for the print, broadcast or special purpose media, he must approach the task with a management outlook. Packaging could be viewed as a project by itself in which we have to go through the same steps of project formulation by defining items from objectives to the workplan as discussed in Chapter 2. Rather than repeating the steps, some salient points extracted from exercises in project formulation that could be helpful when defining the programme for packaging are prescribed here.

(1) Scanning. The technology information service should always be on the look-out for opportunities wherein packaging and dissemination of technology information could be initiated.

(2) Opportunities/Obstacles Analaysis. The opportunities and the accompanying problems have to assessed, particularly as to how they would affect the agency and its clients.

(3) Selection of Priorities. After taking stock of its resources and knowing their limitations, the technology information service should not waste its resources by taking a buckshot approach. A more pragmatic approach is to take on tasks where immediate results could be shown rather than mass resources on long-term goals.

(4) Developing a Strategy for Media Programming. Anticipating events, reactions and needs of the public of the agency enhances packaging and dissemination of technology information. The media tools should be matched with the character, listening and viewing habits and level of education of the public.

(5) Implementing the Programme. Many projects get bogged down in implementation. For technology information packaging and dissemination to succeed, it requires, among others, the cooperation of top management and the other programmes in the agency.

(6) Evaluation of Programme Effectiveness. Feedback and evaluation are necessary to re-align the programme and help plan future activities.

(7) The Need to Sensitize. The target clients need to be sensitized to the usefulness of the technology information packages.

Chart 1

Technology Information Services Using Mass Media

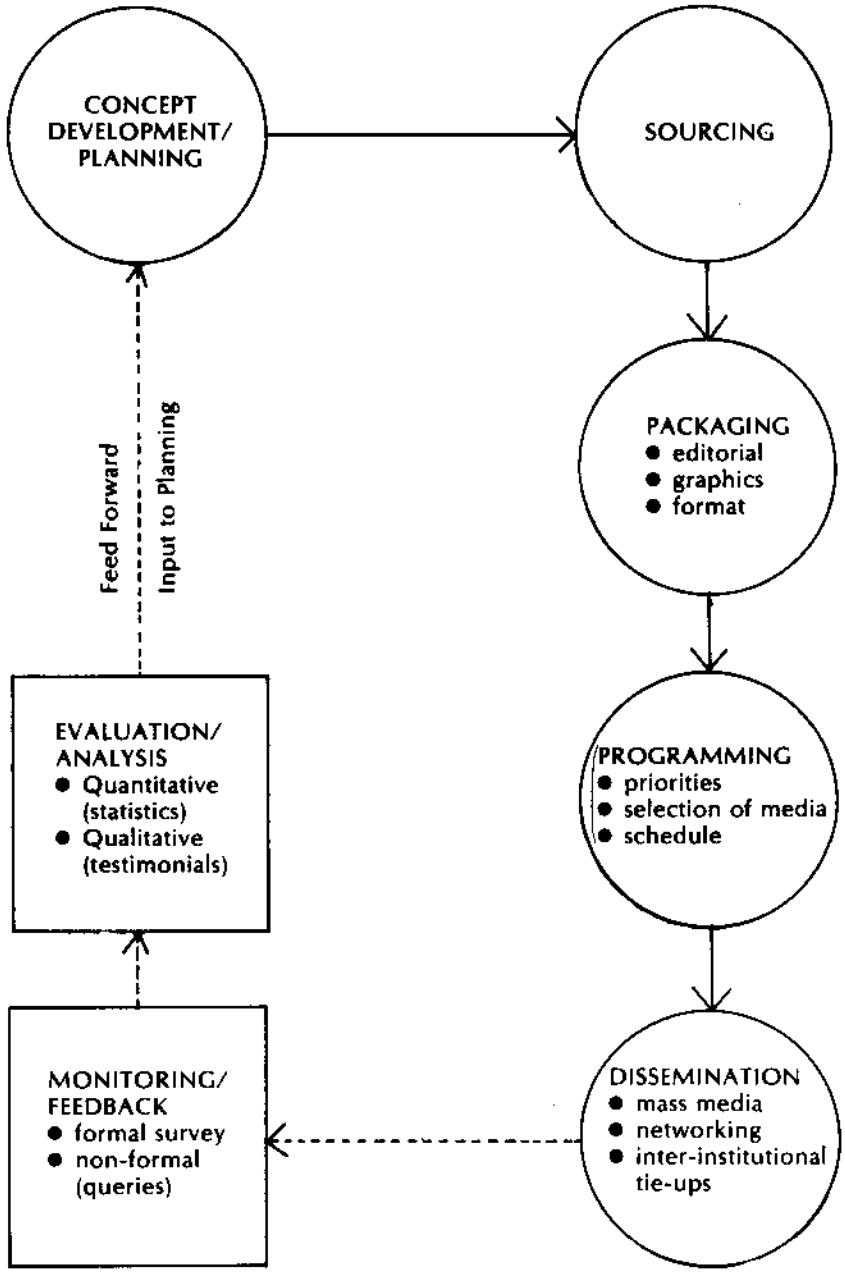


Chart 2

Technology Information Dissemination Process Centre

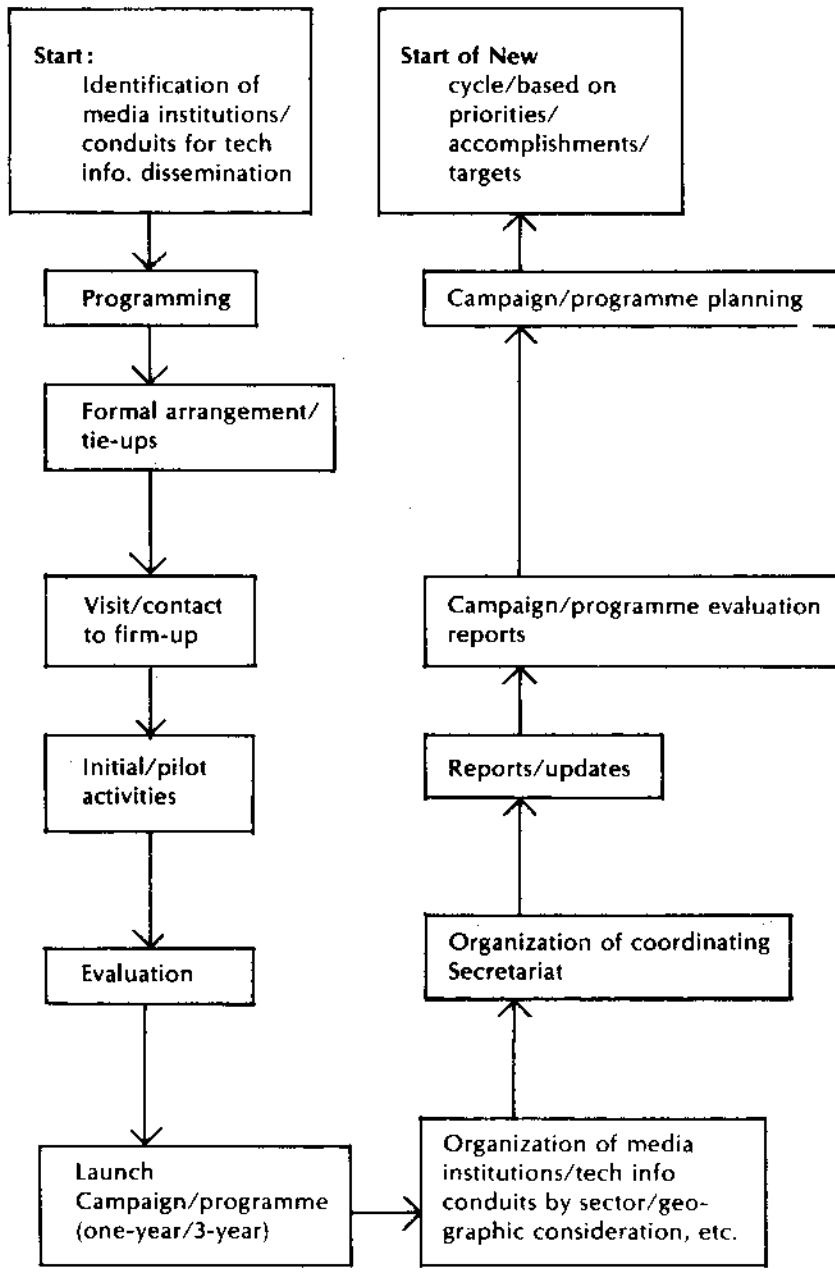
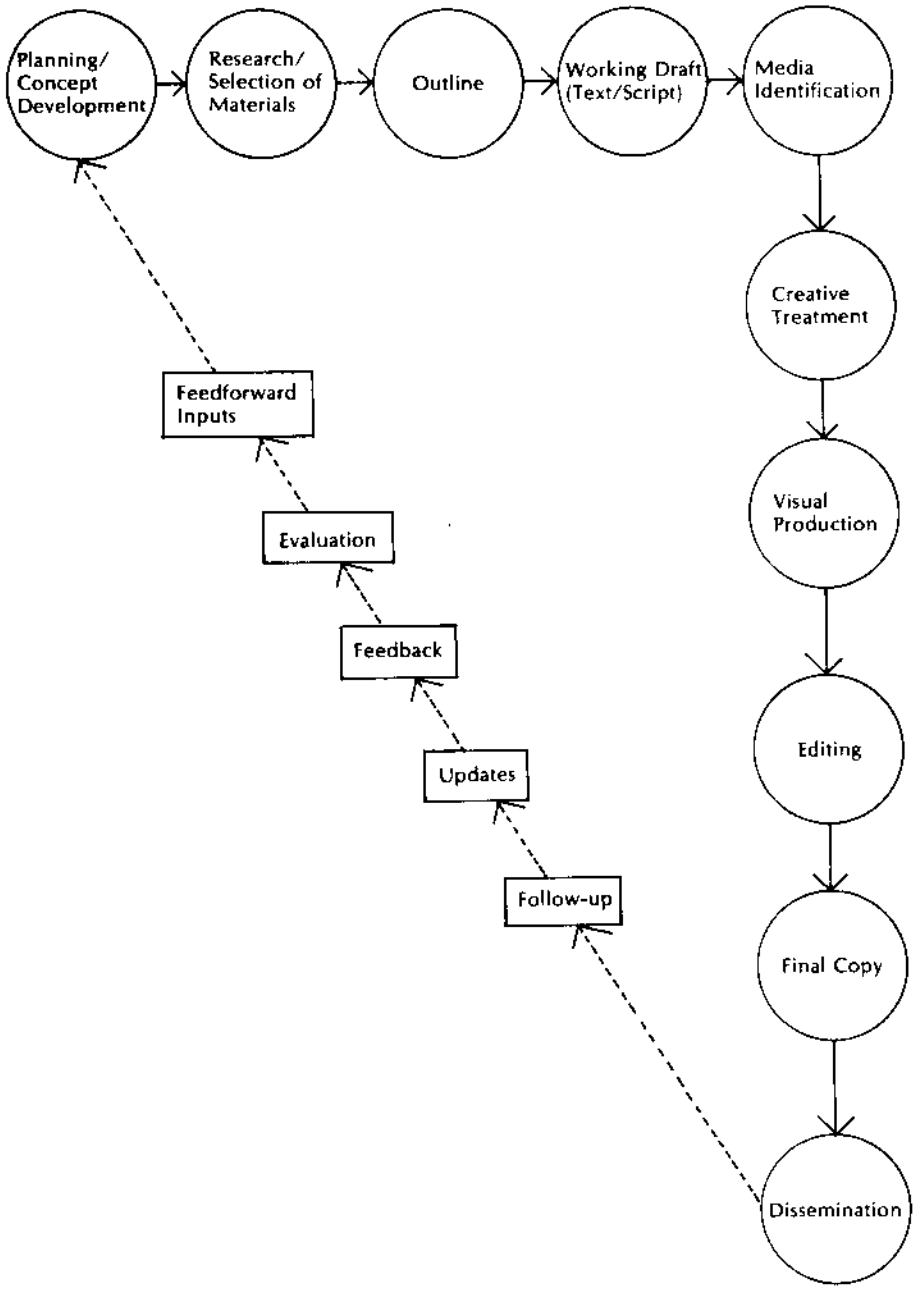


Chart 3

Technology Information Packaging Centre



To improve packaging of technology information you may wish to run down through a checklist of questions.

1. Have you identified your target clients?

2. Are you familiar with their needs and nuances?

3. Have you done scanning of opportunities for you to develop packages for the target clients?

4. Have you decided on the mix of the media to deliver the information?

5. Based on the mix of the media, are you packaging the information in a style that appeal to your target clients?

6. Are you maintaining contacts with the various media to help you refine the packages?

7. Are you getting feedback from the users regarding the packages?

7

Disseminating Technology Information

If we could conceive of technology information service as being divided into supply and demand, technology information dissemination is the main linker to the demand side. The failure of many information programmes could be traced mainly to the breakdown in dissemination. No matter how elaborate and useful is the supply side, it would be useless if not linked to the demand side.

The main task of technology information dissemination is to reach technology information end-users, who could make use of the information in taking a decision on investments or technology application. End-users are mainly investors, firms and entrepreneurs. In addition, dissemination should also reach those crucial to the operations of the technology information service. These would include sources who sustain the supply of information, facilitators/communicators who re-disseminate the information to their respective clientele, and top decision-makers who affect the flow of technology transfer and development and who wield influence over the survival of technology information service and the agency it operates from.

Direct users such as firms and entrepreneurs would be the ultimate target of technology information dissemination. In the case of HKPC of Hong Kong, reaching the end-users directly works effectively. Hong Kong is small and has very good communications infrastructure. Moreover, its packages and servicing of queries are directed at only a few hundred manufacturers/exporters, who are key elements as far as maintaining the competitive level of Hong Kong in the export market is concerned.

Technology information service in many other developing countries, on the other hand, has to reach a wider audience and operates in a vast area with poor transportation and communications infrastructure. To go one on one with direct users would not only limit the outreach but would also be an expensive proposition. Thus, a technology information service would have to work

closely with facilitators/communicators such as the mass media and trade/industry associations who in turn would re-disseminate the packages to their respective clients. This approach has been tested by APCTT and TRC of the Philippines in disseminating information.

Planning Dissemination

As it is in organising each component of technology information service, the dissemination of technology information also has to be planned as if it were a programme or a project proposal. One has to go through defining long- and short-term objectives, outputs, inputs, workplan and resources for implementing the programme. These steps have been discussed in Chapter 2.

When going through the steps, there are certain considerations to be kept in mind. As mentioned earlier, there is a need to focus dissemination in terms of priority areas and target clients. Usually, priority areas are in terms of sectors and subsectors, such as energy and renewable energy, while target clients are groupings, such as households, small enterprises, etc. Focusing could further be refined as in the example of HKPC where its information packages are product-specific and targetted only to manufacturers engaged in producing such products.

There is a need to know more about the target clients needs, nuances and capacity to pay for the information. Where feasible, a survey should be conducted. For instance, should the packages be sent only to large manufacturers? Should there be concessionary rates for sending information packages to small enterprises? etc.

The technology information service should also scan for opportunities that open the way for introducing or expanding the dissemination of technology information. Opportunities occur not only when end-users express a new or expanded need or when more end-users are identified but can also come from a facilitator/communicator, such as a newspaper that wants to introduce a column on technology and needs assistance in packaging the information.

In defining objectives, it would be more practical to think in terms of demonstrating immediately the impact of disseminating technology information. Which mix of technologies would find immediate usefulness and hence, would be easier to disseminate immediately? Should dissemination blanket immediately the whole country or should it concentrate first within the capital city and the surrounding areas where most end-users congregate and where catching the attention of policy-makers might be easier? Getting quick acceptance of technology information dissemination from end-users and from top management paves the way for organising a more extensive exercise in disseminating technology information in the future.

Once technology information dissemination is underway, there would be a need for periodic feedback to refine and improve the scheme. Periodic surveys of users' needs could be conducted. The monitoring sheets on servicing quer-

ies could be reviewed periodically in terms of nature, volume and origin of queries and effectiveness of replies so as to spot weaknesses in servicing queries and in disseminating information. Where there are fewer queries than expected from certain countries, the dissemination of information to these countries has to be re-examined. Visits to sources, such as R&D centres, firms and technology fairs, would also help in getting an idea of the technology information to be disseminated. Periodic dialogue with facilitators/communicators, like the mass media, chamber of commerce and agencies promoting small industries, on the use of the information packages would also be useful.

These considerations would get clearer when we discuss disseminating technology information through the print, broadcast and special purpose media, continuing education and in-house publications.

Disseminating through Various Media

Print Media

Disseminating technology information through the print media calls for a strong media relations work. As building and maintaining the media relations involves cost, the technology information service should get support from management for this activity.

The technology information service may designate media coordinators for print, radio/TV and special purpose media. If the technology information service operates with a small budget, the coordinator may be the only liaison officer not just for the print media but also for the broadcast and special purpose media.

In case liaison work with the print media could be done by a team, the work could be divided in terms of number of newspapers and magazines and also of geographical location. Perhaps, a separate liaison officer would be needed to maintain contacts with provincial papers.

The liaison officers should not duplicate contacts. This way, goodwill and expertise would be built up on each contact—in the same way an account executive of an ad agency handles an account—accountability is established, there will be wider coverage by the whole team, and the chance of cross-signals would be reduced.

As explained in the previous chapter, using the print media would require familiarization with the needs of the press and work schedules of the editors. Thus, not only should the content of the packages be adjusted but the release of the packages should also be timed accordingly.

There are times when a press conference or briefing session is called for. Usually, this is tied with a major event or project that has news value. To maximize press mileage, technology information service should prepare press

kits containing fact sheets (statistics, names and places), a backgrounder (a document which provides references) and suggested press story along with pictures. A small souvenir or memento may also be given to the press people as a token of appreciation.

A more lasting arrangement is to have formal or informal institutional tie-ups with newspapers and magazines wherein the technology information service would provide the regular supply of print-media packages.

To ensure rapport, the liaison officers should maintain refular meetings with the press people at places convenient to the latter.

Broadcast Media

While the general steps involved for breaking into the broadcast media programmes are basically the same as those for the print media, work is different for the simple reason that the organisational set-up and the people involved in broadcast media are different. To break into broadcast media programmes, we have to think about time slots, play dates, audience, and broadcast kilowatt power. For instance, it would not be practical for the technology information service to concentrate on the news programmes alone as this is only a small percentage of the broadcasting time. More mileage could be gained by targetting talk shows, entertainment specials, dramas, variety shows, commentaries and public service programmes which take most of the broadcasting time.

Some broadcast media networks sell their time to "block timers". These are broadcast commentators or producers who pay the network for the use of certain broadcast slots for their own programmes. They, in turn, sell time for commercials, sponsorships and spot announcements to advertisers to cover the cost of the airtime and production. This is true for both radio and TV.

Networks produce a large portion of the programmes with support from advertisers and co-sponsors. "Prime time" hours, which command a high listening and viewing rating, are sold at a higher price to advertisers. If the network has a high rating for a particular slot, it enjoys a comparative advantage over other networks.

Kilowatt power is also an important consideration. There would be no point, for instance, releasing packages on farming and fishing technologies to stations at urban centres with only 10 kilowatt power. With this power, these stations would not be able to reach the fishermen and farmers who usually live well away from urban centres.

Let us discuss in detail the steps to be taken for getting optimum coverage and support for technology information dissemination using the broadcast media.

When dealing with block timers, entering into a long-term arrangement is not advisable because block timers have a limited period of broadcast run. Moreover, if the programme does not rate well, the network may exercise its

option to terminate it. If the technology information service is locked in with the block timer, then its package is prematurely taken off the air.

It is difficult to swing a free exposure or insertion in block time programmes. Insertions usually are costly. One way to reduce cost is to go into a *quid pro quo* arrangement. For instance, an agreement can be made with the block timer that a short-run technology show will be provided at no cost to the block timer in exchange for a mention of a post box number and telephone number to facilitate inquiries from viewers.

Another consideration to keep in mind would be the programming strategy of the network. That is, the time slots assigned to programmes from sign on to sign off. Segments of the listeners and viewers are scattered throughout the programme spectrum to allow network penetration and programme appeal. The basic approach would call for a one-to-one matching of programme and segment. For instance, a programme on fisheries should be aired at a time slot when most fishermen are likely to tune in. Of course, this would call for an extensive knowledge of the clientele - their work hours, leisure, listening habits, etc.

Because of the high costs associated with broadcast media, a technology information service could go for short messages or "stingers", ideally of less than 30 seconds duration. These stingers could be inserted during station breaks or free time without disrupting the regular programme schedule. The trick is to spread out the stingers along the broadcast hours. The lesser time-frame is of no consequence because the broadcast media has more personal appeal than, say print media. A captivating voice, a striking visual could more than compensate for the lesser exposure time. And if the stingers are strategically placed and spaced, they would have, collectively, more impact than a 10- or 15-minute straight show.

In summary, the dissemination of technology information through the broadcast media calls for responsive and selective matching of time slots with appropriate information packages beamed to specific segments of the listening and viewing public.

Special Purpose Media

As it is with print and broadcast media, the technology information service must maintain liaison work with various groups, such as appropriate technology groups, trade and industry associations, etc. This would help ensure that packages and the timing of their release are adjusted according to the needs of the specialised groups.

As each group has its own concern, the "what is in it for me" angle will guide packaging. For chambers of commerce, the package should be to help their members make a decision on investments and technology application; for the women's organizations, the package raises their members awareness of tech-

nologies useful for households and for micro-enterprises; for development institutions, the package helps the lending officer advuse potential borrowers on which technologies have a market potential; for policy-makers, the package helps them keep abreast of trends in technology policies and organisational structures; etc. In some instances, the technology information service may also assume the role of a secratariat for the technology project of the specialised groups.

Keeping a regular presence with these groups is important. The technology information service may make presentations on technologies to these groups. It could also give demonstrations on various technologies to communities in collaboration with these groups. The technology information service could also depute an officer to do bi-weekly visits to the headquarters of these groups. KIET of Korea, for example, has an officer visiting the Chamber of Commerce regularly.

Technology information services that are located away from the financial and industrial districts of the important cities will have to make additional arrangements to deliver the goods effectively. Many potential clients may find the distance overwhelming and end up not making full use of the facilities. It might help the technology information service to open sub-offices, perhaps just a desk manned by a single officer and located preferably on the premises of the local chamber of commerce or manufacturers' association. The sub-office will do liaison work and serve as a drop point to receive queries, which could be later sent in batches to the main office for servicing. It would be better to start with one such sub-office, and increase the number after the system is refined enough.

Continuing Education

Continuing education is another effective means of disseminating technology information. It could be offered at the premises of the technology information service or fanned out throughout the country with the help of learning institutions and extension service workers. It could be in the form of regular courses with practical orientation, seminar/workshop, night classes, etc. TRC and HKPC have such activities undertaken on a regular basis.

In-house Publications

Disseminating technology information through in-house publications is a much easier proposition. If there is a budget, a decision could quickly be made in putting out some in-house publications. The more difficult part, however, is in maximizing the outreach of such in-house publications. As their packaging is generally poor, their appeal, vis a vis other publications, is low. Yet, even if they are well packaged, their outreach would still be limited as compared to other media. For example, a newsletter with 3,000 circulation reporting on a technology item would not catch as much attention as a newspaper would when it reports on the same item.

The most common practice to disseminate in-house publications is to go one on one with the potential recipient. Usually, this is done through a subscription. To gain more attention, the technology information service would use the conventional methods of publishing houses by giving samples, exhibiting the publications at technology fairs or book fairs, and working out some arrangement with distributors. A regional institution was inventive in asking its officers going on mission to leave copies of its periodical in airport lounges and this resulted in getting subscription from businessmen outside of the region. Another agency makes full use of its continuing education courses to unload its in-house publications to target clients.

Advertising the publications in newspapers and magazines could be costly. A way around it is to go into a quid pro quo arrangement with the magazines where an ad of the magazine could be inserted in the agency's periodical free of charge in exchange for a complimentary insertion of the advertisement of the agency's periodical in the magazine. APCTT, for example, has such an arrangement with *Asiaweek* and the *Asia Conventions and Exhibition Review.*

Measurement of Dissemination

Among advertising agencies, the performance of the ad is measured in terms of cost effectiveness and cost benefit. Because the ad involves a cost, its performance has to be measured to justify the expenditure. Technology information dissemination can also be measured in the same way.

One way of quantifying the benefits of technology information dissemination through the mass media is to measure the cost per thousand (CPT). For every dollar put in, how many people were reached? Using print media as an example, we will know our outreach by computing the cost of putting the advertisement against the circulation of the newspaper among the target clientele. But this is not quite enough as it does not tell us whether the dissemination had been fruitful. That calls for further indications.

Some of the conventional indicators used for measuring the reach of technology information disseminated are as follows.

- More facilitators/communicators request for the information packages;
- The contents of the information packages are being repackaged and redisseminated by facilitators/communicators who are not regular recipients of the information packages;
- More sources of information, which did not have any previous transactions with the technology information service, are sending their materials or are visiting the agency owing to the dissemination of the information packages;
- More queries are being generated as a result of the dissemination of information packages.

We have limited the discussion mainly on disseminating technology information through the print, broadcast and special purpose media, continuing education, and in-house publications. There are other means of disseminating technology information – i.e. the use of cinemas which is popular in South Asia, video-tapes which are used in rural areas and in technology fairs, roving technology fairs, folk theatre which is used by agricultural chemical companies to attract farmers to their products, use of learning institutions and extension service agents to disseminate technology information, etc.

There are no standard formulas on how to make contacts. Having a nose for opportunities and ingenuity to take advantage of such opportunities help. Personal touch is also a must in this region known for personalised transactions.

To recapitulate some points that could help an agency organise its technology information dissemination, here are some checklist questions:

1. Have you focused the dissemination based on priority areas and target clients?

2. Have you worked out the mix of media to be used for disseminating information?

3. Have you conducted a survey to know more about the need of the media people?

4. Are the packages and the timing of their releases adjusted according to the needs of the media people?

5. Do you maintain close liaison with the various media people?

6. Are you constantly looking at opportunities where dissemination of information could be initiated or expanded?

7. Are you evolving your dissemination schemes to show immediate impact?

8. Even before you have a clear idea of the total plan, are you testing your dissemination schemes?

9. Do you have feedback mechanisms on the implementation of your dissemination schemes?

8

Servicing Technical Queries

Query service is an integral part of any technology information service. It enhances the possibilities of making effective use of information acquired at considerable expense of financial and human resources and also provides a basis for evaluating the effectiveness of technology information service. Without a query service, the technology information service that limits its activities to sourcing, packaging and disseminating information would be no more active than the popular magazines that feature technologies and provide referrals.

After all have been said and done about how to organize technology information service, the test of its effectiveness eventually redounds to the number of technical queries being generated from the targetted public and the quality of servicing the queries as measured by the extent to which the information provided has answered a technical question, facilitated a technology decision, such as expanding production or increasing investment, or helped in syndicating a technology venture.

The volume and type of queries being generated provide a feedback by which the agency could assess and reorient its operations. For instance, if the agency's information packages reach an audience of two million but the number of queries generated would only be 200 a year, its strategy needs to be reviewed. The agency may be reaching the wrong audience, the items being featured may not be interesting or the packaging of information may not be attractive. If most of the queries received deal mainly with science rather than technology and if they come mainly from the curious general public or academics rather than people in a position to expand or start ventures from the use of the information, such as entrepreneurs and investors, the agency also has to review how its corporate image as a technology agency is being projected, the kind of information being disseminated and the type of clients being reached.

Even the format of the query letters reveals the effectiveness of the technology information service. A simple rule of thumb, used to identify information users from the industrial sector, would be the format of the letter. If most of the queries are typed in letters with letterheads, the chances are that the agency is reaching the right audience. (Of course, the agency has to expect that queries regarding technologies for households might likely come as hand-written letters). In addition, the specificity of queries also measures the success of the agency in dealing with technology information. The more general the queries are, the less sure and probably less serious the inquirers are about the use of the information. It also indicates how little the agency has succeeded in projecting its corporate image that it deals primarily with technology information that is product or process specific.

What Generates Queries?

The probability of technical queries being generated is usually higher when there is a healthy or expanding economy. For, there can be no technology ventures when there is no investment. While this observation holds true in general, it cannot be stretched too far either.

That more queries could be expected from a vigorous economy or an open technology market does not necessarily mean that queries would be forthcoming. There are countries in the region importing technology worth millions of dollars without any effort made to secure information that would help appraise the appropriateness of the technologies offered by foreign sources. This happens because the domestic firms either do not realize the need for further information or if they do, they are not aware of technology agencies that could provide the information.

On the other hand, that an economy is stagnant does not mean that technical queries could not be generated. Hard times can just as well propel enterprises to find better ways to improve production or competitiveness or seek alternative ventures to go into because challenge forces human response. Many of the renewable energy and waste utilisation technologies, for instance, came as a response to the oil crisis.

Assuming a situation where opportunities to expand or start ventures do occur, there are certain conditions that encourage the generation of queries.

Just as it is in marketing a product, it is of course basic that an agency that expects to receive queries, should have a product (in this case, technology information) to offer to the target clients and that it is reaching the target clients. How the target clients would respond depends, among others, on (1) the agency being known, (2) the agency being perceived as accessible, (3) the effectiveness of its dissemination programme, (4) efficiency in responding to queries, (5) the cost of servicing the query, and (6) the agency's reputation.

The experiences of APCTT and the few successful technology information

agencies in the region such as KIET of Korea, HKPC of Hong Kong, JICST of Japan, CSIRO of Australia and TRC of the Philippines attest to the need for the above ideal conditions to exist for queries to be generated.

It is important that potential clients should be aware of the existence of the technology information service and the agency. Closely correlated to knowing about the existence of the agency is the perception of its being accessible. In some countries in the region, the major S&T agencies are located 20 to 35 kilometeres away from the centre of the city. The long distance is enough to discourage potential clients from visiting the agency. There is also the case of a large technology information agency in a capital city of more than 5 million people not reaching many clients because its idea of dissemination was to have clients visit its single library. This problem of physical location could have easily been overcome if the agency had sub-offices to attend to the information needs of different parts of the city and made this arrangement known to the potential clients through the mass media, user's education and visits to trade and manufacturing associations.

The effectiveness of the information dissemination programme can, to some extent, be correlated to the number of queries generated, provided the queries are from the targetted section of the public.

The quality in servicing queries in terms of prompt replies and supply of information required helps strengthen the reputation of the agency and gets repeat requests from contented clients. The level of providing a response could range from giving an address of a source to providing at least three technology choices. Giving just the address, which is useful, is no more different from what a magazine featuring technology items could do. To leave the standard of responding to queries at this level does not enhance the image of the agency. Confidence of clients builds up depending on the ability of the agency to provide the widest choice and farthest details possible on technologies.

Closely related to effectiveness is the cost of servicing the query. As mentioned in the discussion on technology information service as a national investment in the opening chapter, the fees for servicing queries would hardly cover the entire cost of operating the technology information service. What would be at issue then is how much of the cost has to be recovered. Initially, a government agency may attract clients by offering the servicing of queries free of charge, then asking for a nominal fees, and then graduating to a subsidized commerical fee. How much higher the agency would charge has to worked out according to the capacity and willingness of the clients. Beyond a certain point, the level of charging may prevent potential users from using the facilities offered by a technology information service.

Once the agency is known to the clients and perceived as accessible, it should work on building up its reputation. There is no substitute for developing a good reputation than solid good work. But this alone is not enough to guarantee a good image. People may not know about the good work unless it is announced to them. Just to empahsize this point, think of the many hardwork-

ing people in your agency who deserved to go up but never made it because their deeds were neither known to nor appreciated by the higher-ups. The agency must not overlook the use of imaginative corporate image projection to establish a positive image before its clients. This projection should start even if the agency has not yet built up an extensive work structure. While APCTT was still fine-tuning its technology information, its regular mass media releases conveyed to the potential clients its desire and readiness to service queries.

Having embellishments by way of testimonials appearing in the mass media or spreading by word of mouth helps cement the image. A good image attracts more clients. Technonet Asia, based in Singapore, does not maintain an in-house collection of technology information and relies more on its network of member institutions to provide the information. But because of its high reputation in servicing the needs of small and medium industries, it receives many technical queries from throughout the world. Despite the comparatively higher cost of its information, JICST of Japan has attracted more than 3,000 password holders for on-line information retrieval.

Speeding Up Query Servicing

Servicing of queries could be a tedious task. How quickly and well an agency could service a query depends on whether it has ready information within or an easy access to the information from the outside, and how its dissemination programme is oriented towards its strongholds. Having the right strategy and doing preparatory work are basic ingredients in speeding up the servicing of queries.

1. Having the Right Information

Storing scientific information is not cost-effective if the main task of the agency is to service technical queries. It would not also be practical for the agency to be storing data on sectors which it is not mandated to cover. Having the right information is very much dependent on knowing what the clients require. Hence, as mentioned in the chapter on knowing the audience, formal and informal surveys to know what the target clients want are to be taken up as an essential component.

Even without a survey, the technology information service can learn with time, what the target clients want. But such a passive attitude could be costly, as it would be quite some time before a definite pattern can be discerned. An agency should be able to perceive queries as per priority areas. At APCTT, for example, about 24% of the queries pertain to food processing, 20% deal with renewable energy, 15% on low-cost construction and 11% on microelectronics. At UNIDO, 29% of the queries sent to INTIB are on industrial chemicals, petrochemicals and pharmaceuticals, 26% deal with food processing and agro-industries, and 18% pertain to capital goods and fabricated metal products. The technology information service, similarly, should also know what type of information is required. At UNIDO, 43% of the queries ask information on manufac-

turing process and know-how, 33% on equipment and machinery suppliers and 6% on research and development. Only 2% ask about raw materials, 1% is interested in quality control, 1% wants to know about marketing and another 1% is interested in patents. Such information should guide the Sourcing Section on what materials to be sourced for ready reference by the Query Section.

2. Access to Outside Sources

No matter how big the agency is, it cannot hold all the information needed. It, therefore, must maintain some arrangement to source information from outside sources on an exchange basis or preferably under some concessionary rates.

3. Servicing Queries with Ready Information

Many technology information agencies may not be in a position to begin the operation with a large number of staff. Hence there could be misgivings about the volume of queries it can service in different areas. But this should not be much of a problem, going by APCTT's experience, if the correct strategy is adopted. A simple rule is that the agency should not package and disseminate any technology information that cannot be supported with additional details, such as the infrastructure requirements, scale of production, unit cost of production, terms of transfer, etc. A release in mass media would attract a host of queries. So by the time a package is released to the media, the Sourcing Section should have acquired all the necessary information and passed them over to the Query Section. Such an arrangement not only makes the work a lot more easy but also helps in generating a favourable impression on the clients since most of their questions can be answered promptly.

But the generation of queries is not limited to releases through mass media. Once the name of the agency gains currency, a number of queries would be forthcoming independent of the releases. These would, evidently, take a longer time to service. If the agency is mandated to cover only a few priority areas, it is advisable that it makes this very clear. Though such a move will not cut out the independent queries totally, it would certainly help reduce the volume of such queries. No single agency, as mentioned earlier, can cover all the areas. It is better that an agency decide at the very beginning that it should bite only what it can chew. At any time it is more desirable to provide quality service restricted to a few areas and build up credibility than spread the resources thinly over a wider area and be criticized for inadequate services.

4. Constant Repackaging and Updating

Sharpening the skills to respond to queries involves exercises in searching, retrieving, constant updating and repackaging of information. Updating depends largely on the trends of information needs as shown by surveys, information market statistics and the nature of queries.

Regarding repackaging, this is done on case to case basis depending on the

query. Sources may send many information on various technologies. Such information are treated as "raw information". Only the relevant portion from various materials would be extracted and then repackaged to conform to the requirements of the query.

Steps for Servicing Queries

Step 1: Upon receiving a query, the concerned information officer should determine the priority for responding to it. For instance, top priority may be given to parties who can start or expand ventures from the information provided, such as investors, entrepreneurs, development finance institution, etc. This decision has to be taken at the top management level, giving due consideration to the agency's mandate, its primary and other publics, its priority areas, etc.

Step 2: Determine whether the query is very specific to warrant a specific reply. This would help the agency service the query immediately. If the query is very general, as is often the case, it would be better to ask for specific requirements than play Sherlock Holmes and try to deduce what the enquirer wants. A technology information service is not a general information desk. The more specific the queries, the better would be the opportunity to provide useful information and achieve credibility.

Inform the enquirer frankly but politely that unless request is made in more specific terms, it would be difficult to provide exact and useful information. May be his need could be better serviced by an investment consultant than a technology information agency. Remember that an agency will be judged by the quality of information it provides. And once it is provided, excuses like "this is what we thought you wanted" will not cut any ice in the information market.

Step 3: If the query could be responded to, then search for the information. Once the information has been located and deemed adequate, send a card indicating the cost of providing the material. The cost, which is fixed by the agency, usually covers decumentation, handling charges and if possible, some profit. The card would also instruct the enquirer that if interested, he has to send back a portion of the card carrying the number assigned to him by the agency along with the costs mentioned. Upon their receipt, the information is duplicated and sent.

Step 4: In the event that the information is inadequate or absent within the agency, the agency should still send a form letter immediately stating that search is going on and that it would revert upon securing the information. It is like ordering a meal in a restaurant. The client would not mind the order taking 20 minutes to prepare if a waiter immediately asks for the order. But the client would be annoyed if he spends 20 minutes waiting to be attended to even if the order takes only five minutes to prepare.

Depending on the information required, the agency could proceed to source the information from outside sources. In case the agency has to secure it

from a commercial data base where searching, for example, may cost $ 10 and documentation another $ 60, the agency must communicate this cost to the enquirer before proceeding further.

Step 5: Although an enquirer may ask only for a particular technology, the agency should strive to upgrade its query service to a level where it could provide the enquirer 2-3 alternatives. Studies made on how users came to ask for information show that many queries resulted following good words from friends or colleagues. It is possible that when the interest on a particular technology was aroused, the enquirer may not have been aware of alternatives and, perhaps, better options.

Step 6: While the query may deal only with technology, the agency should also try to give information on the market if this is available. APCTT, for example, has received queries on activated carbon from a few entrepreneurs in a country where there was already an excess of production capacity.

Limitations of Sources

On many occasions, it may happen that the information is not within the agency and hence, has to seek the assistance of sources of the technology or of the technology information. Below are some of the limitations and samples of some responses, indicating their limitations, when approached for assistance to service queries.

1. Lack of technical specificity of the user's requirement:

   "... this type of equipment cannot be offered on a simple request but needs thorough engineering and consulting in respect to a precise application form"

   "... As all deposits have their own minerological composition, they carry also their own treatment chacteristics., i.e. the treatment of each one requires its individual flow sheet. Such a flow sheet can only be developed with chemical, physical and minerological research work succeeding bench test work."

2. Lack of information on the user's financial and industrial capacity:

   "... technology is available for use. However, before we can even consider discussions with and provide you with further data, we need details of the requesting company so as to determine whether or not it has the financial ability to set up this multimillion dollar project in ..."

3. Latest technologies are not available for transfer:

   "... At the present time, we have not considered licensing our technology to build this equipment."

"... We may not be able to help you as we do not advertise the constituent parts of our products as being for sale to other companies who may wish to build them in their own machines."

4. The technology supplier wishes to deal directly with the user:

"... It is our policy to deal directly with any interested party. Please have enquiries sent to us directly and our technical staff will follow up as appropriate."

5. Constraints owing to company policies and procedures:

"... We are obligated to deal with our company agent in that country and as such, we cannot offer the technology directly to the agency referred in your letter."

"... We have already had a talk with a concern in your country for technical collaboration. Thus, we are not in a position to offer assistance this time."

6. Structural and policy constraints of the data banks:

"... Information and documentation in the technology utilisation programme is not available to requestors and organisations based outside the United States."

"... The technologies in our data bank are not available to companies other than our clients."

"... Our data base is a bibliographic one and does not contain information on the type (i.e. technology suppliers) needed. Therefore, it is not possible to respond to your query."

Feedback

Having a regular feedback system consisting of formal feedbacks through questionnaires sent by the agency to inquirers, and informal feedbacks that come by way of unsolicited letters and comments are necessary to help the agency assess its performance and re-orient its technology information service to become more effective and efficient. Thus, when responding to queries involving technical answers or technology alternatives rather than just addresses, the agency should send along, as is the practice of established trade and technology information agencies, a one page feedback form for the enquirer to indicate whether the information is useful or not. If useful, he should specify how it helped – i.e. in answering a technical question, by giving new sources of technology, in making the decision to expand investment or upgrade production, in starting a new venture or abandoning the intended project, etc.

Assessing the Usefulness of Information

At APCTT, the feedbacks are tabulated into two groups: those that indicate the usefulness or non-usefulness of the information, and those that point to active transactions for technology venture syndications as a result of the information.

In the first group, the main concern is on how information has helped the enquirer make a technology decision. If the enquirer has plans to increase investment, expand production or start a new venture, the information should help him realise whether the technology in question is appropriate to his needs, whether it needs modification before it could be utilised, whether the current market can absorb it, and whether the technology is within his financial and production base. That the enquirer may abandon the project as a result of the information does not mean that the information is useless. It might have saved him from pursuing a losing proposition.

In the second group, the main interest is on the number of active transactions for technology upgradation and technology venture syndication, how many of these deals have been closed, and where information is available, the financial implications of the transactions. It may be pointed out that successful syndications are not due only to the quality of the information; many exchanges between the parties are needed to bring them to terms, and such transactions are usually passed on to the department dealing with technology venture promotion for follow up. As a rule of thumb, about one-fifth queries would have a good potential for immediate technology upgradation or technology venture syndication. These queries would be brought towards active transactions in the hope of matching the source with the potential user. Out of these, one or two will end up in technology upgrading or venture syndication. If one wonders on what appears to be a very low percentage from initial query to actual venture syndication, he should know that even in proposed joint ventures where the terms have already been agreed upon and registered with the Board of Investments or the Technology Transfer Board, a sizeable segment does not get off the ground for one reason or other.

Management Information

For future planning, the Query Section should maintain management information of its operation such as the number of queries, breakdown of queries by region, by sector and by type of users, percentage of queries by sector responded to using information from within and from outside sources, the average response time to queries by sector, and the average number of options given to a query. In addition, it should maintain the feedfack table. The above information helps management diagnose where the technology information service might be weak, let us say, in terms of sectors, of geographical outreach, of reaching the right audience, or of being able to provide the information required.

Once more, it is emphasized that servicing of queries is an integral part of

technology information service. To ensure that the right steps are taken in servicing queries, below are the checklist questions.

1. Upon receipt of a query, have you determined the priority for responding to it?

2. Have you determined whether the query is specific enough for you to respond to immediately or whether additional details are needed from the enquirer?

3. If the query can be responded to immediately and the required materials located, have you determined the cost and sent the invoice to the inquirer?

4. If the information required is not within the agency, have you sent a form letter stating that the search is going on while you proceed to source from outside sources?

5. Are you able to alert the enquirer to various options?

6. If the material is with your agency, are you conveying related information such as market potentials or policies related to the technology under query?

7. Are you monitoring the type of enquiries, the priority areas, and the kind of information required?

8. Are you sending feedback forms on how the information has been used?

9

Computerisation of Technology Information

In the chapter on processing of technology information, we have identified the basic requirements for storage and retrieval of information. The creation of a "record" to represent each document is the principal means of enabling access to documents of information. The record identifies the existence of a physical entity or document and its information content.

A collection of such records constitutes a "file" of the information being held. Such files could be just lists created in a pre-determined order of card indexes with multiple cards for each documents to facilitate easy access to the many separate types of information represented in the document.

Before the advent of computers, the records or files were organised manually. But now the same files are mostly processed in a computer. When we talk of computerising information for storage and retrieval, we are simply creating a file or series of files of the individual document records. But we are not concerned only with a filing order or creation of multiple copies of the record for filing at appropriate points with all the physical constraints that apply to manual systems. Neither is it just the transfer of the old card format to the computer file. We are talking of something more, of enhancing the record for more productive use through the much greater versatility provided by computerisation for access to and manipulation of the records.

The long-standing popularity of the card index system stems from the flexibility it provides for additions without disrupting the filing scheme and for multiple access points without excessive re-writing or re-typing of records. If the files are computerised, the computer can pick out records even much faster and produce outputs for the requestor in more varieties of formats to satisfy the requirements of the query. All these are done without re-editing and with minimal intellectual intervention.

That a computer is available does not mean that all existing manual systems should automatically be transferred to the computer. Each file must be ana-

lysed and a decision made whether it should be in the computer or not. Addresses for regular correspondences could be kept in a master file in the computer for recording purposes but not with the intention of discarding the address cards. In a computer with configuration for multiple entry for different users, the access time may be more. Thus, for day to day retrieval, the secretary would find it more practical to have nearby the file of address cards. That a computer does not exist, on the other hand, does not mean that a current manual system be maintained as it is. The possibility of future computerisation should be borne in mind so that the structure and format could be designed accordingly. For example, the manually organised file on technologies could be designed to include more elements for easy computer storage and retrieval so that when a computer becomes available, file transfer would be easy.

Structuring the Record for Computerisation

In manual filing, the record is structured. The record is created with logical separate elements. To repeat the example on creating a record for reports as mentioned in Chapter 5, we have elements for (1) author, (2) title of the document, (3) publisher, (4) details and number of pages, (5) keywords, and (6) address/number for storage location.

In structuring the record for computerisation, the same elements, called fields, could be retained. As long as searching is restricted to any of the above elements, i.e. author or keywords, then the above fields would suffice. However, if we were to look for a report published in 1980, the document may be retrieved by looking at all the titles published and then isolating those that were published in 1980. This is a rather lengthy and inefficient way of retrieving. To simplify the retrieval, we would need to add another field for date. Thus, when we look for documents published in 1980, we could direct the computer to search only for characters which represent 1980.

We could add a few more fields to a file which we may find valuable for anticipated use. For example, if we created a file on technologies available for transfer, and selection is influenced by the country of origin of the technology, then we would have to add a field for the country of origin. Similarly, if the choice of a technology is influenced by the degree of its commercialisation, a field for this purpose would have to be incorporated.

The degree of structuring for a file varies according to the output requirement of the system. Increased structuring, as shown by the above examples of adding new fields, would provide more capability to manipulate and generate varied outputs from the information. It also allows for more control for searching and retrieving the information. On the other hand, one must be cautioned against over-structuring. Putting too many fields could add more work to what already might be an over-burdened staff.

Computer Not a Prerequisite

Although we are living in the computer age, it is basic to start on the assumption that computerisation is not a prerequisite for effective technology information service. Think of the years before the United States had computers. It generated and stored its scientific and technology information well to bring it to the forefront of technological development. USSR has two million scientists for whom some 15% of the scientific and technology information has to be translated. But it was only towards the 60s that the wealth of information was being computerised. Many extension services for agriculture and industry in many developing countries are able to do a good job using scientific and technology information which are not computerised. We could also think of many technology agencies with computers but where the information stored is not being used adequately. With such examples we can say that computerization is not an integral part of a technology information service, at least for some time to come.

Just as a library is a support resource for an effective technology information service, so is a computer. Its use therefore should be seen in the light of how it enhances technology information service rather than having computerised technology information *per se* as the end itself.

There are many things to be done to make technology information service efficient and effective than just computerising the information. The resourcefulness to locate sources, the creativity to package the information for different users, the marketing skills to identify different users and their needs and the communication and extension service skills to reach the different users cannot be substituted by computers. Considering that many S&T information agencies have a good supply of materials but are not reaching adequately the different users, the above skills are probably more urgent today than skills to computerise information.

Computerisation, in the long run, however, is unavoidable. The world is fast computerising. The children are taking computer lessons as a matter of course rather than as special subjects in the same manner that bored housewives in developed countries occupy/their free time organising household activities with a computer. The trend in the field of information is towards on-line retrieval. While each succeeding generation of computers becomes more powerful than the previous one, the prices are dropping down to be within the reach of low-budgeted technology information agencies in developing countries. Thus, it is just a matter of time before such agencies would contemplate computerisation of their information system. The question is no longer whether to computerise or not but what, when and how to computerise.

What to Computerise

Every section of technology information from sourcing to servicing queries usually maintains files. The section on sourcing, for example, would maintain,

at the minimum, a file of sources of technologies from within and outside the region. The section on packaging information would keep a file of technologies featured and in what packages they appeared. Such files, which are maintained manually, could be the basis for starting computerisation. As a computer expert would explain, computerisation deals extensively with the organisation and keeping of files to enhance decision-making.

We will run through a list of the basic files that a technology information service can computerise. As it gains more expertise and resources, it could develop new data bases and where it is desirable and possible, even to allow for on-line information retrieval.

I. Sourcing

1. Directory of sources of technology

This is basically a directory of sources of technologies that the technology information agency is promoting as defined by its priority areas. The Sourcing Section would like to know as many technologies and sources possible, which sources have been contacted, what material has been received, where it is located, and the terms of technology transfer.

2. Technologies for transfer

This is a more refined list than the list of sources which indicates technologies available for transfer compiled from replies to sourcing letters, information provided by sources during trade fairs, walk-in clients, and from unsolicited communications. This file includes the title of the technology, technical description, main application, advantages, degree of commercialisation, which years and countries it has been commercialised, inputs required such as raw material, labour, equipment and operating capital, terms of transfer, and contact person.

3. List of technologies transferred to the country

This file lists the firms availing of technologies from abroad, the technology involved and the terms of transfer for which the transactions are recorded with the national technology transfer board. This file is useful to programmes on technology assessment, technology policies, and technology venture promotion.

4. Directory of consultancy firms

This directory lists consultancy firms that could assist in the utilisation of technologies which are being promoted by the agency. This file includes, among others, the name of the firm, address, the date of establishment, the size, and the track record in terms of projects done. This file is useful to the programmes on technology development and technology venture promotion.

5. Directory of experts

This is somewhat similar to the directory of consultancy firms except that,

instead of dealing with the agency's tract record, this file would be more interested in the technical preparation and the track record of the individual expert. This file is useful to the programmes on technology development and technology venture promotion.

6. Directory of small- and medium-scale industry agencies

Developing the small- and medium-scale industries is a top priority for most developing countries. The successful technologies of small- and medium-scale enterprises which could be transferred elsewhere are not always well documented. Such documentation could be done by agencies dealing with small-and medium-scale industries. Hence, the need for keeping a directory of these agencies.

7. Directory of technology transfer centres

Technology transfer centres are sources of information on technologies being considered for transfer and the terms of the transfer.

8. Directory of technology promotion agencies

Just as it is with technology transfer centres, technology promotion agencies provide valuable information on technologies available for transfer.

9. Directory of R&D centres

This file lists R&D centres by sectors or product lines both in the government and private sector, the researches being undertaken, the specific products and processes beyond the pilot stage that could be considered for commercialisation, and other services that the centres provide in terms of testing and consultancy.

10. Directory of S&T agencies

This provides the agency profile of S&T agencies in terms of objectives, main programmes, year of establishment, manpower, annual budget, and so forth. This file is useful to the programmes on technology policies, technology venture promotion and technology information.

11. Compilation of technology policies

This compiles policies affecting technology transfer and development both at the macro level (national technology planning) and at the microlevel (sector or product specific). It would contain, among others, a summary of the framework, the regulations, the incentives, the financial aspects and the structure for implementation. This file is most useful to the programmes on technology policies and technology assessment.

12. Serials

This is basically a monitoring file of the Librarian to check what material has been ordered and what has been received.

13. Technical articles in books

For technology information, the file on books is less focussed on the titles as it is on identifying and locating the articles in the books which could be referred to when packaging information or servicing queries.

14. Technical articles from journals

Just as it is in the case of the file on books, this file is not interested in the titles of journals as it is in identifying articles in journals that would help in servicing queries.

15. Reports

Like the other references aforementioned, this file is more oriented towards identifying the portions of or articles in reports which could help in packaging information and servicing queries.

16. Patents

This file contains information on patents organised along sectoral, sub-sectoral and product/process lines.

II. Packaging

1. Technologies packaged

This file lists the technologies, by sector and by origin, that have been packaged and in what form they were released. It also includes the technologies that would be considered for future releases.

III. Dissemination

1. Mailing list of publications

This would contain the list of recipients of the in-house publications of the agency with the fields inverted, i.e. programmed for quick access, by sector, country, type of firm and subscription.

2. Recipients of general and specific packages

This file lists the recipients of the different packages released by the agency for the general public and for specific users like mass media, trade and manufacturing agencies, development finance institutions, technology promoters, small- and medium-scale industry agencies, etc.

3. Special information service agreement

This lists the entrepreneurs or firms that have registered, through special information service agreements, and their technology requirements in terms of upgrading technology or starting a new venture. The agency would assess the needs against its services and would try to provide assistance by giving information, locating partners or getting technical consultancy. This file is usually maintained by the programme on technology venture promotion.

IV. Servicing of queries

1. Queries

This file lists the enquirers with the various fields inverted to allow breakdown by sector, country of origin, date of receipt of query and the date of reply, the number of technology alternatives offered, and whether the query was responded to using material from within or outside the agency.

A basic element that should be part of the file on queries would be the feedback to the queries. This would cover information gained from unsolicited feedback or from the feedback form that is sent along with the replies. The feedback shows whether the information provided has helped improve technology decisions in terms of investments or improving productivity, and in syndicating technoogy ventures. This information is very useful to guide future information collection, packaging and dissemination and servicing of queries.

Expansion of Data Base

As the agency develop more expertise and acquires more resources for computerisation, it could expand its data base. KIET of Korea, for example, maintains the following data bases: Korean scientists and engineers abroad, union catalogue of scientific and technological periodicals, Korean patents, imported technologies, transferred technologies from foreign sources, transferrable technologies from abroad, and union catalogue to articles in domestic periodicals.

If the computer system is large enough and compatible with other systems, foreign data bases could be introduced. Some of these data bases include:

AGRIS	Agriculture, forestry, fisheries and nutrition
CAS	Chemical engineering and chemistry
CIN	Chemical industry
COMPENDEX	Engineering
INSPEC	Physics, electronics and computers
ISMEC	Mechanical engineering
USGRA	U.S. government reports and announcements
WPI	World patent index

Agencies with such facilities could plan for the future upgrading of its system for on-line information retrieval. This depends greatly on the desirability, as reflected in a demand for on-line information retrieval, and in the availability of telecommunication lines. Companies competing in the export market would find a need for a quick on-line access to the latest information on the technology state-of-the-art and on the world market while for those catering to a domestic sellers' market or are in the "screwdriver" mode of operation, the old mailing service would suffice. If on-line information retrieval is desirable, its

feasibility would also depend on the availability of telecommunication lines. As most people familiar with this region would know, there are but a few countries where the infrastructure for on-line information retrieval exists.

When to Computerise

When to computerise depends on many factors. The primary factor, of course, is whether there is the necessary finance. Apart from this however, when to computerise is dictated by the capability of the technology information service to carry on current and expected future workload, especially in servicing the demand side, using the manual system. Increases in the volume of information to be collected and processed could still be managed, to some extent, without a corresponding increase in manpower or resorting to computerisation by simplifying and streamlining operations. Form letters, for example could be introduced for repetitive communications. Instead of writing individual letters when sourcing a material, different form letters could be sent to different type of sources of technology. Similarly, the Query Section could send form letter indicating what material has been sent and what further actions are to be taken.

The pressure posed by the volume of work could be eased further by instituting priorities. Since a technology agency is more interested in the utilisation of technology, it could respond only to queries from parties in a position to expand or start a new venture such as firms, investors or entrepreneurs while ignoring others.

There comes, however, a time when the volume of work overwhelms the staff. Management techniques, no matter how effective, could extract only so much from a limited resource. When the volume finally becomes unweidly for the manual system, computerisation becomes an attractive proposition.

It may be noticed that we are not emphasising the supply side. Even having finances for computerisation is not enough a reason to computerise. Although computerisation helps organise better the supply side, this too is not a sufficient reason to justify computerisation. We have seen many S&T agencies virtually sitting on a goldmine of information but, unable to disseminate the information adequately to the users. It would be a waste of resources to improve further the supply side, whether manually or by computer, if the information is not reaching the users. Thus, we are emphasising more the servicing of the demand as the gauge to decide when to computerise.

How to Computerise

Phase 1 - Study the Existing System

As it is with any task, it is basic to get first a good idea or general picture of the situation. Depending on the purpose and magnitude of the information and

the services being offered, decisions could be made on the computer hardware, software and personnel to do the computerisation.

An idea of the information to be computerised by an agency dealing with technology information is given in the files mentioned earlier. Just looking on the query side, the amount of information on technologies to be stored and processed would correspondingly increase with the increase in the number of queries. This volume could easily increase three-fold if the agency operates by the guideline of giving the enquirer at least three choices.

Phase II - Feasibility and Design

For low-budgeted technology agencies, the options are mainly limited to micros and minis; because the larger the computer, the higher is the cost of purchasing and maintaining it. Compared to a micro, a mini would require more personnel to operate it. So before buying the computer, certain points have to be considered.

1. **Budget**: This is basic. The budget should include not just the computer hardware and software but also the input/output medium (disk, tape, diskette, continuous paper, etc.), the cost of personnel training, cost of spares and maintenance cost. Maintenance cost per year ranges from 6 to 15% of the cost of the computer. If a computer costs $100,000, this could mean allocating about $10,000 per year for maintenance, an amount which, without the computer, could have been used for other purposes.

A micro, these days, is a viable proposition for low-budgeted technology agencies. If micro is to be purchased, it would be worthwhile to keep in mind the use of the "microsoft disk operating system" (MS-DOS) as the operating system since it has become an industry standard with most of the available software packages coming out in this system. An ideal configuration would be a microcomputer with 512 kilobytes of main memory, single or double floppy disk drive and a hard disk of about 10 to 20 megabytes, a monochrome or a colour monitor, and a printer which could preferably be a dot matrix printer. Regular back-ups are essential for reliable data storage and retrieval since power fluctuations or failure could easily alter or corrupt the information on the disk. The agency may consider the use of a streamer cartridge tape as the back-up. Floppy drives become messy and time consuming especially when a hard disk of 10, 20 or 40 megabyte capacity is to be backed-up.

A micro has less options than a mini, as it is basically a single user system. Even if it were connected to a local area network, it would still be difficult to allow two users to access the same data base at the same time. A micro is more suitable for in-house use. If external services are to be offered such as selective dissemination of information (SDI), publications or on-line public access, then a mini is more suitable. There would be multiple users. The computer may process by batch or on-line. In batch processing, each job is completed according to a set programme before taking on the next job. On-line processing allows for different jobs to be undertaken by the computer and for different

users to interact with computer simultaneously through the control of the Central Processing Unit (CPU).

A typical mini-computer configuration would be a system with 1 megabyte of main memory or more, disk storage of 150 megabytes upwards, capability to support from 8 to 16 terminals, and has line printers and other peripherals. The back-up would be a streamer cartridge or magnetic tape. Most agencies which do not have communication links for their computers usually transfer information among themselves using tapes. To simplify interchangeability of information, it would be worth considering going for a standard 9 track "phase encoded" (PE)/"non-return to zero index" (NZRI) tape drive. PE and NZRI are different modes of recording with the former storing 1,600 characters per inch of tape as against 800 characters for the latter. The above mini-computer configuration could cost around $60,000 upwards.

Data base operations may not involve a lot of number crunching (complex computation) but they place a heavy demand on the resources. Sorting and searching, the most common data base operations, require considerable CPU time and can overload the input/output ports between the processor and the disk storage. As a result, an organisation with modest computing needs may find itself later on having to move a larger computer to handle data base management systems (DBMS).

For agencies that could afford a mainframe computer, there is an almost unlimited range of options and excellent software packages. As the mainframe would put to serivce many disk and tape drives to log and back-up information, many users could access a large number of data bases simultaneously.

Complementing the hardware would be the software which gives the programmes or language that instructs the computer on what to do with the data. Software development has surged ahead making the use of the computer much easier even for beginners. Data base can be designed around three models for which software packages are readily available. One model is the relational model, which most of us are familiar with. If we want to organise data on name, nationality, and specialisation, our first impulse would be to organise columns for surname, first name, nationality and specialisation and fill in the rows with the data.

Relational Model

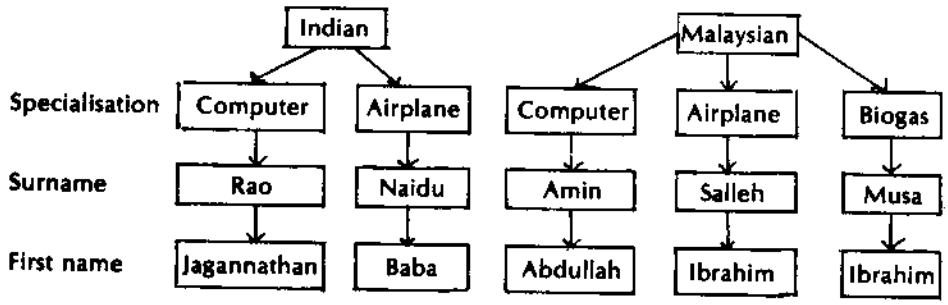
Surname	First name	Nationality	Specialisation
Amin	Abdullah	Malaysian	Computer
Rao	Jagannathan	Indian	Computer
Salleh	Ibrahim	Malaysian	Airplane
Naidu	Baba	Indian	Airplane
Musa	Ibrahim	Malaysian	Biogas

Each column has a different title while each row represents a different listing. The column title provides the key for searching.

The hierarchical model is basically tree-structured, wherein higher order pieces of information are linked through branches to lower level attributes. It is characterised by a one-to-many relationship of its files. A file may point to one or more files below it but each file is pointed to by only one file above it. As in the example above, the file on nationality points to the other files on specialisation and name. This model could be viewed as similar to the organisational chart of a company that is structured in the traditional pyramid type of hierarchy.

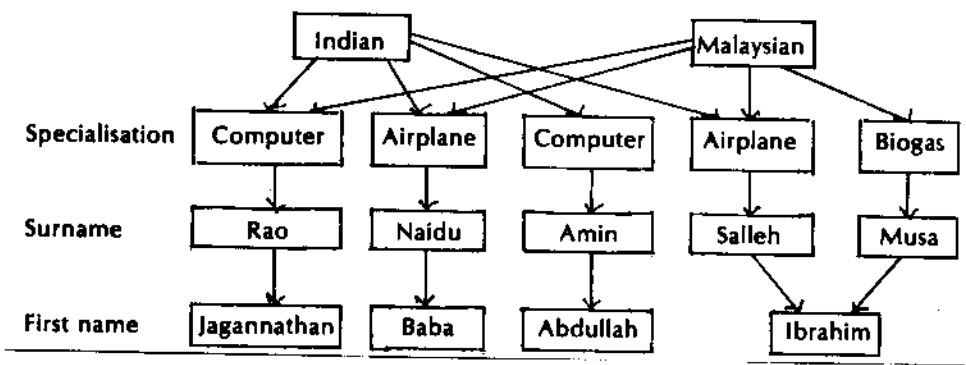
The same data can be organised in a hierarchical manner as shown below.

Hierarchical Model



The hierarchical model could be refined further into a network model as illustrated below.

Network Modle



The network model allows for many-to-many relationship among files. It allows for top to down and lateral connections. While the network model is more complicated in design than a hierarchical model, it offers more flexibility.

There are several software packages for different applications coming out for micro-computers although they are not as well developed as the various options available for larger computers. The data base management system (DBMS) software for micros arrange data in a tabular matrix format with rows of information representing specific record attributes or fields. Thus, when looking at a salary file, there would be a record for each employee with perhaps four fields corresponding respectively to name, identification number, section, and salary. When the user requests the information, the DBMS sequentially scans the tabular records searching for keywords that identify the desired information.

The DBMS software for micro-computer is moving in all directions at once. At the high end, DBMS for large computers are being scaled down to run on the new high power micros. PC/Focus from Information Builders and ZIM from Zanthe Information are basically micro-computer implementation of mainframe data bases. These scaled down DBMS packages support multiple users and can handle large data bases. They use formatting models and manipulation methods, and they are judged by how closely they copy their large computer predecessors. Most of them also feature elaborate data import and export facilities so that they can exchange information with large data bases on large computers. In the middle range, conventional DBMS products like dBASE II and dBASE III have become very flexible and easy to use.

An interesting development is in the area of graphic data bases that manipulate images as well as words and combine the two on a display screen or print-out. Products such as HELIX and FILEVISION are designed to work with high resolution graphics.

Text-oriented data bases which combine word processor and DBMS features such as keyword search and indexing are useful for preparing manuscripts and the packages are readily available. Some examples are Advance Write III from Hewlett-Packard, Factfinder from Forthought, etc.

The software for bibliographic data, which is used mainly for maintaining the technology information files, is not as developed for micros as it is for minis. Bibliographic data consist of fields which have variable length. A record of books could have six fields to cover respectively author, title, publisher, place of publication, year publication and index number. A book's title may have one or fifteen words. The length of the field for title would therefore vary according to the number of characters occupied by the length of the book's title. The field may cover from 3 to 60 characters. Conventional software handles mainly a fixed length field. In the example of the book title, it may assign 60 characters to the field. Even if the title only takes 25 characters, the remaining space for 35 characters would be filled with blanks and still recorded thus wasting the space.

Certain records, such as addresses, have repeatable fields. A company, for example, may have more than one address. If a facility exists for repeatable fields within the same record, one can store the different addresses without having to create one more record with a lot of information being duplicated. Again, conventional software for micros does not cover repeatable fields.

Some fields in certain records, such as addresses, would also have to be put in for quick access or what is referred to in the MINISIS software as "inversion". A user may want to know how many science and technology agencies in China are listed in the mailing list. This could be done quickly if the field for type of agency and the field for country could be inverted. Again, current packages for micros do not support this facility.

Micros have been marketed mainly as support for business, financial and administrative data and for text processing and report generation. As micros expand towards the bibliographic information market, we could expect better systems, both in hardware and software, to handle bibliographic data.

For low-budgeted technology agencies, it would seem that the option easily within reach would be micro. In budgeting, there should be allowance for minor upgrading of the micro in the future. In addition, the agency should also look towards funding support for linking the micro to a network, in the future. It is possible that larger computers such as minis or mainframes might be compatible with the micro allowing for data from the large computer to be downloaded to a diskette or for the micro to be able to provide data input to the larger computer.

Finally, as a reminder, the cost of site preparation has to be taken into account. The cost could become substantial. This is one area where micros are better because they can work without air-conditioning in most environments. Another point to consider would be power supply. Many countries have fluctuations and disturbances in the power supply. On the hardware side, the computer may require a voltage regulator to check voltage fluctuations and an isolation transformer to check sudden spikes. Alternatively, the agency may wish to procure an uninterruptible power supply (UPS) that could control voltage variations to provide reliable and clean power input and at the same time guarantee continuous power from its battery in case of a sudden power cut.

2. **User requirement**: This basically involves two aspects: the type of information for which the computer is to be used for and the volume of information to be stored. If it is just a question of storage, there is an array of choices available among powerful micros that could store as much as 80 megabyte or minis that would have much more capacity. But what is more important is the type of information to be computerised. Not all computers are designed to handle bibliographic data, such as the technology information files.

Depending on the use, a decision has to be made on the software and the hardware. Let us start with the software. The agency may wish to develop the software but this would take time. The agency may prefer to buy a tested existing package suitable to its needs which allows the immediate use of the system. If this is the option to be taken, there are some considerations to be made:

- Is it portable or is it tied to a certain type of hardware? If it is the latter, how suitable is the hardware to your needs?

- Can it handle bibliographic data? If yes, is it flexible enough to handle other types of data, like mailing list?

- Does it support your cataloguing format?

- Can the system do what you want it to do? For information retrieval, can it offer thesaurus-aided retrieval, key word access or sequential text searches?

- What else do you want the system to support - SDI services, microfiche production, card production, publications?

- Is exchange of data with other sites easily accomplished?

- Does the system support your local language alphabet?

- How user-friendly is the system? Is it menu-driven (files and functions on the screen for the user to choose)? Are commands and operations easily learned and handled by documentation staff?

- What security is provided?

- How large a programming staff will be needed to support the system?

In choosing the hardware, here are some points to be considered.

- Does the system come as turnkey package - i.e., all software systems included in the price? Can other software systems be mounted? What other software packages are available? For a micro, does it have a standard operating system.

- Is the system sold as a single package (including all peripherals) from one manufacturer or can other peripherals (such as those locally manufactured, better able to handle local alphabet and more cheaper) be substituted?

- Is the hardware reliable under adverse conditions such as power shortage, power fluctuations, heat and dust?

- What generators, power stabilizers and air-conditioning equipment is needed?

- Is the system batch- or time-sharing?

- How much staff is needed to maintain it?

3. Compatibility with other information centres: Many information are being transferred through discs and tapes. In some countries, on-line information reterieval is possible. Compatability with the computer system of other information centres is a question that has to be considered when undertaking computerisation.

4. Future plans: The type of information and the volume of information to be computerised invariably increases. This is a normal occurence among agencies that computerise their operations. As they get more familiar with computerisation, they are able to spot expansion in existing files or other new files to be

built up. Thus, it is not uncommon for agencies to discover six months later that their computer storage capacity, software and number of terminals are inadequate.

All the above considerations should be kept in mind when deciding on the computer hardware and software. The agency would be besieged by computer sales agents extolling the advantages of their respective systems. If the agency does not have an in-house expert on computers, especially for processing technology information, it would help if it could seek the advice of other agencies already involved in computerising technology information. A visit to such agencies could clarify many points. Alternatively, the agency may seek the counsel of consultants although it should keep in mind that while they may know about hardware and software in general, not many have been exposed to using computers to process technology information.

Phase III - Implementation and Personnel Training

After deciding on the purchase of a computer, the next step is to order it and have it installed. After debugging it, the next step is for the technology information team to familiarise with the workings of the hardware and software. A basic introductory course on computer concepts and terminologies may have to be conducted. After this, a basic course on DBMS concepts will follow. There will then be a hands-on training on the data base software and followed finally with a more specific training to help each section learn how to computerise its information files.

After the training, each section will have to sit down to work out the formats and codings for their files. Much of this work would already have been done earlier while the files were being maintained manually. Some slight adjustments have to be made in accordance with the software and the design for storing the data.

Phase IV - Evaluation and Modifications

After the initial introduction to the computer, the users should have a better feel of the whole system. In about 3 to 6 months, they would be able to evaluate their work and come out with new suggestions to redesign the inputs and outputs. For micro users, designing the inputs and outputs may not affect others but for minis, modifications would affect the whole technology information team. In the case of the directory of sources, for example, it is not just the Sourcing Section that would be using the file but also the Query Section and the programmes dealing with technology venture promotion and technology development. Thus, any modification have to be useful to the other units in the agency.

Phase V - Maintenance

If the requirements of users remain the same, there will not be any major

changes as long as the present system can satisfy the users' requirements. There might be an upgrading when the capacity of the current system is full or the total performance is slowing down. However, users usually try to maintain the existing system as it is difficult to change to another computer, especially if it is a large one.

Computerisation as Teamwork

As it is in organising the work of the different sections of technology information service from sourcing to servicing of queries, computerisation of information requires the teamwork of the different technology information service sections, computer staff, and the management.

Since most sections would be accessing to each other's files, it would be advisable if the files are designed and updated in a manner that could easily be understood by and useful to the different users.

In view of the above, preparatory meetings involving all the sections to discuss the various elements to be included in the information files are necessary. Such exercises would have been done earlier while designing the information files that were being maintained manually, but additional meetings are needed specifically for converting the manual files to computerised files.

Here are some of the common questions asked when the technology information team begins to computerise its information. Which files should initally be built up? Are some files, let us say, directory of sources of technology and the mailing list, to be separate or together? Are all agreed on keywords and other indexing standards? Who would have responsibility for inputting and who would have access to the files? Do the files carry the minimum necessary fields? Which of the fields have to be inverted?

Technology Information Team and Computer Staff

Computerisation of information is neither the sole responsibility of the technology information team nor of the computer staff. It involves the combined effort of both teams. Just as the computer staff may not know much about the information requirements from the point of view of the TIS team delivering the information, the TIS team may not know about the workings of the computer. To come out with a good work in computerising technology information, both the TIS team and the computer staff must work together. The TIS team will explain the various files and formats earlier maintained manually and their purpose to the computer staff while the computer staff would suggest how best to input and retrieve the information.

At the initial stage, there will be a lot of general consultations involving the technology information team and the computer staff as a whole, to be followed by individualised consultations as each section builds up its computerised files.

Technology Information Team and Management

Whether the information files are being maintained manually or by computer, it is but natural for the officer doing sourcing or servicing of queries to be more concerned with fields that enable him to finish the work immediately. The sourcing officer wants more addresses and it would be sufficient to him to maintain fields that compile the addresses by product, process, source and sector. The officer servicing queries would just as well get on with the task of finding and sending the answers to a query and get on with the next query. For him, it would be adequate to just main fields indicating who asked the query and what technology is involved.

Given a very small staff and manual file maintenance, the fields mentioned above would be sufficient. If priorities are to be set given certain objectives with scarce resources, it would be practical to get on with the job first of sourcing or servicing queries and worry later about monitoring mechanisms. Some monitoring, however, is required by management. For such a purpose, additional fields have to be included and inverted for quick access. In maintaining the directory of sources of technology, the performance of the operation in terms of providing alternative sources could be measured by inverting fields on sources by type of firms and geographical locations. The facility or difficulty in securing material could be gauged by having fields that record which addresses sourcing letters were sent to, when the material was received, and the percentage of getting material from small firms as against large firms or from firms in developing as against developed countries. Whether the sourcing officer is slacking off or not could be seen from fields that indicate how many new addresses and how many were contacted in a given month.

Similarly, in looking at the work of the section servicing queries, additional fields are required to indicate when a query has been received and replied to, how many options were provided, and how much of the material came from within and outside the agency. For the sections packaging and disseminating information, they would also be interested if the file on queries included fields to indicate where the queries are coming from. For management and the section servicing queries, they would also be interested in knowing how the information was utilised by way of feedback forms.

If the fields for monitoring purposes were missed earlier when maintaining the files manually, they have to be considered when computerising the files. It is clear from the above that the monitoring is necessary to make the operations more effective. Necessary as it may be, there has to be some balance. While an information could be categorised in 40 ways, may be 10 ways would suffice. It would not be healthy if the officer begins to think that he has to put unreasonably extra work to maintain the fields for monitoring purposes.

This Chapter is intended as an introduction rather than as an exhaustive treatise on how to computerise technology information. The fear of the unknown being a natural phenomenon, there will be some initial hesitancy when working for the first time with a computer but this barrier fades away as technical competence grows with time.

To assist you in computerising technology information, you may wish to go through some checklist questions.

1. Have you identified in detail all the types of documents or media containing information to be processed?

2. Are you evolving the treatment each would be given for creating the records?

3. Have you examined the possible uses of the system being adopted and the type of queries the system is expected to respond to?

4. Have you developed sample record formats?

5. Have you developed sample output formats?

6. With time and with use, are you reviewing and refining the system?

10

Basic Organisational Structure

Based on the activities to be carried out in sourcing, processing, packaging and dissemination of technology information, and the servicing of technical queries, we present here a basic organisational structure for a technology information service. The staff composition fulfills what we consider to be the minimum to undertake a fully operational technology information service.

Sourcing

There are two areas of responsibility in sourcing: one to handle sourcing of catalogues, technical description, patents and other materials from direct sources and agents of technology such as firms, trade attaches, trade exhibitors, and technology information banks and patent offices; and the other to handle sourcing of conventional materials such as books, periodicals, reports, microfiche material and videotapes.

The Sourcing Section usually is headed by the Chief Librarian who will be supervising sourcing, processing and maintenance of the library. As far as sourcing is concerned, he could take the additional assignment of handling the sourcing of conventional materials which would be a lighter load than sourcing materials from direct sources of technology. Sourcing of materials from direct sources of technology could be assigned to a Library Assistant.

The routine in sourcing material from direct sources of technology is to spend half of the day sending 20-30 letters to the sources and use the other half to review sources of technologies as recommended by the different programme officers and to monitor letters sent and materials received.

Due to the pressure on the time of the Chief Librarian, who is also handling sourcing of conventional materials, a system can be instituted wherein a list of materials proposed to be procured can be made and a committee of programme officers go over the list and make recommendations for procurement once a month.

Processing

This task is also under the supervision of the Chief Librarian. There should at least be one Library Assistant to work on classification, indexing and cataloguing. Temporary help will have to be resorted to in case of a backlog.

As there are many administrative matters to be handled, there might also be a need for one Secretary to be assigned to the Chief Librarian. Where there is a slack in secretarial work, the Secretary can be trained to help source materials and assist in processing information.

The library is a common resource servicing not just the requirements of the technology information programme but also of other programmes in the agency. Thus, supervision of the library could be placed under the head of the agency. Where the library, however, assumes more importance through its usage as a support resource for technology information service, then the library, both for programme and administrative purposes, is better placed under the supervision of the technology information programme.

Packaging

Packaging consists of producing technology information packages for general and specific clients. The team to handle packaging would consist of an Editor, who would serve as chief of the Packaging Section while at the same time managing in-house publications from books, reports to journals, one Editorial Assistant to help prepare the material for in-house publications, a Writer to concentrate on information packages for the print media, a photographer-cum-artist, and a Secretary-cum-typist. If the agency also produces packages for dissemination to the broadcast media, this team would also require a Broadcast Media Assistant who will look after the production of the packages and maintain liaison with the TV and radio stations.

As mentioned earlier, corporate communications is very much inter-related with packaging and dissemination of technology information. They deal with the same medium and their releases complement each other. Periodic dissemination of technology information enhances the image of the agency while releases to project the corporate identity also help gain clients for technology information. In view of this complementary nature, some technology agencies assign corporate communications to the Packaging Section under a broad title of "Corporate Communications and Mass Media Affairs". Corporate communications would require at least one Corporate Communications Officer who would help identify the constituency, evolve the strategy for positioning and posturing, and manage the production of corporate communication packages. Corproate communications would also require the services of a Typist.

One question normally asked is whether it is a precondition to successful packaging that the Packaging Section should have a solid background in science, engineering or technology. Undoubtedly, it is a plus to have some training in science, engineering or technology but it is not a guarantee nor a

crucial factor for successful packaging of technology information. After all, there is a limit as to what one trained in a particular field could understand of others. A chemist surely cannot be an expert on aeronautics and vice versa. Since the technology topics being handled by the Packaging Section cover a wide range, what are needed are the capability to follow technical terms and a good command of the language. With exposure, a writer who is not a civil engineer or architect would eventually be able to follow and describe the technical considerations of a flooring or roofing material based on the document at hand. Equally important is for the writer to have the creativity to package and simplify the message in a manner that attracts and could be understood by the target audience. On this count, people with background in mass communications, advertising and social sciences tend to exhibit more imagination than people trained purely in sciences, engineering or technology.

Dissemination

Dissemination involves two distinct operations: the routine release of regular packages both for technology information and for corporate communications - i.e. print media packages, journals, reports; and the non-conventional or specialised dissemination of technology information, like running a movie or video presentation in villages, disseminating information material through a roving technology fair or in international trade fairs, targetting information to a specialist group of manufacturers, etc.

The routine release of regular packages could be handled by a Secretary who works like a circulation manager. She or he would update the mailing list and coordinate with the Registry of the Administrative Office for the release of the materials. The non-conventional dissemination would require the services of one Extension Assistant conversant with extension service or technology expositions, working closely with the Programme on Technology Venture Promotion to maximise the exposure of technology information in various vehicles whenever the opportunity arises.

Dissemination, is closely related to packaging that both tasks are usually assigned to a single unit, usually to the Packaging Section.

Servicing of Queries

Ideally, a specialist would be in the best position to reply to a technical query. The specialist dealing with home solar heating, while knowing about solar collectors, may not be the right man to approach on a question dealing with solar-powered water pumps. Likewise, the specialist on rice, while conversant with general horticultural practices, may not be knowledgeable enough to answer a technical query about onions.

It would be too costly to hire a specialist to cover each specialised topic. It would also be impractical to have many in-house specialists. Not knowing what

queries would come, some fields may not have enough volume to justify the permanent presence of the concerned in-house specialists. At the very least, the agency should strive to have one programme officer for each priority area it covers. If the agency deals with low-cost construction, food processing and small prime-movers as its priority areas, it should hire a civil engineer, a food technologist and a mechanical engineer to handle servicing of queries for these priority areas, respectively. Depending on the volume of queries and the availability of funds, the agency might be able to add 1 to 3 programme officers per priority area to have more specialised knowledge and add depth to its team servicing technical queries. Thus, for food processing, the food technologist could be joined by others specialising in fruit juices, protein food or dairy and poultry meat products, as the need dictates.

The Query Section would be responsible also for securing feedback on the quality of servicing queries. For this purpose, a feedback form letter is sent along with the reply to a query.

Assisting the programme officers would be at least a Secretary-cum-typist who will handle the additional chores of arranging the duplication of material and the mailing of replies, feedback forms and other communications.

Computerisation

The computer, like the library, is a common resource which caters also to the needs of other programmes besides the programme on technology information. Thus, for administrative purposes, the Computer Unit is supervised by the head of the agency. However, if the Computer Unit, as in the case of a library dealing mainly with technology information, comes out mainly as a resource to support the requirements of technology information, then it would be more practical to put it under the supervision of the programme on technology information to ensure a smooth flow in the storage and retrieval of technology information.

The Computer Unit is usually headed by a Data Base Manager who would manage the system and its application. Assisting him would at least be one System Analyst-cum-Programmer for application and one Data Entry Operator. Depending on the volume of the data and software, additional computer assistants might be required. If the agency works with just 1 or 2 micro-computers, then only one Computer Assistant might be required.

Since the computer company usually provides the maintenance, the Computer Unit does not require an in-house computer maintenance assistant. If the agency, however, is working with a mini-computer costing $100,000 for which a 10% maintenance fee could cost the agency $10,000 per year, it might work out cheaper if the agency hired its own in-house Computer Maintenance Assistant who could then be called upon to do other computer-related tasks.

Chart 1
Basic Staff for Technology Information Service

Functions	Programme Staff	Support Staff
1. Coordination of TIS	Coordinator	1 Secretary
2. Sourcing	1 Chief Librarian 1 Asst. Librarian	1 Secretary
3. Processing	1 Asst. Librarian	
4. Packaging		
A. Tech Information	1 Editor 1 Editorial Asst. 1 Writer 1 Photographer-cum-artist	1 Secretary
B. Corporate Communications	1 Corporate Com. Asst.	1 Typist
5. Dissemination	1 Extension Asst.	1 Secretary
6. Queries	1 Specialist/ priority area	1 Secretary
7. Computer	1 Data base Manager 1 System Analyst-cum-Programmer 1 Data Entry Operator	

If APCTT's experience is an indicator, much could be done by a small technology information team. Extracting much from a same team involves not just having technical skills but a lot of teamwork among both programme and support staff. Because APCTT does not have enough people to handle each section, much less, to have enough in-house specialists to service queries, each member of the technology information team has to take on additional matrix-type responsibilities. While each staff member has his distinct programme responsibility – i.e. the Data Base Manager looking after the computer – he also assumes a responsibility for locating information for a specific priority area. Thus, the Sourcing Officer looks for information on agriculture while the Data Base Manager is responsible for information on microprocessors. In addition, each one is given a back-up responsibility. Thus, if the Librarian is absent, the Sourcing Officer automatically fills in without the need of getting an instruction from the Chief of the technology information service. One on one discussions and regular group meetings help each one understand other's functions and limitations. This type of structuring, however, will not be advisable on the long run, and hence should be avoided if possible.

The range of activities that a technology information service could cover is wide. There are the traditional library services such as documentation, translation, abstracting, photo-duplication, and audio-visuals. Sourcing may wish to go more into patents. Packaging may wish to produce specific information kits for a specific clientele of specialised manufacturers. In collaboration with the technology venture promotion programme, the Dissemination Section may wish to disseminate through technology fairs. In addition, the Dissemination Section may wish to conduct extension service for community-based technology ventures. It may also wish to provide continuing service for would-be entrepreneurs. These new activities would require staff for extension service and for course development. At a future time, the technology information service might be able to upgrade its computerisation to enable on-line sourcing thus requiring, under the Query Section, a staff to handle on-line servicing.

As the volume increases and new tasks are added as per the mandate of the agency, the basic staffing pattern would need to be expanded and modified accordingly. The World Trade Centre of Japan, for example, which services 20 queries a day, employs 40 people supported by a large computer, office computers, access to other data bases, facsimile and telex facilities. In the event that the agency may wish to undertake more activities than those mentioned for a basic technology information service, it could study and adopt facets of the structure of larger technology information agencies.

11

Policies for Technology Information

At the "Inter-regional Seminar on the Vienna Programme of Action – Role of Information in Accelerating Scientific and Technological Progress in Developing Countries and Prospects for the Establishment of the Global Information System" held in Moscow on 24 September to 5 October 1985, the following recommendations were made:

1. set up national coordinating mechanisms to oversee the over-all development of national scientific and technical information network;

2. collect, process, store and disseminate data on ongoing and completed R&D work in order to avoid duplication of efforts;

3. adopt standard norms for collection, processing, storage and retrieval of scientific and technical information;

4. develop union catalogue of publications;

5. improve inter-library loan schemes;

6. expand current awareness services;

7. prepare and update the directory of national information organisations;

8. develop national data bases wherever possible;

9. improve document delivery services;

10. consider non-bibliographic information as important part of the system;

11. develop programmes to introduce the use of computers and computer communication network for information processing;

12. pool resources for scientific and technology information at the regional level.

Most of the recommendations have validity when viewed against the needs of developing countries. But the above recommendations hardly deal with technology information. To begin with, they put the focus on science and on

R&D results. In addition, they view the library as the main resource or arena for transactions on information. Moreover, the emphasis again is mainly on the supply side. For technology information, as we have stressed several times, linking to the demand side is more problematical.

If technology information as a separate and self-contained entity is to grow, there should be additional steps taken in that respect. Policy makers in this field may consider the following propositions:

1. There should be a technology information service organised as separate from but complementary to science information.

2. Because of the nature of technology information, the content should concentrate on mature or commerical technologies, those that are beyond pilot stage and are ready for application in the context of trade and industry.

3. As the skills for technology information are different from the skills for science information, there should be manpower training on the various components and techniques of technology information service.

4. As the schemes for organising technology information service are new and are distinct from those of science information, agencies should be encouraged to test the schemes and from there, work out an expansion of the service.

5. Since technology information is crucial in upgrading technologies and syndicating technology ventures and the nature of information usage is such that a technology information service is hardly self-financing, the government should be prepared to subsidise technology information service.

6. Once the systems are well understood, various S&T agencies engaged in technology information should be encouraged to adopt the same basic systems to enable easier network accessing to each other.

7. Once the benefits of providing technology information service could be perceived, the government should work out a national policy that would support technology information service.

The recommendations focusing on the supply side have become rather standard. If we review various reports of meetings in the past 15 years dealing with scientific and technology information, the venues of and participants to the meeting vary but the recommendations remain basically the same. The same recommendations constitute also the usual contents of national policy statements on scientific and technology information.

Despite the repeated exhortations or prescriptions, by way of policy statements on how to improve scientific and technology information in developing countries, the situation has hardly improved. Much of the information being collected and stored is not being utilised. Where do we go from here?

No one can argue against the rationale of setting policies. Whatever may be the operation, we need guidelines or policies not just to set the right direction

but to define the extent of the programme and to ensure the corresponding support required.

Where one could raise a question, however, is on the timeliness of setting policies. But policies that are not accompanied by appropriate and adequate delivery mechanisms staffed by personnel having the proper orientation and skills to undertake the tasks would not amount to something significant. And setting up the delivery structure and upgrading manpower does not happen in just a couple of years. It is not surprising therefore that even national development targets set 20 years ago by grandiose policies and plans are yet to be realised.

The policy environment and bureaucratic culture in developing countries have not changed to any considerable extent in the last 20 years. In some countries, there is even a feeling that the situation is deteriorating rather than improving. The vigour in setting up plans and policies is just not matched correspondingly with implementation.

For countries which do not have a framework or guideline involving science and technology, much less scientific and technology information, some policy exercise would be useful. For countries which already have policies or for which a tacit firm policy commitment could be gleaned from the enormous funds budgeted for collecting scientific and technology information but for which use of information is considered minimal, the problem requires a more broader approach. Considering that most of the scientific and technology agencies in the region have not really been exposed to the workings of a technology information service, we feel that a more practical approach is for the agencies to try out first a technology information service. A portion of the current information programme could be retooled for technology information. For instance, an existing S&T information service may set aside 25% of resources mainly for organising a technology information service. This involves a simple internal management decision and does not require a national policy.

Once the decision to experiment with technology information service is made, the agency could arrange to send a number of its staff for hands-on training at centres of excellence on technology information in the region. Upon their return, they can institute some of the systems utilised by the centres of excellence and they can also serve as trainers for the other staff assigned to technology information. The retooling for and experiment on technology information service may take half to one year. At the end of the period, the agency can then make a decision on future programmes on technology information. If it sees the system as being effective and finds value in its interventions on technology information by way of generating more information usage and creating opportunities for investments and technology ventures, then the agency could plan out a larger programme in technology information. At this stage, an exercise in setting policies for technology information would be fruitful. The agency would need the policy to set the direction, legitimise an expanded programme, and ensure the logistical support for undertaking the activities in technology information service. At this stage, the agency, having

been exposed to technology information service, would also be in a better position to define and defend its programme on technology information.

As the process of formulating policies, getting them approved, and then implementing them is complex and whatever schemes developed would still be adjusted to the local environment, we will desist from providing checklist questions. All we could suggest is that national agencies get started in trying out technology information service. Once they perceive the benefits, the questions of expanding the programme, seeking resources and getting a mandate by way of policies on technology information would follow.

12

Gaining Support

How should we press home the importance of technology information? By linking it closely to the importance of technology itself. If we review ads of products emphasising the technology content, the messages harp on four themes.

One group of ads tells us that to survive in today's world, we need to innovate: "Bringing Technology to Life is our Aim", "One Good Idea Leads to Another", and "You Can't Plan Tomorrow's Battle with Yesterday's Technology".

Another theme preaches about the need to look to the future. Some popular lines are: "In a Fast Changing World, We Put You into the First Century", "Building the Telecommunications Future", "Space-age Technology,", "Why Not Come to the Fair and See the Future?" "You see, Nothing is Impossible," and "An Eye to the Future."

Beside innovation and looking to the future, another theme emphasizes being ahead with the best: "It Keeps you Ahead," "A True Performance," "Quality that Lasts," "We Put Our Reputation on the Line," "Get into the Future only with the Best," "Making Advanced Technology Work," "Investments Made to Last," and "High Tech Made to Last."

And finally, in recognizing the threat of uncontrolled technological changes to the dignity of mankind in this fast changing world, another theme calls for maintaining the face of humanity amidst technological changes: "The Best of Tradition and Modernity," "Harmony Between Man and Machine," and "Beyond Technology, We Care".

While the jingles are catchy, they have to be given meaning in the day-to-day life of potential technology users. Thus, for households, technology helps the housewife overcome the drudgery of labour, to save, or to start a micro-enterprise that could expand into a small-scale industry. Villages need technol-

ogy for basic needs such as food, water, shelter and energy. Firms need technology to attain savings, efficiency and higher productivity, and to enhance opportunities for expanding operations or opening new ventures. Export-oriented firms have to keep abreast of the state-of-the-art of technology to survive in the international market.

These messages are delivered from the subliminal to the obvious, from whispers to screams until we convince the people of the importance of technology. Once convinced, the need for technology information is just a step away. That should do our job.

Unfortunately, we are not being asked to justify the need for technology or for technology information. Our problem is how to gain support for a technology information service.

This is a different and more difficult proposition. Technology information service costs quite a bit. The fees earned from the 25% information supplied would not cover the cost of acquiring and storing the 75% of information not utilised but necessary to get that 25% of useful information. Technology information service is hardly a self-financing proposition. It could try to recover as much as it could of the cost. But for it to survive, it needs to be subsidized. Under this circumstance, the agency offering technology information service would be under constant pressure to justify to those controlling the finance why it must continue to receive support for technology information service.

As we suggested in Chapter 1, we could look at technology information service as an investment of the country to upgrade the technological consciousness and skills of each succeeding generation and to help investors, firms and entrepreneurs be competitive. The alternative of keeping potential technology information users ignorant by not having a technology information service is a retrograde step.

To gain support for technology information service, the agency must project itself. At every opportunity, it must try to be heard, seen and appreciated. No matter how intrinsically good is its work, it will not automatically be appreciated unless its work is made known to those who are supposed to appreciate it, who are expected to support it.

Once the technology information service attains a good reputation, sources of technology would sustain the supply of information, facilitators/communicators would assist in disseminating information, user would have more confidence in availing of the service, and the national leadership would be more inclined to understand technology information service as an important programme whose survival requires subsidy.

This legitimising process is what is known in corporate communications as constituency building. It is a process that involves identifying the different groups whose support or patronage is needed, positioning and posturing before the constituency, and reaching the constituency through services and creative corporate image projection. In short, it must be appealing to its publics.

But the nature and degree of perception varies considerably with each group. To sources of technology, the appeal could be in terms of the agency being able to help promote their technologies. To communicators, such as the mass media, the appeal could be in terms of upgrading their industrial and trade section with interesting technology items. To facilitators, such as the chambers of commerce and development finance institutions, the attractiveness of the agency could be in terms of the assistance it could provide through information packages and query service for their constituency. To end-users of technology information, the appeal could be in terms of the swiftness and appropriateness of the response to queries at a price affordable to them. To high officials in the government, the line of approach could be in terms of the agency complementing the work of related ministries. To political leaders, the theme would be technology information service contributing towards the economic upliftment of their constituency by way of creating opportunities for investments, technology upgrading and technology venture syndication.

Projecting and maintaining the appeal of the agency before the end-users in the private sector is done mainly through the information packages being disseminated to general and specialised clientele and through efficient servicing of queries. These could be complemented by face to face contacts, wherein the agency would make regular visits to chambers of commerce, Manufacturers associations,trade attaches offices, development finance institutions and trade and technology fairs. In addition, the agency could reach the private sector through other vehicles by making presentations in social and professional clubs.

Developing a healthy relationship with top officials is a more intricate exercise. An agency offering technology information service covering, say, five sectors runs the risk of being perceived as duplicating the work of substantive ministries concerned with the sectors. In the highly charged political arena of many developing countries in the region, such a perception could lead to inter-agency conflicts. In such a situation, it is important for the agency to put signals immediately that its activities are not duplicative but complementary.

Better yet, the agency could diffuse the potentially conflicting situation by requesting closer association. Let us take, for example, agricultural technologies as one of the sectors to be covered by the agency. The units dealing with agricultural research and development and with extension service under the Ministry of Agriculture may feel that this is encroaching on their turf. To avoid conflict and to further its interests, the agency should immediately arrange a meeting with top officials from these units and present its case that its technology information packages will not only highlight results of research and development from the Ministry but also the packages will supplement the extension service activities. If the agency is also maintaining releases on technology trends and on technology policies, it may also mention that its packages highlight advances in technology and the policies of the Ministry. If the officials from the Ministry feel that the work supplements their work and is rewarding to be part of the team trying to define the package, some consensus can be arrived at regarding the package and the mode of collaboration. With these

questions cleared by the officials, the head of the agency can formalise the collaboration by signing a Memorandum of Agreement with the Ministry.

Having a good track record helps gain political support. When it is time to review its budget, KIET of Korea can always point to the 300,000 technical queries it services per year on a fee-paying basis. This track record convinces the national leadership to support KIET by allowing for 50 to 70% of the cost of servicing queries to be subsidized by the government.

An agency, however, cannot rest content on its solid track record. It should also strive to be in good terms with those who can affect its existence positively or negatively.

While there is no hard and fast rule on how to make the agency appealing to its publics, one most important aspect to remember is that the exercise should be a corporate one. The regularity in releasing weekly technology information packages to the mass media accompanied by a short note inviting readers to contact the agency for further details projects the extensive involvement of the agency with technology information and its depth in being able to service of queries. The weekly releases could be complemented with corporate communication releases highlighting, for example, successful stories of technology ventures aided by the agency to indicate its capability to bring technology information to the point of technology venture syndication. So as not to pigeonhole the agency as being involved only with technology information, it could also come out with corporate communication releases such as reports or mass media packages directed at specific members of its constituency showcasing also its other programmes.

To ensure that the corporate identity would be consistent and its projection carried out and synchronized in all the programmes, there might be a need to have a Corporate Communications Unit, as mentioned earlier. As it is with the work of the various sections in technology information, the Corporate Communications Unit would define both long-term and short-term objectives and prepare the appropriate action plans.

Since corporate communications has to reflect the agency's philosophy, mandate, objectives and programmes, the corporate communications effort must be done in close cooperation with the top officials of the agency. The Corporate Communications Unit would get its final guidance from the head of the agency.

If the agency wishes to organise an action plan for corporate communications with the view of mobilising support for technology information service, it could consider some of these checklist questions.

1. Would the projection of the agency and of technology information service require a team for corporate communications?

2. Can the corporate communications team work better as separate from or as part of the technology information service?

3. Since corporate communications and technology information service complement each other and also use the same vehicles to release information packages, are the action plans of corporate communications and technology information service defined to ensure the complementation?

4. In defining the work of corporate communications, has the team consulted the key officials of the agency and the other programmes on the themes to be projected and how each programme could complement each other?

5. Has the corporate communications team identified the various groups to be reached?

6. Has the corporate communications team identified the activities for different groups and the approach to be taken in terms of positioning and posturing before and reaching out to the constituency?

7. Has the corporate communications team identified activities that would show immediate impact in terms of making the agency and technology information service heard, seen and appreciated?

8. Does the corproate communications team maintain personalised linkages with various groups?

9. Does the corporate communications team scan and seize opportunities to project the agency and the technology information service?

10. Does the corporate communications team have mechanisms for feedback and review of its implementation of the action plan?

13

Prospects and Problems of Networking

There are many technology agencies in Asia and the Pacific that collect, assess and disseminate technology information serving national, sub-regional, regional and international coverage. The level of techno-banking varies from elementary/non-existent for island developing countries in the South Pacific, adequate for the ASEAN newly industrialised countries to sophisticated large computerised systems for the more industrialized countries like Australia, Hong Kong, Japan, Korea, New Zealand and Singapore.

Techno-banking is usually undertaken on a sectoral basis by agencies mandated to work on the development of that particular sector. For food processing, for example, information could be obtained from the Division of Food Research of CSIRO of Australia, the Central Food Technology Research Institute of India, the Institute of Nutrition Sciences and Food Technology of Iran and the Food and Nutrition Research Institute of the Philippines. Food-related departments of universities also provide information.

As for techno-banking covering a wide range of sectors, there are not many institutions in the region organised for such a task. Among the techno-banks covering many sectors are the Institute of Scientific and Technical Information in China, the Hong Kong Productivity Council, the Japan Information Centre for Science and Technology, the Korea Institute for Economics and Technology, the Technology Resource Centre of the Philippines, the Pakistan Scientific and Technological Information Centre and the Singapore Institute of Standards and Industrial Research.

Information on various sectors is also available from major R&D institutions and technology transfer/promotion centres such as the National Research Development Corporation of India, Korea Technology Transfer Centre, Korea Technology Advancement Corporation and Korea Advanced Institute of Science and Technology, and the Pakistan Council of Scientific and Industrial Research. Queries could also be addressed to the main S&T agencies, like the

Bangladesh Council of Scientific and Industrial Research, Central Research Organisation of Burma, Council of Scientific and Industrial Research of India, Department of Scientific and Industrial Research of New Zealand, Ministry of Science, Technology and Energy of Thailand, etc., with the detailed reply likely to be assigned to the relevant specialised technical agency under its umbrella.

National information exchange is carried on along different sectors. An example of a successful network is the Philippine Centre for Agricultural Research and Resource Development (PCARRD) which links together R&D centres under various ministries and universities dealing with agricultural research. Specialisation on agricultural R&D is farmed among the participants in the network with funding from PCARRD. On scientific and technology information exchange *per se*, India has many examples. It has INDONET, an information/communication network organised by the Computer Maintenance Corporation. Its Defence Scientific Information and Documentation Centre (DESIDOC) is also well organised. In addition, a Council for Advancement of Rural Technology (CART) serves as a nodal agency for the collection and dissemination of information on appropriate technology for the rural areas while Tata Energy Research serves as nodal point for information exchange on renewable energy.

Sub-regional technology information exchange is handled by sub-regional organisations/networks and national agencies assigned a regional task. Information on technologies appropriate to the South Pacific is being collected and disseminated by the South Pacific Economic Commission, South Pacific Economic Bureau and South Pacific Appropriate Technology Foundation. In addition, the University of South Pacific, using Applications Technology Satellite (ATS-1) of NASA, links its School of Agriculture at Alafue, Samoa, with nine extension centres in the Pacific Islands. This is further linked with the Pan Pacific Educational and Communications Experiments by Satellite (PEACESAT) coordinated by Hawaii which links 16 additional stations from Papua New Guinea, Saipan to New Zealand. In the ASEAN countries, various entities provide information: ASEAN Association for Planning and Housing (for housing), ASEAN Food Handling Bureau (for post harvest and handling), Southeast Asia Fisheries Development Centre (for aquaculture), Southeast Asia Iron and Steel Institute (for steel), and national institutions of learning assigned a sub-regional responsibility such as the University of the Philippines (for agriculture), Mahidol University of Thailand (for medicine) and Bogor Bio Tropical Institute Indonesia (for biology).

Region-wide exchange of technology information is carried out by regional institutions/networks and national institutions tasked to provide regional services. Among the regional institutions/networks are the Asian and Pacific Coconut Communicty (coconut), Asia-Pacific Pepper Community (pepper), Technonet Asia (agencies promoting small scale industries), Asia-Electronics Union (electronics), Asian and Pacific Regional Research and Training Centre for Small Hydro Power (mini-hydro), Asian Productivity Organisation (productivity), Food and Fertiliser Technology Centre for Asia and the Pacific (food and fertiliser), Approtech Asia (appropriate techologies), and the Centre for Inte-

grated Rural Development for Asia and the Pacific (rural development). National institutions serving the region, on housing for example, include the Directorate of Housing Research in Indonesia and the Central Building Research Institute in India.

One of the rare examples of a successful regional networking is Technonet Asia. Started in 1973 as a project funded by the International Development Research Centre of Canada, Technonet Asia brings together 16 organisations from 11 Asian and Pacific countries to provide technical assistance to small- and medium-scale enterprises. The programme provides industrial information and extension service with emphasis on processes, methods, techniques and equipment.

Technonet Asia carries joint undertakings with other institutions such as UNIDO, ILO, UNESCO, World Bank, APCTT and US AID. It serves as the ASEAN focal point for APCTT. It also serves as a window for matching Canadian sources of technology with potential users in Asia and the Pacific. Overall, it has established links with some 60 cooperating institutions from around the world.

As is expected in networking, a salient feature of Technonet Asia is the pooling of resources. It draws assistance from its members and cooperating institutions. Another notable feature is that the participating agencies make annual contributions and provide counterpart support to the activities. This is where Technonet Asia excels over other networks. It has maintained its viability because of the participating agencies, voluntary agreement to work together and to back up this commitment with regular funding support.

Promoting international technology information sharing is done by international institutions based in the region and by regional and national agencies tasked with such responsibility. Among the international institutions are the International Rice Research Institute and the International Centre for Living Aquatic Resources Management, both located in the Philippines, the International Crops Research Institute for the Semi-Arid Tropics in India and the United Nations University in Japan. The Asian Institute of Technology, as a regional institution, maintains, among others, an international information network on renewable energy, ecology and ferrocement. As for national institutions, CSIRO of Australia is assigned to maintain a network of technology information on renewable energy for Commonwealth countries while the Central Food Technology Research Institute of India services information needs on food processing for the United Nations University system.

Information on sources of technology information in Asia and the Pacific could be found in directories and trade periodicals of various organisations. Even the yellow page section of the telephone directories, with a quick scan, could provide an idea of the level of technology of sectors in a country. Ironically, information on technologies is hardly compiled and disseminated by government technology agencies. Such information is more readily available from the trade rather than technology agencies.

Networking in technology information would involve all the components from sourcing information to servicing queries. For the purpose of illustrating the importance of making linkages, let us look at servicing of queries. As pointed out in discussing the nature of information usage, only 25% of stored information would service 75% of queries. This means that the technology information service would have to locate the information from outside sources to answer the other queries. The pressure to locate more outside sources would increase correspondingly with increases in queries. It would therefore be necessary for a technology information service to establish linkages with cooperating entities from within and outside the country that could provide information to help it in servicing queries.

The same approach could be done for other components of technology information. With good linkages, sourcing could cover more subject fields as well as secure more materials. A good supply of materials, in turn, facilitates packaging. The technology information service would have a wider outreach if it could disseminate the packages to various media. With assistance from other entities, queries could be serviced quickly.

The conventional approach to networking of technology programmes is to go one on one. In other words, an agency or programme in one country seeks a linkage with a counterpart agency or programme in another country as its focal or nodal point. However networking in technology information will not progress much if done on a one to one basis. The various components, to be effective, require as many linkages possible from both the public and private sector. Supposing the Sourcing Section requires information on tapioca, it would be impractical for it to depend solely on a nodal point in a country to secure the information. The effective way is to tap as many sources possible such as food research centres and food companies that might be involved with tapioca. Similarly, disseminating information will not go far if it has to be channelled only through a nodal point. Depending on the target audience, the technology information service would use various mixes of and as many disseminators possible to reach the target audience.

Another point to remember when we are looking at the sharing of experiences to upgrade skills is that each component of technology information service requires a different expertise. The officer who can do sourcing need not necessarily know packaging, just as this officer would not know about how to computerise technology information. Even within the dissemination section, the person who can deal with the printed media may not have the skills to deal with the broadcast media. If networking is to be used for upgrading skills, it must be flexible to enable linkages per component of technology information service.

This networking cooperation should not be restricted only to S&T agencies but must include all other entities both in the public and private sector who could contribute towards faster and efficient sharing of technology information. In addition, networking need not start by being a formal arrangement.

The theoretical benefits of networking are enormous: duplication is avoided; resources that become common to members of a network could gain more mileage due to the larger audience; techniques developed from the experiences of agencies could be imparted to others; etc.

Thus, the term "networking" has been and continues to be in vogue in various attempts to foster multilateral cooperation and in rationalising many development projects. Despite its theoretical soundness and regular exhortation for its use in various fora and S&T accords, networking remains elusive.

The foundation of networking is transaction; ideally, confident and mutally beneficial transaction. Where there is confidence and perceived benefits, transaction will flourish even without a networking arrangement.

In this regard, it appears that the agencies do not yet sufficiently interact with each other. They do not maintain a regular contact by assisting each other in servicing technical queries. Their contacts are limited to the expensive but rare meetings, the exchange of periodicals which is done as a matter of course and, in the case of ASEAN, multilateral programmes. Most of the agencies have goodwill and are eager to cooperate – if asked. That they do not interact regularly might be because of not knowing what they could do for each other.

In cases where there is transaction, agencies are hampered by the lack of resources to carry out their networking responsibilities. Many agencies lack already the resources just for their own operation. In many instances, the agencies do not have access to information from other agencies because they do not have the funds to cover the cost of documentation and mailing. In a case involving two agencies from two countries, the agreement to help each other translate technical literature ceased to be implemented after the first translation as it took one party half an year to complete.

Looking at the experience of the few successful networking activities at the national or regional level, they have progressed and survived because a donor or the participating agencies have been able to provide the funds to cover the networking activities. If the donor withdraws and no replacement for the void is found, the network will collapse. For donors, it raises a fundamental question. Should networks, for the sake of networking, be propped up artificially through the pumping of external funds? One position looks at networking as a long-term investment. As the network jells, benefits arising therefrom would emerge. There are others, however, who believe that for networking to endure, it might be better in the long run to set aside formal networking until such time that the interested would-be participants are serious enough to commit resources regularly, as shown by the example of Technonet Asia, to meet networking obligations.

To promote networking, here are some measures that could be considered.

(1) Agencies should be encouraged to transact with each other more regularly at the national and regional level. At the regional level, regional agencies could serve as brokers bringing key officials of national agencies to meet each

other. When queries arise, the regional agencies could also serve as traffic managers directing the queries to national agencies for assistance. This way, transaction occurs and confidence would emerge as benefits from such transactions become visible.

(2) Additional budgetary resources both from within and without should be made available to carry out the networking responsibilities of agencies.

(3) Once agencies begin to transact regularly, then networking could be formalised through a written agreement.

(4) The designation of a national node from both the public and private sectors for networking could be pursued mainly for setting policy direction in technology information.

(5) For a wider scope and freer exchange of information through networking, membership should be open to as many of the appropriate parties in the public and private sectors as possible.

ANNEXES

ANNEXE 1

ADDRESSES OF TRADE AND INDUSTRY ASSOCIATIONS IN ASIA AND THE PACIFIC

AUSTRALIA	Australian Chamber of Commerce Brisbane Avenue Barton ACT 2600 AUSTRALIA
	Australian Industries Development Association 10 Queen's Road, Melbourne VIC 3004 AUSTRALIA
	Confederation of Australian Industry P.O. Box E14 Queen Victoria Terrace ACT 2600 AUSTRALIA
BANGLADESH	Federation of Bangladesh Chamber of Commerce and Industry 60 Motijheel Commercial Area, (4th Floor) Dhaka 2 BANGLADESH
	Bangladesh Electronics Manufacturers Association 10/C, Dhanmondi R.A., Road No. 6 G.P.O. Box 3119, Dhaka BANGLADESH
CHINA, P.R. OF	All-China Federation of Industry & Commerce Beijing P.R. OF CHINA
FIJI	Suva Chamber of Commerce P.O. Box 337, Suva FIJI
	Fiji Manufacturers Association P.O. Box 1095, Suva FIJI
HONG KONG	Chinese Manufacturers' Association of Hong Kong Wing Hang Bank Building 9/F, 161 Queen's Road Central HONG KONG
	Federation of Hong Kong Industries Rooms 407-411, 412, 414-416 4th Floor, Hankow Centre (formerly) J. Hotung House, 5 to 15 Hankow Road Tsimshatsui, Kowloon HONG KONG

	The Chinese General Chamber of Commerce 24-25 Connaught Road, C. 7/F HONG KONG
	Hong Kong General Chamber of Commerce 22nd Floor, United Centre, 95, Queensway HONG KONG
INDIA	Electronics Industries Association 1203, Prasad Chambers Tata Road, Bombay INDIA.
	Federation of Cottage and Small Industries Association of West Bengal P 31, CIT Road, Calcutta 700 014 INDIA.
	Appropriate Technology Development Association P.O. Box 311, Gandhi Bhavan Lucknow 226 001 INDIA
	Federation of Indian Chamber of Commerce and Industry Federation House Tansen Marg, New Delhi 110 001 INDIA
	Federation of Association of Small Industries of India 23B/2 Guru Gobind Singh Marg, New Delhi 110 005 INDIA
	All India Housing Development Association HUDCO House Lodhi Road, New Delhi 110 003 INDIA
IRAN	Iran Chamber of Commerce, Industry and Mines 254, Ave. Takht-Jamshid, Tehran IRAN
JAPAN	Electronics Industries Association of Japan Tosho Building, 2-2, 3-chome, Marunouchi Chiyoda-ku, Tokyo JAPAN
	Japanese Industrial Technology Association No. 20, Mori Building 8F 2-7-4 Nishi Shinbashi Minato-ku, Tokyo 105 JAPAN
	Association of Overseas Technical Scholarship 30-1 Senju-Aguma 1-Chome Adachi-ku, Tokyo JAPAN

	Federation of Pharmaceutical Manufacturers' Association of Japan 9, 2-Chome, Nihonbashi Hon-chu Chuo-ku, Tokyo JAPAN
	The Japan Chamber of Commerce and Industry 2-2, 3-Chome, Marunouchi Chiyoda-ku, Tokyo JAPAN
	Japan Iron & Steel Federation Keidanren Kaikan 9-4, 1-chome, Ote-machi Chiyoda-ku, Tokyo 100 JAPAN
	Japan Machine Tool Builders' Association Kikai Shinko Building, 3-5-8 Shibakoen Minato-ku, Tokyo JAPAN
KOREA REP. OF	Electronics Industries Association of Korea Room 1101, World Trade Centre, Seoul REPUBLIC OF KOREA
	Federation of Korean Industries FKI Building, 1-124, Yoido-dong Yongdungpo-ku, Seoul REPUBLIC OF KOREA
	Korea Chamber of Commerce & Industry No. 45, 4-ka, Namdaemun-ro Chung-ku, Seoul REPUBLIC OF KOREA
	International Cooperation Division Korea Federation of Small Business G.P.O. Box 4/8, Seoul REPUBLIC OF KOREA
MALAYSIA	Federation of Malaysian Manufacturers 17th Floor, West Wing, Wisma Sime Darby Jalan Raja Laut, Kuala Lumpur MALAYSIA
	The National Chamber of Commerce and Industry of Malaysia 6th Floor, Bangunan UDA (lama) 44, Jalan Sultan Ismail, P.O. Box 2529, Kuala Lumpur MALAYSIA
NEW ZEALAND	Building Research Association of New Zealand Private Bag, Porirua NEW ZEALAND

	New Zealand Manufacturers Federation Industry House Courtenay Place & Allen Street, Wellington NEW ZEALAND
NEPAL	Nepal Chamber of Commerce Nepal Bank Building No. 2, P.O. Box 198 Kathmandu NEPAL
	Federation of Nepalese Chamber of Commerce & Industry P.O. Box 269, Meera Home Khichapokhari, Kathmandu NEPAL
PAKISTAN	Federation of Pakistan Chambers of Commerce and Industries Clifton, Karachi PAKISTAN
	Pakistan Small Industries Association Madha Chamber (2nd Floor) M.A. Jinnah Road, Karachi PAKISTAN
	Pakistan Electronics Manufacturers Association Rizvi Chambers, Akbar Road Box No. 7741, Karachi PAKISTAN
	Pakistan Industrial Employers Federation 11-12, Hotel Ambassador Davis Road, Lahore 5 PAKISTAN
PAPUA NEW GUINEA	Papua New Guinea Chamber of Commerce and Industry P.O. Box 1621, Port Moresby PAPUA NEW GUINEA
PHILIPPINES, THE	Philippine Chamber of Commerce and Industry P.O. Box 579, Makati Commercial Centre 3 Rigal, D-108 THE PHILIPPINES
	United Coconut Association of the Philippines Inc. 941, Josefa Llanes Escoda Street, Manila THE PHILIPPINES
	Philippines Chamber of Commerce and Industry Chamber of Commerce Foundation Building Megallanes Drive, Intramuros, Manila THE PHILLIPINES

The Association of Development Financing Institutions in Asia and the Pacific (APFIAP)
PDCP Building, Ayala Avenue
Makati, Metro Manila
THE PHILIPPINES

SINGAPORE

Singapore Chinese Chamber of Commerce and Industry
47 Hill Street
SINGAPORE 6

Singapore Manufacturers Association
Suite 118, World Trade Centre
SINGAPORE 0409

Singapore International Chamber of Commerce
Denmark House
SINGAPORE 0104

Singapore Federation of Chambers of Commerce and Industry
Room 201, 2nd Floor
Chinese Chambers of Commerce Building
47, Hill Street,
SINGAPORE 0617

SOLOMON ISLANDS

Solomon Islands Chamber of Commerce
P.O. Box 64, Honiara
SOLOMON ISLANDS

SRI LANKA

Ceylon Association of Manufacturers
C/o Ceylon Chamber of Commerce
P.O. Box 274, Colombo
SRI LANKA

Federation of Chambers of Commerce and Industry
YMBA Building, Colombo 1
SRI LANKA

Ceylon Chamber of Commerce
127 Lower Chatham Street, Colombo 1
SRI LANKA

THAILAND

The Association of Thai Industries
394/14, Samson Road
Tambol Dusit, Bangkok 10300
THAILAND

Thai Chamber of Commerce
150 Rajbopit Road, Bangkok 2
THAILAND

Thai Food Processors' Association
Kesetsart University
Paholyothin Road, Bangkok
THAILAND

TONGA	Tonga Chamber of Commerce Workers and Industries P.O. Box 838, Nuka Alofa TONGA
VANUATU	Trade Information Service Chamber of Commerce of Vanuvatu P.O. Box 189, Port Vila VANUATU

ANNEXE 2

INFORMATION USERS' SURVEY
(Technology Information Pilot System)

a. At present, TIPS is designed to disseminate information in the following ten areas. Please check the **one** area in which you are most interested in receiving and/or supplying information, and please list in order of priority the rest of the areas.

RECEIVE SUPPLY

— Biomass
— Solar energy
— Coal
— Hydropower
— Electronics
— Extractive metallurgy
— Agricultural machinery
— Biotechnology
— Food processing
— Pharmaceuticals

If you are interested in any of these areas, please respond to all succeeding questions in reference to THIS ONE AREA OF INTEREST ONLY.

b. Independent of these ten areas, please indicate five additional products or areas of activities in which you are interested in RECEIVING and SUPPLYING information. Please list in order of priority.

Receive	Supply
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

If you have not indicated any of the ten TIPS areas in question "a" above, please respond to all succeeding questions in reference to the area of highest priority indicated here in which you are interested in RECEIVING information.

c. In what form and how do you currently receive information and would need additional information? Further, please indicate in what form and how could you supply information. Please check for each of the three columns.

FORM	RECEIVE	NEED	SUPPLY
Form of material			
a. Printed materials	—	—	—
b. Computer readable forms	—	—	—
c. Microfiche/film	—	—	—
d. Other, please specify	—	—	—
Form of tranmission			
a. Mail	—	—	—
b. Telephone	—	—	—
c. Telex	—	—	—
d. Data network	—	—	
e. Other, please specify	...	...	...

d. Please indicate the purposes for which you utilize the information that you currently receive and/or need. If in response to questions marked "a" and "b" you have expressed your institution/organization's willingness and ability to supply information to the network, indicate the purposes for which such information can be used. Please check for each use the extent to which you receive, need and can supply information on a scale from 1 (very much) to 3 (not much).

USES	RECEIVE 1 2 3	NEED 1 2 3	SUPPLY 1 2 3
a. Basic research (research into principles and phenomena)	—	—	—
b. Applied research (e.g. new products, processes, materials and applications, pilot operations and prototypes)	—	—	—
c. Industrial applications			
ca. Materials	—	—	—
cb. Design and engineering and field testing	—	—	—
cc. Production and processing	—	—	—
cd. Equipment	—	—	—
ce. Transport	—	—	—
d. Costs	—	—	—
e. Technology acquisition, licensing and patents	—	—	—
f. Human resources development (e.g., training courses, seminars)	—	—	—
g. Environmental effects	—	—	—
h. Trade, marketing and business opportunities	—	—	—

i. United Nations procurement and trade information	___	___	___
j. Financing opportunities	___	___	___
k. Other, please specify			
.....	___	___	___
.....	___	___	___

Additional comments .....

.....

e. Would your organization/institution be interested in receiving information about government regulations on technology transfer and trade from other countries?

RECEIVE	NEED	SUPPLY
1 2 3	1 2 3	1 2 3
___	___	___

ANNEXE 3

LIST OF COMMERCIAL DATA BASES

NAME	No. of FILE	MAIN SUBJECT AREA	No. of references	Time span
ABI/INFORM	**30**	Management	245.000	1971
ABI/SOFT	**89**	Business softwares	3.500	1983
ACOMPLINE	**35**	Urban matters	75.000	1973
AEROSPACE DAILY	**72**	Daily aerospace news	2.500	1983
AFEE	**73**	Aquatic sciences	57.000	1970
AGRIS	**29**	Agriculture	920.000	1975
ALUMINIUM	**9**	Aluminium	110.000	1968
AMPEREDOC	**81**	Electricity	1.300	1983
AQUALINE	**25**	Aquatic environment	83.000	1974
ASIAN GEO	**70**	Geotechnical engineering	28.000	1970
BIIPAM	**71**	Metallurgy	65.000	1970
BIOSIS	**7**	Biology	3.252.000	1973
CAB	**16**	Agriculture	1.625.000	1973
CBA	**95**	Biotechnology	6.800	1983
CEA	**85**	Chemical engineering	67.000	1970
CETIM	**54**	Engineering	70.000	1975
CHEMABS	**2**	Chemistry	6.500.000	1967
CHEMABS TRAINING	**38**	Subset of CHEMABS	68.000	
CIS-DOC	**40**	Occupational health and safety	21.000	1973
COMPENDEX	**4**	Engineering	1.345.000	1969
COSMIC	**69**	Softwares	1.000	current
CPI	**36**	Conference proceedings	1.020.000	1973
CURRENT BIOTECH	**95**	Biotechnology	6.000	1983
EDF-DOC	**27**	Electricity-Energy	284.000	1972
EDIN	**26**	INIS Training - Subset		
EI MEETINGS	**51**	Engineering proceedings	220.000	1982
ENEL	**60**	Italian Electricity Board	7.000	1980
ENERGYLINE	**19**	Energy	81.000	1971
ENERGYNET	**50**	Energy: US key institutions and personnel	updated quarterly	1983
ENVIROLINE	**11**	Environment	111.000	1971
EUDISED	**24**	Educational research projects	4.100	1975
FOOD SCIENCE	**20**	Food sciences	267.000	1969
FLUIDEX	**48**	Fluid engineering	147.000	1973
HSELINE	**47**	Health & safety	55.000	1977
INIS	**28**	Nuclear sciences	780.000	1975
INSPEC	**8**	Physics-informatics	2.100.000	1971
INSPEC LIBRARY	**31**	Information sciences	17.000	1971
INSPEC TRAINING	**39**	Subset of INSPEC	46.000	1977
IRRD	**43**	Road research	167.000	1972
ISMEC	**10**	Mechanical engineering	167.000	1973
LABORDOC	**53**	Labour-related aspects	119.000	1965
LAB. HAZARDS BULL	**90**	Chemical hazards	3.000	1981
LEDA	**13**	Catalogue of remote sensing Images	190.000	1975
MASSLIT	**86**	Mass spectrometry	125.000	1966
MATHFILE	**80**	Mathematics	400.000	1973
MERLIN-TECH	**65**	Electrical & electronic engineering	30.000	1973
METADEX	**3**	Metallurgy	500.000	1969

MOLARS	**82**	Meteorology	124.000	1971
NASA	1	Aerospace *(access restricted to ESA member states)*	1.334.000	1962
NTIS	6	U.S. government reports	1.050.000	1962
OCEANIC	17	Oceanography	153.000	1964
PACKABS	55	Packaging technology	9.000	1981
PASCAL	14	Multidisciplinary	5.080.000	1973
PASCAL TRAINING	37	Subset of PASCAL	23.000	1976-78
POLLUTION	18	Pollution	105.000	1970
PTS	45	Personal Time Series	—	—
ROBOMATIX	84	Robotics	4.200	1983
SATELDATA	12	Satellite equipment parameters	900	1974
SPACECOMPS	22	Components for spacecraft use	11.000	1970
STANDARDS & SPECS.	44	U.S. standards and specifications	104.000	1950
TELEGEN	49	Bio-engineering	11.500	1976
TEXTLINE/NEWSLINE	21	Daily company news	200.000	1980
TRANSDOC	74	Transportation, economics, policy	11.000	1970
WORLD TRANS INDEX	33	Translation announcements	155.000	1978

ANNEXE 4
WORKSHEET FOR CATALOGUES

APTIS COMPUTER WORKSHEET NO.2

DATA BASE : CATALOG

Title: (R100) NON-FIRED CLAY BRICK		
Country: (R200) KOR	ISIC: (R300) 3691	Sector: (R400) LCC
Keywords: (R500) /LCC// BRICKS// CLAY// CLAY BRICK// NON-FIRED CLAY BRICK/ /RED BRICK// ADDITIVES/		
Capacity: (R510) 1200 BRICKS / HOUR		
Technical Description: (R600) MAINLY MADE OF GENERAL SOIL CLAY WITH ADDITIVES AND COMPRESSED BEFORE IT IS CURED IN OPEN AIR FOR 5-7 DAYS. NON-FIRED CLAY BRICK IS RESISTANT TO WATER, SAVES HEATING AND COOLING ENERGY, SHOWS GOOD ADHESION TO CEMENT MORTAR. CAN BE USED FOR ANY TYPE OF CONSTRUCTION.		
Contact Address (R700): Name (R701): HAN KUK SANG SA CO LTD. Line1 (R702): # 1157-7, CHORANG-DONG Line2 (R703): DONG-KU, PUSAN, P.O. Box 462, PUSAN Line3 (R704): REPUBLIC OF KOREA Line4 (R705): —		
Type of Contact (R706): ( ) Licensor (✓) Manufacturer ( ) R&D Inst. ( ) Agent/Dealer	Terms of Tech. Transfer (R800) ( ) Licence (✓) Know-how ( ) Turnkey ( ) Cash investment ( ) Joint venture	
Status of Technology (R900): Stage of Development (R901): (✓) Commercialized ( ) Commerciable ( ) Patented ( ) Pilot scale Year of commercialization/~~patent~~ (R902): 1988		
Material available (R910): ( ) Project profile ( ) Tech. Write-up (✓) Catalogue ( ) Others [specify]		
No. of pages (R920): 8	Located at rack no.(R930): 18-A	
Investment cost (R940): ——		
Remarks (R950): PATENT NO. 17227 REPUBLIC OF KOREA PATENT NO. 1580227 UNITED KINGDOM		

ANNEXE 5
A SAMPLE OUTPUT FOR A CATALOGUE FILE

```
ISN=1621
R100 TYPE   : C
R110 TITCAT : NON-KILN BRICK MAKING MACHINE
R200 CNTRY  : CHN
R300 ISIC   : 3691
R400 SECTOR : LCC
R500 KEYS   : /LCC//BRICKS//BRICK MAKING//BRICK MAKING
              MACHINERY//NON-KILN BRICK
              MAKING//SOIL//CEMENT//NON-KILN BRICKS/
R600 DESC   : THE PROCESS OF PRODUCTION OF BRICKS IS VERY
              SIMPLE AND INVOLVES THE STELS OF SOIL SUPPLY,
              CRUSHING, MIXING CEMENT, HARDENING AGENTS
              ADDITION AND AGAIN MIXING, SHAPE FORMING, STORAGE
              AND THEN SHIPPING.  THIS NON-KILN BRICK IS
              EXCELLENT HEAT INSULATION.
R701 NAME   : NEOGEST TRADING CO., LTD.,
R703 ADD2   : 67, 92 SEC.
R704 ADD3   : ANKING E ROAD, TAIPEI,
R705 ADD4   : TAIWAN ,CHINA.
R706 TYPCON : MANUFACTURER
R901 STADEV : COMMERCIALISED
R910 MAT    : CATALOGUE
R920 PAGES  : 2


ISN=1683
R100 TYPE   : C
R110 TITCAT : WALLBANK P1714-46DP  :  DRY PRESS BRICK MAKING
              PLANT
R200 CNTRY  : AUS
R300 ISIC   : 3824
R400 SECTOR : LCC
R500 KEYS   : /LCC//BRICKS//DRY PRESS BRICK//BUILDING
              MATERIALS//BRICK MAKING MACHINERY/
R510 CAP    : 1100 BRICKS/HOUR ,
R600 DESC   : THIS 'WALLBANK P1714-46DP' MAKES LOW COST, HIGH
              STRENGTH DRY PRESS BRICKS AND FLOOR TILES.  IT
              SUITS BOTH LARGE INDUSTRY APPLICATION AND SMALL
              SCALE PRODUCTION.  THE MACHINE MANUFACTURES HIGH
              QUALITY BRICKS AND FLOOR TILES.  THESE BRICKS
              PRODUCED ARE SUITABLE FOR STRUCTURAL WORK.  FOR
              EASE OF TRANSPORTATION, THE BRICK MAKING MACHINE
              HAS BEEN DESIGNED AS A MODULAR UNIT.  THIS HAS
              THE CAPACITY TO PRESS 1100 BRICKS/HOUR AND
              PROVIDES TROUBLE FREE OPERATION AND OFFERS EASY
              MAINTENANCE.
R701 NAME   : PACTRA SERVICES PTY. LTD.
R702 ADD1   : 37-49 PITT STREET
R703 ADD2   : SYDNEY  NSW 2000,
R705 ADD4   : AUSTRALIA
R706 TYPCON : MANUFACTURER
R901 STADEV : COMMERCIALISED
R910 MAT    : CATALOGUE
R920 PAGES  : 2


ISN=2751
R100 TYPE   : C
R110 TITCAT : NON-FIRED CLAY BRICK
R200 CNTRY  : KOR
R300 ISIC   : 3691
R400 SECTOR : LCC
R500 KEYS   : /LCC//BRICKS//CLAY//CLAY BRICK//NON-FIRED CLAY
              BRICK//RED BRICK//ADDITIVES/
R600 DESC   : THE NON-FIRED CLAY BRICK IS MAINLY MADE OF
              GENERAL SOIL CLAYSPECIAL ADDITIVES AND THEN
              COMPRESSED BEFORE IT IS CURED IN THE OPEN AIR FOR
              ABOUT 5-7 DAYS.  THE NON-FIRED CLAY BRICK IS
              RESISTANT TO WATER, SAVES HEATING AND COOLING
              ENERGY OF LIVING, A GOOD ADHESION TO CEMENT
              MORTAR AND THIS CAN BE USED FOR ANY TYPE OF
              CONSTRUCTION.
R701 NAME   : HAN KUK SANG SA CU LTD
R703 ADD2   : # 1157-7, CHORANG-DONG,
R704 ADD3   : DONG-KU, PUSAN, P.O. BOX 462, PUSAN,
R705 ADD4   : KOREA
R706 TYPCON : MANUFACTURER
R800 TERMST : KNOW-HOW
R901 STADEV : COMMERCIALISED
R901 STADEV : PATENTED
R910 MAT    : CATALOGUE
R920 PAGES  : 4
R950 REMARK : PATENT  NO: 17227 REPUBLIC OF KOREA     :     NO:
              1580227 UNITED KINGDOM
R960 FEATUR : AT-270
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ANNEXE 6
EXAMPLES OF ORGANISATIONAL SUTRUCTURE OF TECHNOLOGY INFORMATION AGENCIES

Chart A: Institute of Scientific and Technical Information of China (ISTIC)

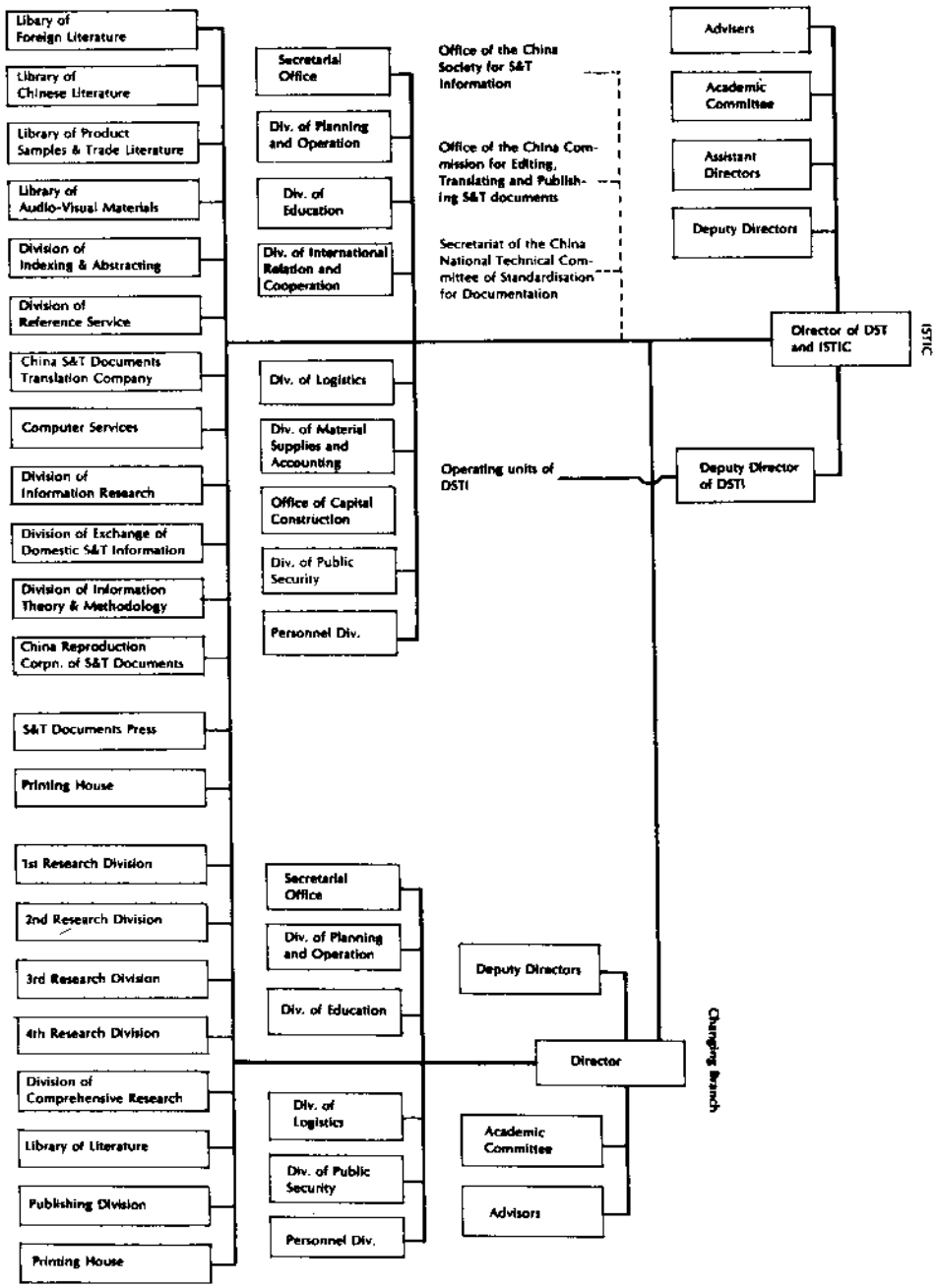


Chart B: Japan Information Centre of Science and Technology (JICST)

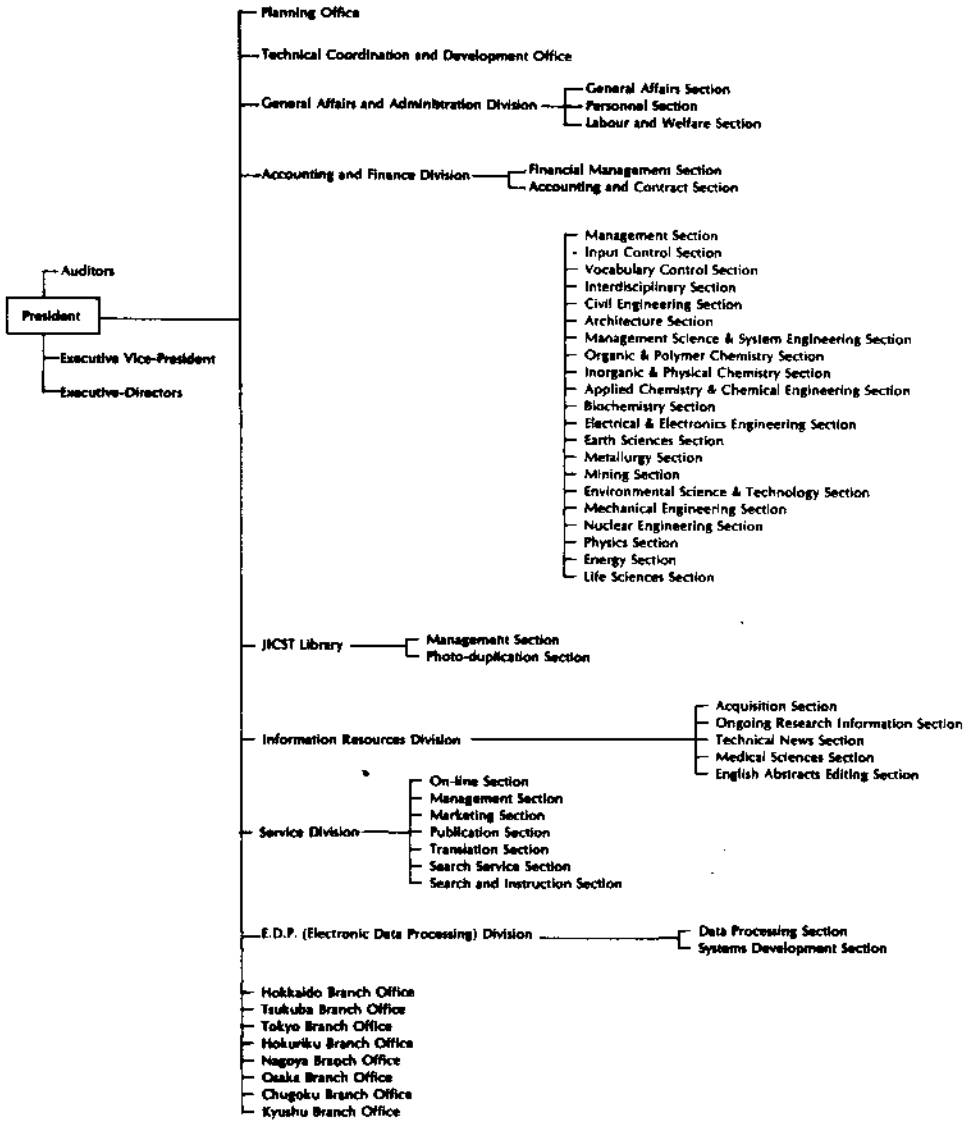
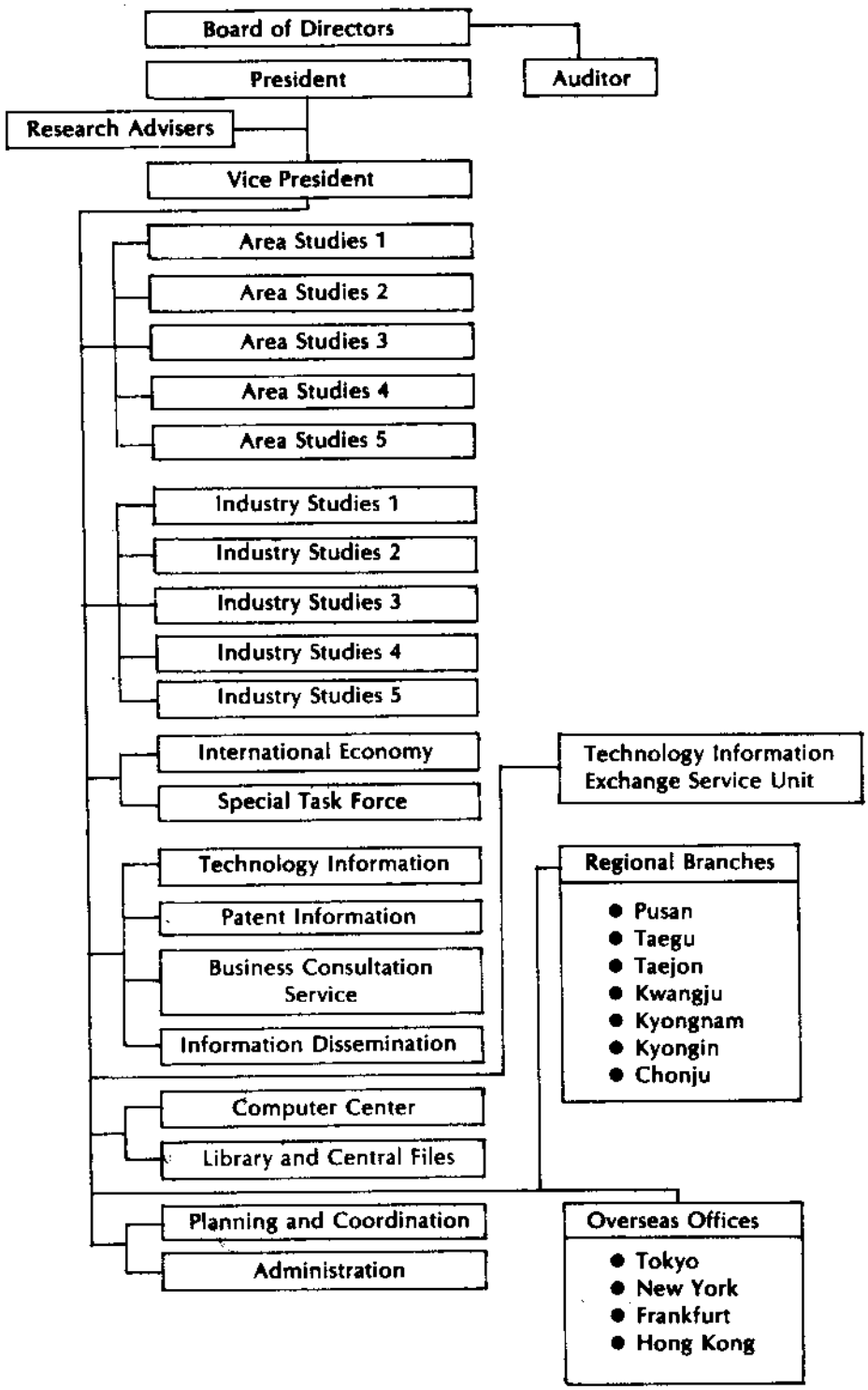


Chart C: Korea Institute for Economics and Technology (KIET)



Area Studies

Division 1	North America. Central America
Division 2	Japan, Southeast Asia, Pacific Island Countries
Division 3	Western Europe, Oceania, South America
Division 4	Middle East, Africa
Division 5	Communist Countries, South-west Asia

Industry Studies

Division 1	General machinery (excluding transportation machinery), electrical machinery, plant and construction
Division 2	Transportation machinery (autos, shipbuilding, aircraft), steel, metals, nonferrous metals
Division 3	Electronics, high-technology industries
Division 4	Chemicals, textiles, ceramics, pharmaceuticals
Division 5	Natural resources, energy, primary industry (forestry, agriculture, fisheries), light industry.

International Economy and Special Studies

Int'l Economy Division	International economic trends and prospects, world oil and commodity markets, international trade, international financial markets, foreign exchange markets.
Special Task Force Division	Major policy issues, business support issues

Information Dissemination and Business Consultation Service

Technology Information Division	Technical information search and dessimination; publication of abstracts, indexes and other information research tools
Patent Information Division	Patent information search and dissemination; publication of patent abstracts, indexes and other patent research tools
Business Consultation Service Division	Consultation and extension services to individual enterprises covering technical information, marketing, financing, technical consultancy and transfers of technology.
Information Dissemination Division	Data and information dissemination, subscriber and membership management
Regional Branches	Information dissemination and business consultation and extension services to individual enterprises in their jurisdiction; advice to local governments on regional economic issues
Technology Information Exchange Service Unit	Collection and promotion of transfers of technological information

Information Services and Data Bank

Library and Central Files Division	Collection and management of information resources; reference services

Computer Center	Database management; database development; computer-based information retrieval

Planning and Administration

Planning and Coordination Division	General Planning; domestic and international coordination; overseas and domestic branch administration; public relations; publications
Administration Division	General administration; budget; accounting; general services.

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